# South Australia's Recycling Activity Survey

## 2011-12 Financial Year Report

www.zerowaste.sa.gov.au

rawtec

Government of South Australia
Zero Waste SA

# 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 2011-12, which collected the State's recycling and landfill disposal data for this purpose.

## Summary of 2011-12 results

Total resource recovery for SA was 3.98 million tonnes (Table 1 below). In accordance with new National Guidelines for compiling waste and recycling data (DSEWPC 2012a), this total resource recovery comprised:

- 2.75 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of metals, organics, cardboard & paper, glass, plastics, masonry, etc.;
- 1.23 million tonnes of 'Separately Reported Materials' – 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 was 1.22 million tonnes.

- Nearly one quarter (311,000 tonnes) of this landfill disposal was contaminated soil from construction activities. This material can also be categorised as a 'Separately Reported Material' under new National Guidelines for compiling waste and recycling data (DSEWPC 2012a).

SA therefore achieved a diversion rate of 76.5% (of total waste generated to resource recovery).

**Table 1** Summary of 2011-12 Recycling Activity results for resource recovery, landfill disposal, total waste generated, and total diversion (waste to resource recovery) achieved in SA during 2011-12.

| | 2011-12 Recycling Activity Data Account Summary | | |
|---|---|---|---|
| | Standard Reporting Materials* | Separately Reported Materials* | **TOTAL (All materials)** |
| Resource recovery, tonnes | 2.75 million | 1.23 million | **3.98 million** |
| Landfill disposal, tonnes | 0.91 million | 0.31 million | **1.22 million** |
| Total Waste generated**, tonnes | 3.66 million | 1.54 million | **5.2 million** |
| Diversion, % to resource recovery | 75.1% | 79.8% | **76.5%** |

* *Standard and Separately reported materials – As specified by the new National Guidelines for compiling waste and recycling data (DSEWPC 2012a)*

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

## Resource Recovery by Material

Over 2.2 million tonnes, or more than 50% (by weight), of SA's resource recovery were masonry materials and the Separately Reported Materials (Figure 1 below). These materials were mainly generated by construction activities. The next major contributor to SA's resource recovery was Organic materials (at 0.9 million tonnes or 22.7%), arising from timber mills, regional processing of primary produce, and local government kerbside collections of garden organics. Metal (11.4%) and Cardboard & Paper materials (6.3%), from industrial activity and kerbside collections, were the other significant contributors to SA's resource recovery.

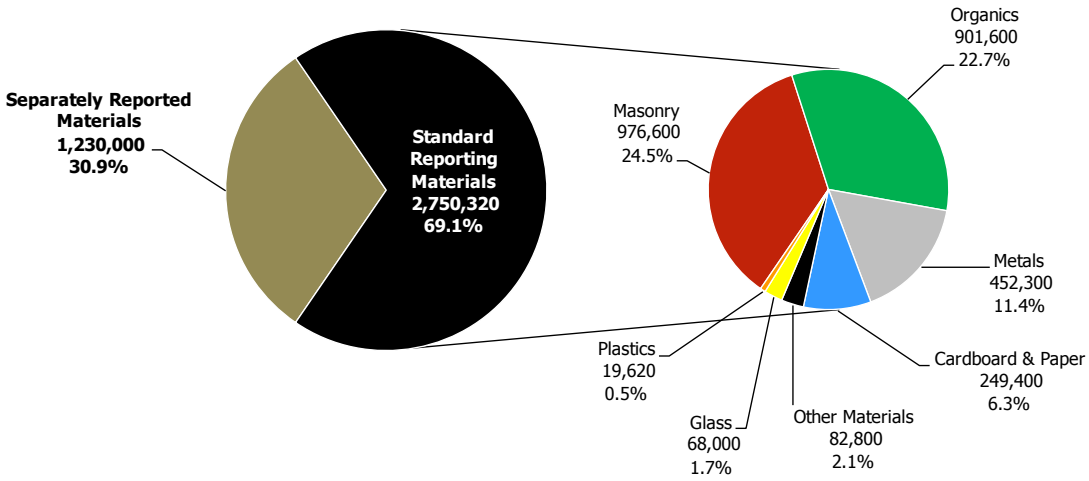


**Figure 1** Contribution of different material categories to SA's resource recovery during 2011-12

## Market value of resource recovery

The estimated total 'direct' market value of resource recovered materials for SA in 2011-12 was $313 million (Figure 2), or $79 per tonne of resource recovered on average. Metals, organics and paper and cardboard waste materials were the major contributors to this resource market value.

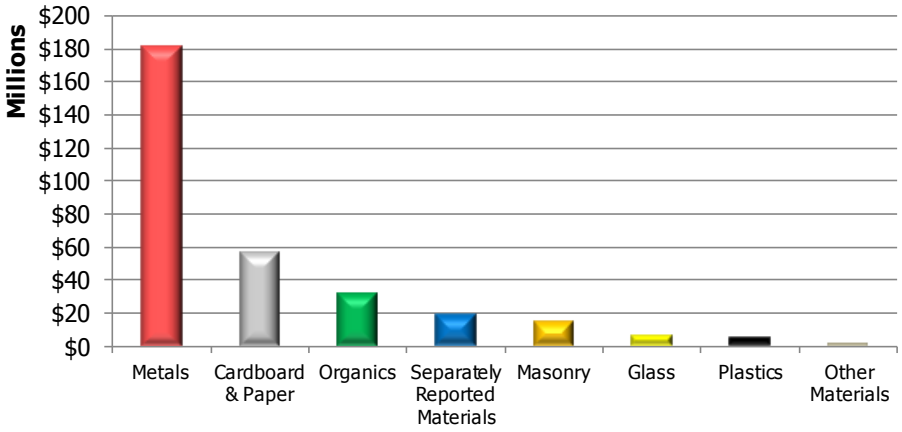


**Figure 2** Estimated 'market' value of resource recovered material in SA during 2011-12

## Resource recovery trends

Total resource recovery (3.98 million tonnes) and diversion (76.5%) was less than 2010-11, which had a total resource recovery of 4.31 million tonnes and a diversion of 79.9% (Figure 3 below and Figure 4 overleaf).

- Separately Reported Materials decreased by 16% (230,000 tonnes).
- Standard Reporting Materials also decreased, by 3% (96,000 tonnes).

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 4 million tonnes each year.
- The diversion rate has steadily increased from just above 60% to between 75 and 80%.

Several major infrastructure projects have occurred in SA during the past two years (since 2009-10). These projects include the Adelaide Desalination Plant, Adelaide Oval Redevelopment, and Royal Adelaide Hospital. Waste soil from this construction activity has contributed substantially to an increased resource recovery of Separately Reported Materials over this period.

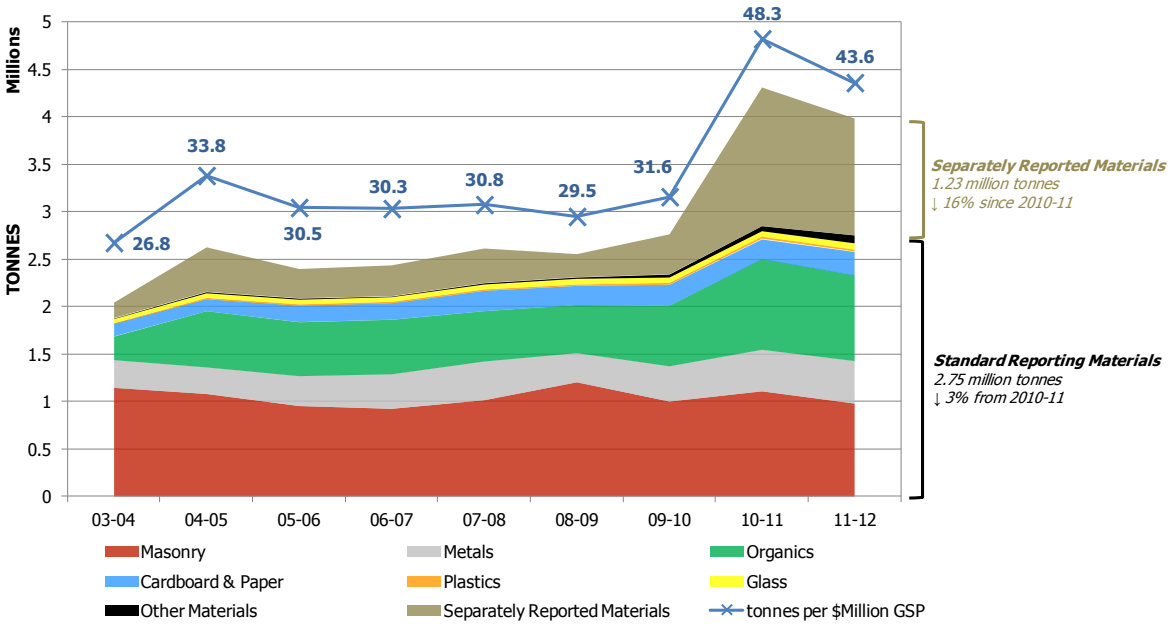


**Figure 3** Trend in resource recovery for SA by material category since 2003-04, including tonnes per $ million of Gross State Product (GSP) since 2006-07.

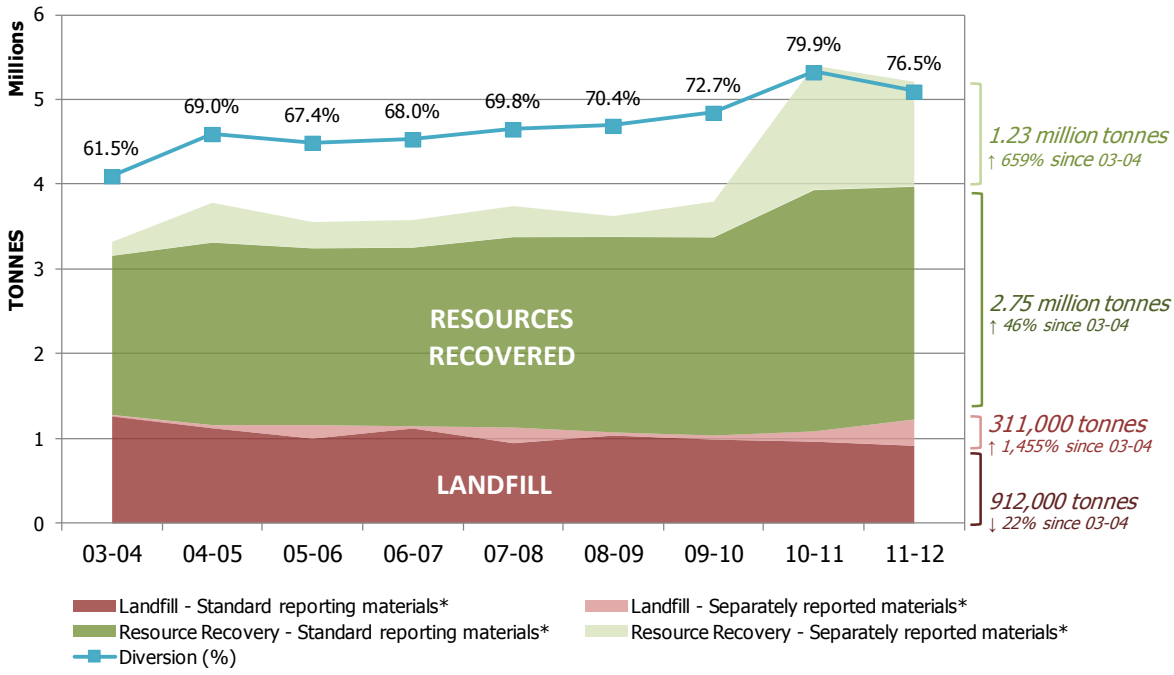


**Figure 4** Trend in resource recovery and landfill disposal in SA since 2003-04. * Reporting of both resource recovery and landfill disposal is divided into Standard Reporting Materials and Separately Reported Materials categories (see page 1).

## Resource recovery by source sector

Construction & Demolition (C&D) was again the major source sector (at 54% by weight) for SA's resource recovery (Figure 5 below). Separately Reported Materials (i.e. waste soil) provided more than half of this C&D sector contribution.

Commercial and Industrial (C&I) and Municipal (MSW) source sectors achieved similar levels of resource recovery to last year (2010-11).

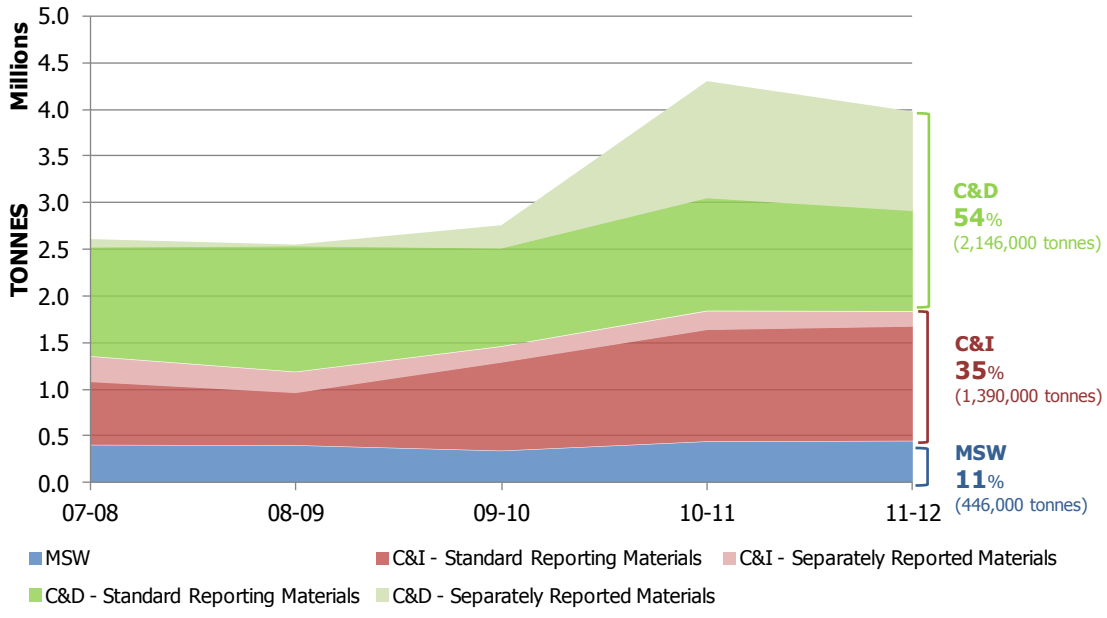


**Figure 5** Contribution to resource recovery in SA by source sector for 2011-12 and trend since 2007-08

## 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 2011-12, SA's resource recovery activities led to estimated savings in:

- Greenhouse Gas emissions of 1.28 million tonnes of CO2-e;
- Energy savings of about 16,400 Terajoules (TJ[1]); and
- Water savings of about 13,700 Megalitres (ML[2]).

## Landfill disposal

Total landfill disposal rose to 1.22 million tonnes, up by 13% from 1.08 million tonnes recorded in 2010-11 (Figure 4 on page 5 and Figure 6 below). Growth in landfill disposal was caused by a significant contribution of (the aforementioned) 311,000 tonnes of contaminated soil from major infrastructure projects. As a consequence, C&D contribution to landfill disposal (at 45%) is greater. Even though the relative (or %) contribution from MSW and C&I sectors decreased, there was little change in landfill disposal volumes from these source sectors. Landfill disposal from these source sectors has remained relatively steady over the past several years, displaying slight downward trends.

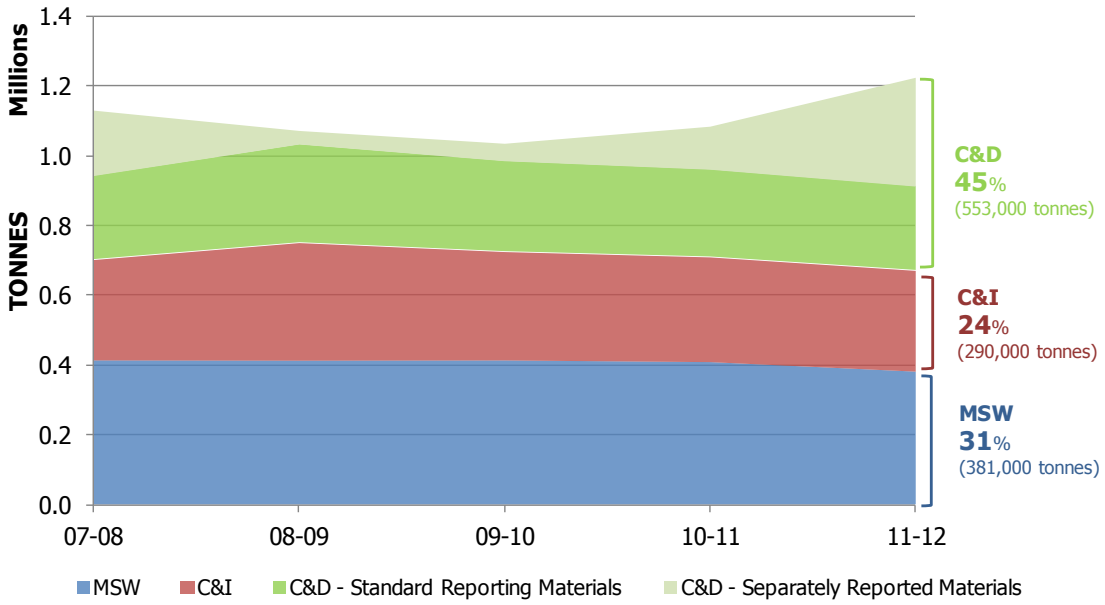


**Figure 6** Contribution to landfill disposal in SA by source sector for 2011-12 and trend since 2007-08

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

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

## 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.***

South Australia would be on target to achieve this goal if not for recent growth in landfill disposal of contaminated soil (Figure 7 below). Excluding contaminated soil, SA's disposal to landfill (at 913,000 tonnes) has reduced by 26% since 2003-04 (1.23 million tonnes). Consequently, there is potential risk that this target will not be achieved if excessive quantities of contaminated soil continue being disposed to landfill.

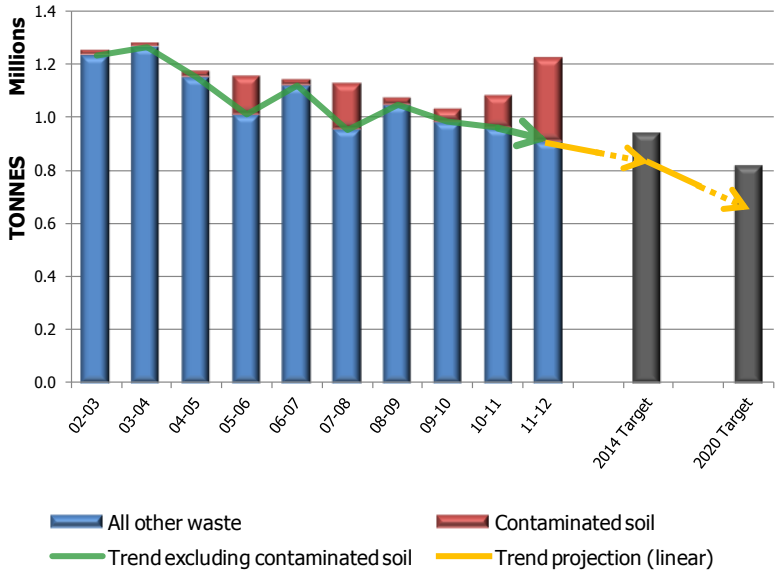


**Figure 7** Landfill disposal trend in SA versus State Waste Strategy Target for landfill reduction

## 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 2011-12 decreased by >3% (from 2010-11) for both Standard Reporting Materials and overall (including Separately Reported Materials). If this trend continues, South Australia will be on track to achieve the 2015 target.

**Table 2** 2011-12 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* | ***% Change*** | |
| Standard Reporting Materials | 2,300 | 2,210 | **-3.9%** | 5% Reduction |
| Separately Reported Materials | 960 | 930 | | |
| **TOTAL** | 3,260 | 3,140 | **-3.7%** | |

## 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 2011-12.

- MSW – A diversion rate of 59% fell just short of the 2012 Target.
- C&I – The 2012 Target was achieved with a diversion rate of 74.9%.
- C&D – The diversion rate (80.2%) was below the 2012 Target. This diversion rate only increases marginally (to 80.7%) when Separately Reported Materials are removed.

**Table 3** 2011-12 Recycling Activity results for metropolitan diversion by source sector in 2011-12 vs. State Waste Strategy targets

| Source Sector | 2011-12 Diversion Achieved | Metro Diversion Target | |
|---|---|---|---|
| | | *By 2012* | *By 2015* |
| ■ **MSW** | **59.0%** | 60% | 70% |
| ■ **C&I** | **74.9%** | 65% | 75% |
| ■ **C&D - *excluding Separately Reported Materials*** | **80.7%** | 85% | 90% |
| ■ **C&D - *Total*** | **80.2%** | | |

## 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, South Australia:

- Achieves the highest diversion rate (at 76.5%) and per capita resource recovery (at 2,410 kg/person/yr) in Australia;
- Has one of the lowest per capita landfill disposal rates (at 740 kg/person/yr);
- But continues to have a per capita waste generation rate (at 3,150 kg/person/yr) above several other States or Territories.

# 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 2011-12 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 new 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 2011-12 Recycling Activity Survey report

This report presents the results of Zero Waste SA's annual Recycling Activity Survey for the 2011-12 Financial Year (1 July 2011 – 30 June 2012). 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 2011-12.
- **Section 3** – Presents the 2011-12 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 2011-12 Recycling Activity Survey data.
- **Section 6** – Assesses the environmental benefits, including greenhouse gas emission savings, of recycling for SA achieved by its 2011-12 recycling performance.
- **Section 7** – Provides an estimate of the market value for resources recovered during 2011-12.
- **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** – Lists references and other sources of information used in compiling this report.
- **Appendices** –
  - *Appendix 1* – Describes the methodology that was used to undertake the 2011-12 Recycling Activity Survey.
  - *Appendix 2* – Summarises selected 2011-12 Recycling Activity Survey statistics relating to industry participation.
  - *Appendix 3* – Provides a copy of the questions used in the 2011-12 Recycling Activity Survey.
  - *Appendix 4* – Lists the emission and conversion factors that were adopted for the environmental benefits analysis of the 2011-12 Recycling Activity data.

# 2 Key 2011-12 Recycling Activity statistics

**At a glance:**

- *This section summarises the key outcomes and statistics obtained from analysis of the 2011-12 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 2.3); and*
  - *SA's resource recovery and performance relative to other States and Territories in Australia (Section 2.4)*

## 2.1 Resource recovery & landfill disposal

### 2.1.1 Overview

In 2011-12 SA's recycling industries reported 3.98 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:

- 2.75 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of metals, organics, cardboard & paper, glass, plastics, masonry, etc.;
- 1.23 million tonnes of 'Separately Reported Materials' – reported data for soil, sand, rock, rubble and fly ash materials[4].

Total resource recovery was down by 7% from the 4.31 million tonnes reported for 2010-11.

As a consequence, SA's 2011-12 per capita diversion/recovery rate decreased to 2,410 kg per person per year (down from 2,600 kg/p/yr in 2010-11). Material recovered per $ Gross State Product (GSP) in 2011-12 also reduced (from 48 tonnes in 2010-11) to 44 tonnes per $1 million.

Based on this total resource recovery, SA achieved a diversion rate of 76.5% (down from 79.9% in 2010-11). 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 2011-12 the amount of waste accepted by landfills in SA increased to 1.22 million tonnes (up from 1.08 million tonnes in 2010-11). This represents a per capita waste-to-landfill rate of 740 kg/p/yr (up from 640 kg/p/yr in 2010-11). Waste to landfill per $1 million GSP also increased from 12 tonnes in 2010-11 to 13 tonnes.

*{Continued overleaf below Table 2.1}*

[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 2011-12, 2003-04 (first survey year) and since 2007-08.** *This table presents a breakdown of 'Standard' and 'Separately' Reported Materials in accordance with new National Waste Reporting Guidelines (DSEWPC 2012a). Of 3.99 million tonnes of recycling reported in 2011-12, 1.23 million tonnes was recycled soil, sand, rock and fly ash materials, or 'Separately' Reported Material. Changes in performance since 2003-04 and from 2010-11 are also shown.*

| | 2003-04 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | Change | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | *10-11 to 11-12* | *03-04 to 11-12* |
| **RESOURCE RECOVERY (TONNES)** | | | | | | | | |
| Standard Reporting Materials | 1,880,000 | 2,248,000 | 2,309,000 | 2,340,000 | 2,850,000 | 2,750,000 | -3.5% | 46% |
| Separately Reported Materials | 162,000 | 363,000 | 243,000 | 420,000 | 1,460,000 | 1,230,000 | -16% | 659% |
| **TOTAL (for SA)** | **2,042,000** | **2,611,000** | **2,552,000** | **2,760,000** | **4,310,000** | **3,980,000** | **-8%** | **95%** |
| **LANDFILL DISPOSAL (TONNES)** | | | | | | | | |
| Standard Reporting Materials | 1,258,000 | 943,000 | 1,033,000 | 985,000 | 961,000 | 913,000 | -5.0% | -27% |
| Separately Reported Materials | 20,000 | 187,000 | 39,000 | 50,000 | 123,000 | 311,000 | 153% | 1455% |
| **TOTAL (for SA)** | **1,278,000** | **1,130,000** | **1,072,000** | **1,035,000** | **1,084,000** | **1,224,000** | **13%** | **-4.2%** |
| **WASTE GENERATION (TONNES)** | | | | | | | | |
| Standard Reporting Materials | 3,138,000 | 3,191,000 | 3,342,000 | 3,325,000 | 3,811,000 | 3,663,000 | -3.9% | 17% |
| Separately Reported Materials | 182,000 | 550,000 | 282,000 | 470,000 | 1,583,000 | 1,541,000 | -2.7% | 747% |
| **TOTAL (for SA)** | **3,320,000** | **3,741,000** | **3,624,000** | **3,795,000** | **5,394,000** | **5,204,000** | **-3.5%** | **57%** |
| **DIVERSION/RECOVERY RATE (%)** | | | | | | | | |
| Standard Reporting Materials (ONLY) | 59.9% | 70.4% | 69.1% | 70.4% | 74.8% | 75.1% | 0.4% | 25% |
| **TOTAL (for SA)** | **61.5%** | **69.8%** | **70.4%** | **72.7%** | **79.9%** | **76.5%** | -4.3% | 24% |
| **SA population (persons)** | **1,534,000** | **1,601,800** | **1,622,700** | **1,644,600** | **1,657,000** | **1,654,800** | **-0.1%** | **7.9%** |
| **PER CAPITA DIVERSION/RESOURCE RECOVERY (KG/PERSON/YR)** | | | | | | | | |
| Standard Reporting Materials (ONLY) | 1,230 | 1,400 | 1,420 | 1,420 | 1,720 | 1,660 | -3.5% | 35% |
| **TOTAL (for SA)** | **1,330** | **1,630** | **1,570** | **1,680** | **2,600** | **2,410** | **-7.3%** | **81%** |
| **PER CAPITA LANDFILL DISPOSAL (KG/PERSON/YR)** | | | | | | | | |
| Standard Reporting Materials (ONLY) | 820 | 590 | 640 | 600 | 580 | 550 | -5.2% | -33% |
| **TOTAL (for SA)** | **830** | **710** | **660** | **630** | **650** | **740** | **14%** | **-11%** |
| **PER CAPITA WASTE GENERATION (KG/PERSON/YR)** | | | | | | | | |
| Standard Reporting Materials (ONLY) | 2,050 | 1,990 | 2,060 | 2,020 | 2,300 | 2,210 | -3.9% | 8% |
| **TOTAL (for SA)** | **2,160** | **2,340** | **2,230** | **2,310** | **3,250** | **3,150** | **-3.1%** | **46%** |
| **SA Gross State Product[(a)] (GSP) ($millions)** | **76,287** | **84,855** | **86,450** | **87,346** | **89,322** | **91,217** | **2.1%** | **20%** |
| **PERFORMANCE METRICS PER $GSP (TONNES/$MILLION GSP)** | | | | | | | | |
| TOTAL SA Diversion/Resource Recovery (b) | 27 | 31 | 30 | 32 | 48 | 44 | -10% | 63% |
| TOTAL SA Landfill Disposal (b) | 17 | 13 | 12 | 12 | 12 | 13 | 11% | -20% |
| TOTAL SA Waste Generation (b) | 44 | 44 | 42 | 43 | 60 | 57 | -5.5% | 31% |

Notes:

(a) Reference year for GSP chain volume measures (which removes the inflation effects on GSP values) is 2009-10.

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

Both 2010-11 and 2011-12 saw a significant spike in resource recovery and waste to landfill in South Australia. This spike has been caused by several major infrastructure projects (Royal Adelaide Hospital, Adelaide Oval Redevelopment and Adelaide Desalination Plant) in metropolitan Adelaide which have coincided during this period. These projects have contributed up to an extra 1 million tonnes to resource recovery of soil and contaminated soil during these financial years. Contaminated soil also added 311,000 tonnes to landfill waste for 2011-12, and 123,000 tonnes in 2010-11. The resource

recovery and landfill disposal of soil and contaminated soils should return to more normal conditions (and lower levels) following completion of these infrastructure projects.

The landfill disposal rate for 2011-12, once contaminated soils are excluded (i.e. for Standard Reporting Materials, only), shows a decrease of 5% from 2010-11, and 27% since 2003-04.

### 2.1.2 Recovery by material type

Resource recovery reported for various waste materials changed during 2011-12 (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 12% overall from 2010-11). Despite contribution of the major infrastructure projects occurring in SA, there appears to have been a reduction in Construction and Demolition (C&D) activity across other sectors of the economy.

Lower resource recovery was reported for Organics. This decrease seems to have been caused by reduced collection of kerbside garden organics recovered (down 20,000 tonnes from 2010-11).

Plastics recovery reported in SA dropped in 2011-12 (down 17% from 23,700 tonnes). Part of this reduction, particularly for HDPE, seems to be due to improved methods of reporting by re-processors. Difficult economic conditions during the past year also appear to have contributed to lower resource recovery volumes from Commercial and Industrial (C&I) sources.

Higher resource recovery was reported for Cardboard & Paper (up 18%), Glass up (17%) and Other Materials (up 57%).

The increase in resource recovery for Cardboard & Paper continues a recent trend of improved resource recovery for cardboard materials, which has doubled in quantity since 2003-04. This trend has been driven by its improved commodity value and on-going expansion of local services and infrastructure for its collection.

Whilst a relatively small contributor to Cardboard & Paper, the resource recovery of phonebooks reported during 2011-12 (900 tonnes) decreased substantially (by 64%) from 2010-11 (2,500 tonnes). This change is attributed to recent adoption of a 'compact version' phone book combined with lower hard copy printing and distribution of phone books.

Foundry Waste, which increased by 29,000 tonnes (or 92%) from 2010-11, has been the main contributor to the rise in resource recovery for Other Materials. There appear to be several factors behind this increase. First, foundries have turned to resource recovery as a lower cost than landfill disposal for these waste materials. Secondly, a major re-processor has resumed accepting foundry waste materials, including accepting slag-type wastes, for cement manufacture.

**Table 2.2 Reported material quantities (tonnes) being diverted for resource recovery in SA for 2011-12, 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 2010-11 and 2011-12. The data is presented in accordance with new National Waste and Recycling Guidelines (DSEWPC 2012a).*

| ID | Material | 2003-04 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | Change (%) 10-11 to 11-12 |
|---|---|---|---|---|---|---|---|---|---|
| | **Masonry** | | | | | | | | |
| 1 | Asphalt | 100,000 | 83,640 | 103,070 | 101,484 | 131,000 | 145,000 | 143,000 | -1% |
| 2 | Bricks | 165,000 | 43,962 | 90,846 | 113,993 | 77,000 | 100,000 | 73,000 | -27% |
| 3 | Concrete | 877,000 | 793,710 | 818,116 | 984,735 | 790,000 | 860,000 | 760,000 | -12% |
| 4 | Plasterboard | 0 | 0 | 0 | 0 | 0 | 300 | 600 | 100% |
| | *Subtotal* | *1,142,000* | *921,312* | *1,012,032* | *1,200,212* | *998,000* | *1,105,300* | *976,600* | *-12%* |
| | **Metals** | | | | | | | | |
| 7 | Steel | 264,200 | 323,850 | 365,391 | 271,277 | 334,000 | 391,000 | 404,000 | 3% |
| 8 | Aluminium | 19,000 | 20,845 | 24,434 | 21,895 | 18,200 | 19,400 | 20,500 | 6% |
| 9 | Non-ferrous metals | 13,000 | 24,300 | 21,755 | 18,495 | 23,600 | 31,100 | 27,800 | -11% |
| | *Subtotal* | *296,200* | *368,995* | *411,580* | *311,667* | *375,800* | *441,500* | 452,300 | 2% |
| | **Organics** | | | | | | | | |
| 10 | Food Organics | 0 | 3,981 | 5,796 | 4,820 | 5,800 | 4,400 | 5,600 | 27% |
| 11 | Garden Organics | 130,100 | 209,725 | 202,397 | 203,558 | 220,000 | 230,000 | 212,000 | -8% |
| 12 | Timber | 116,700 | 275,385 | 241,387 | 254,866 | 262,000 | 280,000 | 281,000 | 0% |
| 13,14,15,16 | Other Organics | 0 | 82,636 | 79,359 | 41,666 | 148,000 | 440,000 | 403,000 | -8% |
| | *Subtotal* | *246,800* | *571,727* | *528,939* | *504,910* | *635,800* | *954,400* | 901,600 | *-6%* |
| | **Cardboard & Paper** | | | | | | | | |
| 17 | Cardboard & Waxed Cardboard | 91,000 | 96,436 | 122,357 | 104,128 | 162,000 | 154,000 | 183,000 | 19% |
| 18 | Liquid Paperboard | 0 | 1,373 | 1,476 | 1,475 | 3,900 | 3,500 | 3,600 | 3% |
| 19 | Magazines | 0 | 4,680 | 5,728 | 7,313 | 5,500 | 5,700 | 6,700 | 18% |
| 20 | Newsprint | 31,398 | 40,000 | 41,393 | 40,219 | 32,000 | 32,000 | 31,900 | 0% |
| 21 | Phonebooks | 1,303 | 2,042 | 2,000 | 5,051 | 2,500 | 2,500 | 900 | -64% |
| 22 | Printing & Writing Paper | 12,300 | 30,574 | 42,745 | 45,877 | 16,400 | 13,600 | 23,300 | 71% |
| | *Subtotal* | *136,001* | *175,105* | *215,699* | *204,063* | *222,300* | *211,300* | 249,400 | *18%* |
| | **Plastics** | | | | | | | | |
| 23 | Polyethylene Terephthalate | 0 | 5,704 | 5,440 | 5,200 | 5,500 | 4,100 | 4,500 | 10% |
| 24 | High Density Polyethylene | 0 | 2,779 | 2,821 | 2,685 | 4,900 | 4,600 | 3,200 | -30% |

| ID | Material | 2003-04 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | Change (%) 10-11 to 11-12 |
|---|---|---|---|---|---|---|---|---|---|
| 25 | Polyvinyl Chloride | 0 | 363 | 317 | 408 | 80 | 170 | 50 | -71% |
| 26 | Low Density Polyethylene | 0 | 5,403 | 3,375 | 2,954 | 4,200 | 4,600 | 4,400 | -4% |
| 27 | Polypropylene | 0 | 1,542 | 1,202 | 1,529 | 4,000 | 4,000 | 2,100 | -48% |
| 28 | Polystyrene | 0 | 167 | 365 | 540 | 200 | 430 | 270 | -37% |
| 29 | Mixed &/or Other Plastics | 8,607 | 922 | 1,755 | 462 | 1,600 | 5,800 | 5,100 | -12% |
| | *Subtotal* | *8,607* | *16,880* | *15,275* | *13,778* | *20,480* | *23,700* | 19,620 | *-17%* |
| | **Glass** | | | | | | | | |
| 30 | Glass | 45,600 | 50,110 | 53,224 | 61,552 | 57,000 | 58,000 | 68,000 | 17% |
| | **Other Materials** | | | | | | | | |
| 40 | Foundry Waste | 0 | 2,000 | 0 | 0 | 11,900 | 31,800 | 60,900 | 92% |
| 41 | Leather & Textiles | 4,080 | 2,348 | 2,376 | 3,052 | 3,900 | 3,900 | 4,500 | 15% |
| 42 | Tyres & Other Rubber | 88 | 1,486 | 9,434 | 10,138 | 15,000 | 17,000 | 17,400 | 2% |
| | *Subtotal* | *4,168* | *5,834* | *11,810* | *13,190* | *30,800* | *52,700* | 82,800 | 57% |
| | ***Total of above materials*** | ***1,879,376*** | ***2,109,963*** | ***2,248,559*** | ***2,309,372*** | ***2,340,180*** | ***2,846,900*** | ***2,760,320*** | ***-3%*** |
| | ***Separately Reported (per National Waste and Recycling Guidelines (DSEWPC 2012a)*** | | | | | | | | |
| 39 | Fly Ash | 0 | 260,913 | 272,000 | 223,000 | 170,000 | 200,000 | 160,000 | -20% |
| 5 | Clay, Fines, Rubble & Soil | 162,400 | 63,251 | 90,837 | 19,831 | 250,000 | 1,260,000 | 910,000 | NA |
| 6 | Clay, Fines, Rubble & Soil – Intermediate Waste Soil[1] | NRS[2] | NRS[2] | NRS[2] | NRS[2] | NRS[2] | NRS[2] | 160,000 | NA |
| | Total Clay, Fines, Rubble & Soil | 162,400 | 63,251 | 90,837 | 19,831 | 250,000 | 1,260,000 | 1,070,000 | -15% |
| | ***Total Reported*** | ***2,041,776*** | ***2,434,127*** | ***2,611,396*** | ***2,552,203*** | ***2,760,000*** | ***4,310,000*** | ***3,990,000*** | ***-7%*** |

*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*

### 2.1.3 Source sector outcomes

During 2011-12, an increase in material recovery from Municipal (MSW) sources was reported (up to 446,000 tonnes from 400,000 tonnes in 2010-11) (see Table 2.3 below). The quantity of materials originating from the C&D sector decreased (from 2.47 million tonnes in 2010-11). The reported quantity of C&I resource recovery appeared to remain relatively constant.

C&I and C&D sources (at 35% and 54%, respectively) continued to constitute the main sources of resource-recovered material reported by SA recycling industries in 2011-12 (Table 2.3 and Figure 2.1 overleaf). The source sector splits by material for 2011-12 (Figure 2.1) were also similar to those previously reported for 2010-11.

In 2011-12, an estimated 31% of waste disposed of to landfill in SA was from MSW, 24% from C&I sources and 45% from C&D sources. During the past several years, the relative contribution of MSW and C&I material disposed of to landfill each year have stayed relatively constant, trending downwards together as improvements in resource recovery have been achieved in these source sectors. However, the quantity of C&D waste to landfill has fluctuated depending on construction activity. In particular, recent major infrastructure projects in SA have seen substantial volumes of contaminated soil (311,000 tonnes in 2011-12) being disposed of to landfill. It is therefore important to note that these percentage splits between source sectors can change from year-to-year.

**Table 2.3 Source sector origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2011-12, and diversion rates (%).** *Source data for resource recovery by source sector was obtained from the 2011-12 Recycling Activity Survey data. Source data for landfill disposal by source sector during 2011-12 was obtained from Zero Waste SA.*

| Sector Origin | Resource Recovery | | Landfill | | Diversion (%) |
|---|---|---|---|---|---|
| | tonnes | (%) | tonnes | (%) | |
| Municipal | 446,000 | 11% | 381,000 | 31% | 53.9% |
| C&I | 1,390,000 | 35% | 290,000 | 24% | 82.7% |
| C&D | 2,146,000 | 54% | 553,000 | 45% | 79.5% |
| **Total** | **3,982,000** | **100%** | **1,224,000** | **100%** | **76.5%** |

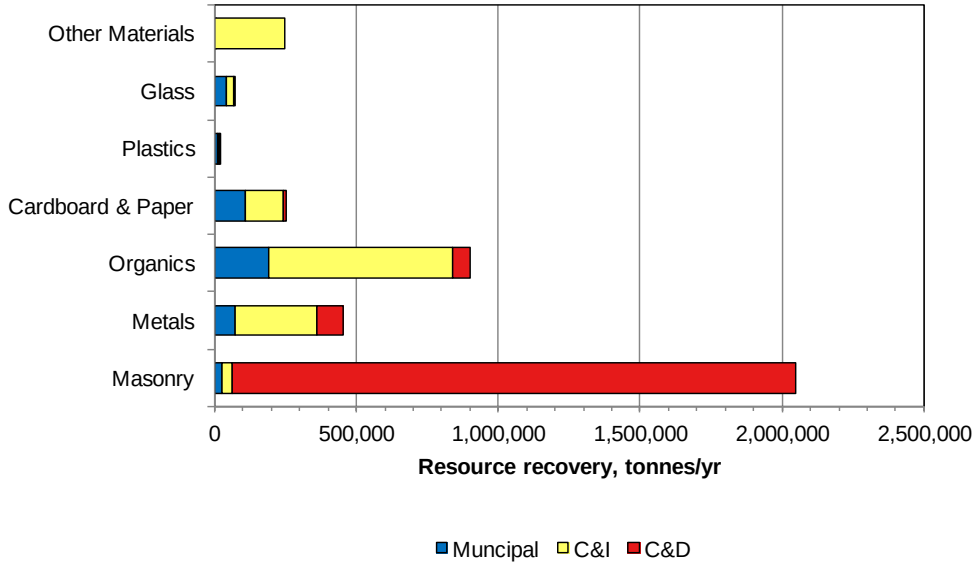


**Figure 2.1 Sector origin of SA recovered materials according to material category (by weight, tonnes), SA 2011-12.** *This figure shows the source sector splits resource recovered materials by source sector (MSW, C&I and C&D). Source data for resource recovery by source sector was obtained from the 2011-12 Recycling Activity Survey data.*

### 2.1.4 Geographical origin

During 2011-12, metropolitan areas were responsible for nearly 80% (3.2 million tonnes) of resource recovery and 83% (1 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 2011-12, providing the balance (790,000 tonnes or 20%) of material being resource recovered. A significant proportion of this resource recovery was achieved from re-processing of industrial by-products from processing industries for primary/agricultural products (e.g. wine, timber, meat). Regional areas were also responsible for 0.2 million tonnes (or 17%) of waste disposed of to landfill in SA.

**Table 2.4 Geographical origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2011-12, and diversion rates (%).** *The separate contributions by metropolitan and regional areas to resource recovery and landfill disposal in SA are shown in this Table. These contributions were derived directly from the 2011-12 Recycling Activity Survey data. Landfill data was provided by Zero Waste SA.*

| Sector Origin | Resource Recovery | | Landfill | | Diversion |
|---|---|---|---|---|---|
| | tonnes | (%) | tonnes | (%) | |
| Metro | 3,190,000 | 80% | 1,021,000 | 83% | 75.8% |
| Regional | 792,000 | 20% | 203,000 | 17% | 79.6% |
| **Total** | **3,982,000** | **100%** | **1,224,000** | **100%** | **76.5%** |

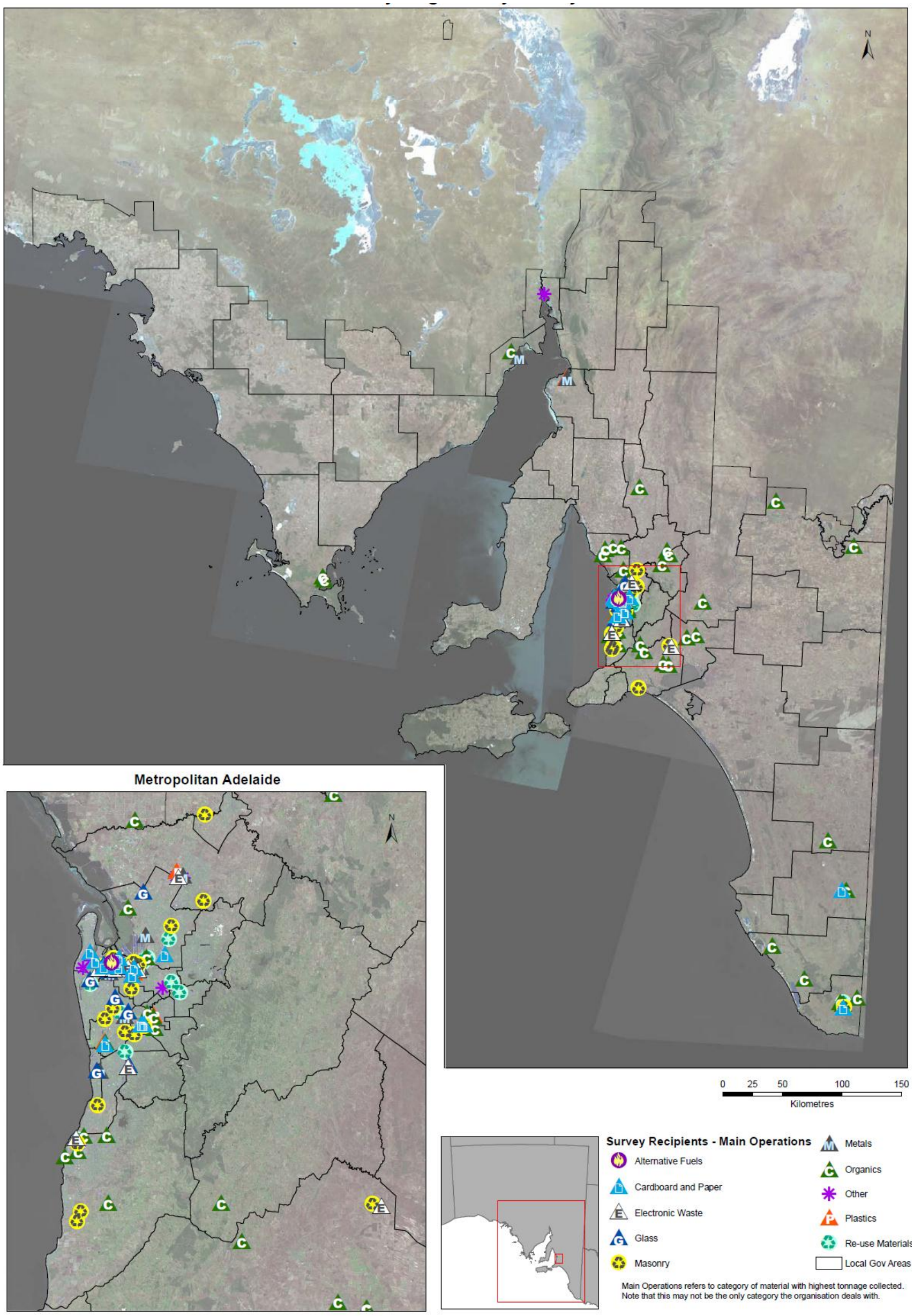


**Figure 2.2 Approximate geographical location of main sites for recyclers/re-processors reporting resource recovery data to the 2011-12 Recycling Activity Survey.** *This map was produced by Zero Waste SA using data from the Zero Waste Environment User System (ZEUS) from 2011-12 Recycling Activity Survey data. The map illustrates the clustering of SA resource recovery sites in the metropolitan area.*

### 2.1.5 Destination for Recovered Materials

In 2011-12, an estimated 3.35 million tonnes or 84% of all recovered material reported for 2011-12 was sent for re-processing in SA (see Table 2.5 below). South Australia has developed its own recycling industry capabilities in most material sectors with the exception of Paper and Cardboard (Figure 2.3). Despite this, the quantity of materials reported as being exported overseas increased to 430,000 tonnes (from 370,000 tonnes in 2010-11). This rise in exported material is principally attributable to greater quantities of recovered metal sent overseas for re-processing, but increasing quantities of some other materials, such as plastics, are also being sent overseas for re-processing.

**Table 2.5** **Final reported destination (by weight, tonnes and %) of SA sourced materials, 2011-12.** *The destination is where the 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 | 3,350,000 | 84% |
| Interstate | 200,000 | 5% |
| Export | 430,000 | 11% |
| **Total** | **3,980,000** | **100%** |

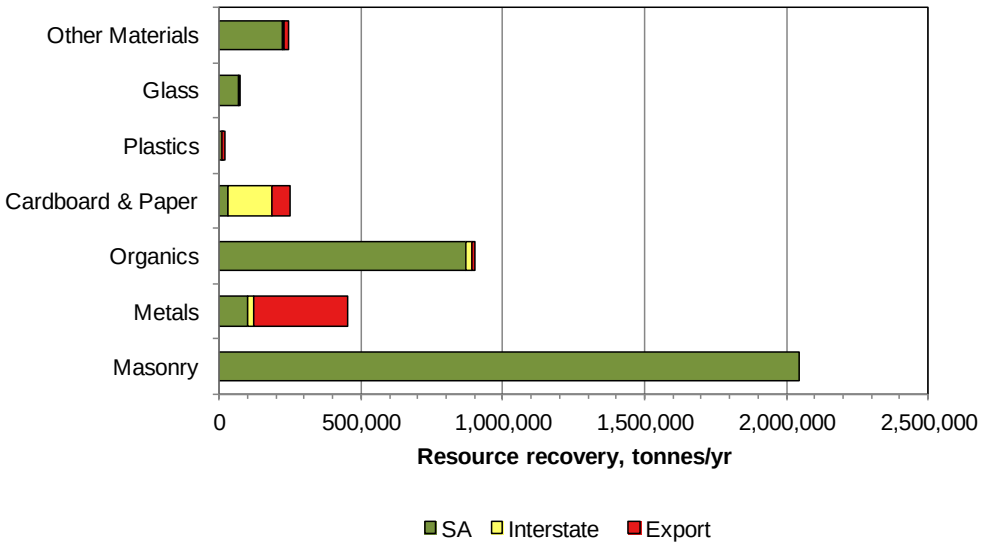


**Figure 2.3** **Destination of SA recovered materials according to material category (by weight, tonnes), SA 2011-12.** *This figure shows that, with the exception of Paper & Cardboard, most resource recovered materials in SA can be re-processed locally.*

## 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 2011-12 was 1.22 million tonnes, which would be a decrease of only 2.2% on the landfill disposal rate in 2002-03 (1.25 million tonnes) – Figure 2.4 below. Excluding contaminated soil, however, SA's disposal to landfill (at 913,000 tonnes) has reduced by 27% since 2003-04 (1.23 million tonnes).

SA would therefore be on track to achieve this target if not for the growth in landfill disposal of contaminated soil.

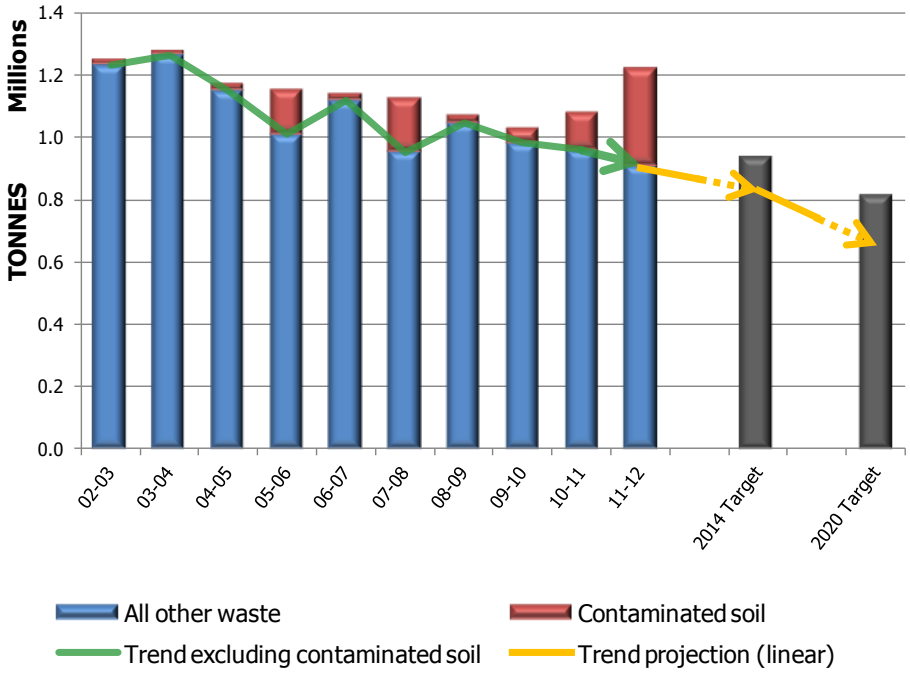


**Figure 2.4** **Landfill disposal: Trend in SA since 2002-03 and State Waste Strategy Targets.** *This figure shows how landfill disposal in SA has changed since 2002-03 relative to SA's Strategic Plan (SA Government, 2011) landfill reduction targets. The separate contribution to landfill disposal of 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 2011-12, per capita waste generation in 2011-12 decreased by >3% (Table 2.6 below). This reduction occurred for both Standard Reporting Materials and overall (if Separately Reported Materials are also included).

While only one year has passed (since the baseline year), SA will be on track to achieve the 2015 Target for reduction in per capita waste generation should this trend continue.

**Table 2.6** **Per capita waste generation 2011-12: Recycling Activity results and State Waste Strategy target.** *This table gives values for per capita waste generation in 2010-11 and 2011-12 and compares the change achieved 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* | ***% Change*** | |
| Standard Reporting Materials | 2,300 | 2,210 | **-3.9%** | 5% Reduction |
| Separately Reported Materials | 960 | 930 | | |
| **TOTAL** | 3,260 | 3,140 | **-3.7%** | |

### 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 2011-12, SA has demonstrated the following progress towards achieving these diversion targets.

- MSW – A diversion rate of 59% fell just short of the 2012 Target.
- C&I – The 2012 Target was achieved with a diversion rate of 74.9%.
- C&D – The diversion rate (80.2%) was below the 2012 Target. This diversion rate only increases marginally (to 80.7%) if Separately Reported Materials are removed.

**Table 2.7** **Metropolitan diversion by source sector: 2011-12 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). For the C&D sector, the diversion performance including and excluding Separately Reported Materials (i.e. soil) from resource recovery and landfill disposal data is also presented.*

| Source Sector | 2011-12 Diversion Achieved | Metro Diversion Target | |
|---|---|---|---|
| | | *By 2012* | *By 2015* |
| ■ **MSW** | **59.0%** | 60% | 70% |
| ■ **C&I** | **74.9%** | 65% | 75% |
| ■ **C&D - *excluding Separately Reported Materials*** | **80.7%** | 85% | 90% |
| ■ **C&D - *Total*** | **80.2%** | | |

## 2.3 Comparative performance (with other jurisdictions)

Based on resource recovery and landfill data for 2011-12, SA currently has the both the highest publicly reported diversion (at 76.5%) and per capita resource recovery rate of any state or territory in Australia[5] (Figure 2.8 overleaf). It also has the second lowest landfill per capita rate (behind Victoria).

[5] Note: Not all recycling data needed for this comparison could be obtained for 2011-12. 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. Fly ash was excluded from SA and QLD recycling data for comparison purposes. All figures have been rounded. 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.

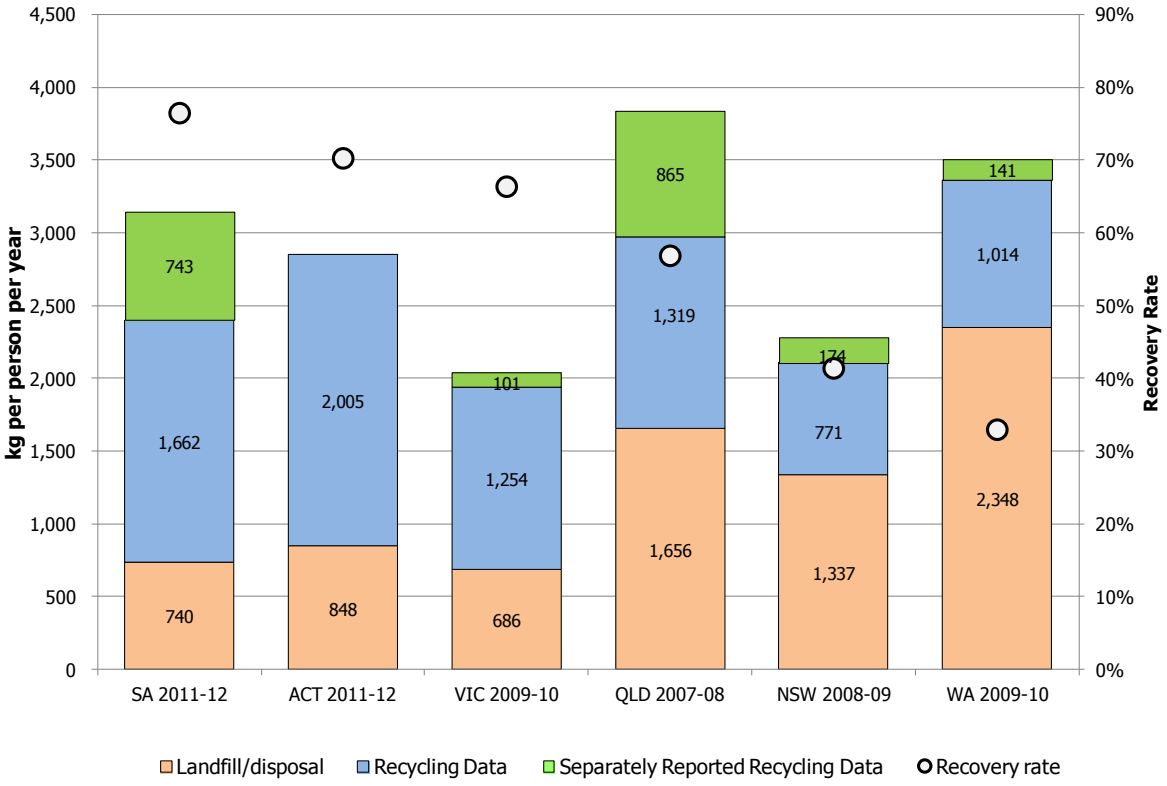


**Figure 2.8 Comparison of reported per capita (kg/person/yr) resource recovery and landfill disposal and recovery (%) by State or Territory[5].** *This figure illustrates the per capita resource recovery and landfill disposal for different states and territories in Australia based on latest and currently available data (not all of which are for 2011-12). The per capita data for resource recovery is differentiated according to 'Recycling data' and 'Separately reported data' scopes in line with the National Waste Reporting Guidelines (DSEWPC 2012a).*

# 3 Material Recycling Activity Reports

**At a glance:**

- *This section presents the key findings from analysis of 2011-2012 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. 26 of this report]***
   - *Asphalt*
   - *Bricks*
   - *Concrete*
   - *Plasterboard*
   - *Clay, Fines, Rubble & Soil*
   - *Clay, Fines, Rubble & Soil- Intermediate Waste Soil (separately reported)*
2. ***Metals [refer pg. 30]***
   - *Steel or Ferrous Metals*
   - *Aluminium*
   - *Non-ferrous Metals (exc. Aluminium)*
3. ***Organics [refer pg. 34]***
   - *Food Organics*
   - *Garden Organics*
   - *Timber*
   - *Other Organics*
4. ***Cardboard & Paper [refer pg. 38]***
   - *Cardboard and Waxed Cardboard*
   - *Liquid Paperboard*
   - *Magazines*
   - *Newsprint*
   - *Phone books*
   - *Printing & Writing paper*
5. ***Plastics [refer pg. 42]***
   - *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. 46]***
7. ***Other Materials [refer pg. 48]***
   - *Fly Ash*
   - *Foundry Sands*
   - *Leather & Textiles*

## 3.1 Masonry

**Highlights:**

- *In 2011-12 the quantity of recovered Masonry materials fell in line with lower levels of Construction and Demolition (C&D) activity in the State.*
- *Recovered Clay, Fines, Rubble & Soil remain at historical highs due to several major infrastructure projects.*
- *Resource recovery of Intermediate Waste Soil[6] was separately reported for the first time.*
- *The short-term outlook for resource recovery of Masonry is considered poor as major government infrastructure projects will be ending soon and private sector C&D activity remains depressed.*

The total quantity of recovered Masonry materials reported for SA during 2011-12 was approximately 2 million tonnes, which is down by 13% from 2010-11 (see Table 3.1 below). Clay, Fines, Rubble & Soil continued to constitute the majority (52%) of masonry materials recovery followed by Concrete (37%) (Figure 3.1 overleaf). About 18% of the Clay, Fines, Rubble & Soil were classified as Intermediate Waste Soil[6], which is being separately reported for the first time in 2011-12.

**Table 3.1 Quantity (tonnes) of masonry material recovered in SA during 2011-12, including estimated reporting error (in tonnes & %).** *This table includes separate reporting of Intermediate Waste Soil in the Clay, fines, rubble & soils for the first time.*

| Item | Net Recovery[1] | Reporting Error | |
|---|---|---|---|
| | tonnes | tonnes | % |
| Asphalt | 143,000 | 12,000 | 8% |
| Bricks | 73,000 | 6,000 | 8% |
| Concrete | 760,000 | 55,000 | 7% |
| Plasterboard | 600 | 100 | 17% |
| Total Clay, Fines, Rubble & Soil [2] | 1,070,000 | 100,000 | 9% |
| • Clay, Fines, Rubble & Soil[2] | 910,000 | 88,000 | 10% |
| • Clay, Fines, Rubble & Soil – Intermediate Waste Soil[3] | 160,000 | 12,000 | 8% |
| **Total** | **2,046,600** | **170,000** | 8% |

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 being 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.

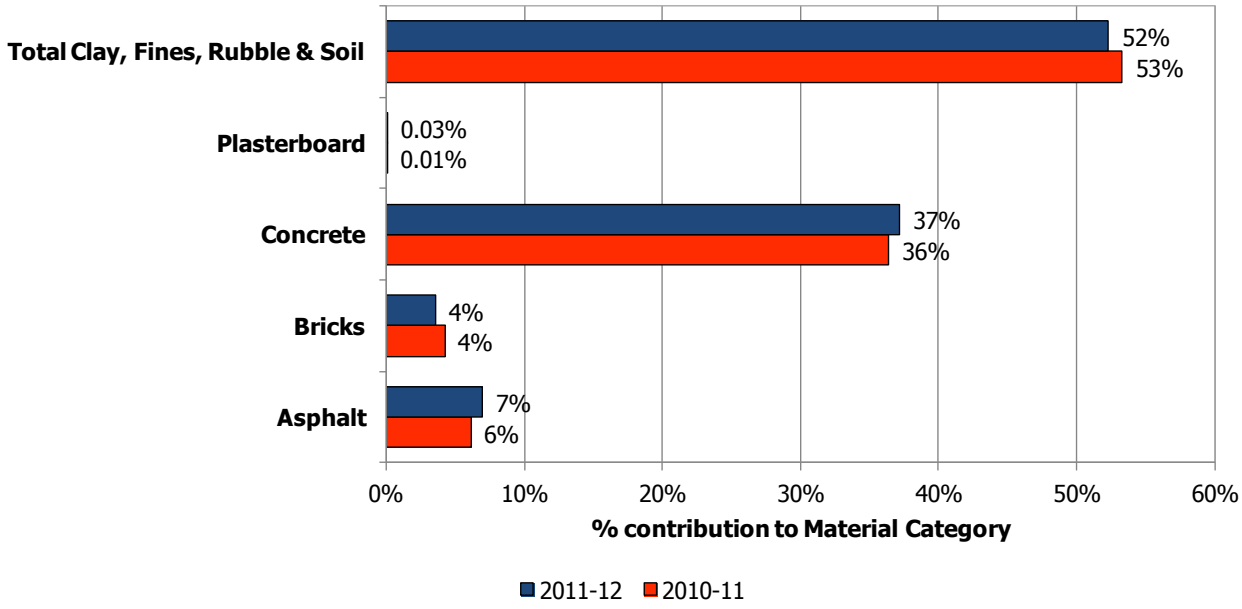


**Figure 3.1 Changes in percent composition of recovered Masonry (by weight), SA, between 2010-11 and 2011-12.** *In 2011-12, there was little change in the relative contributions of each material type to the total recovered Masonry category.*

During 2011-12 there was a fall in the resource recovery for most Masonry materials.

- Clay, Fines, Rubble & Soil fell 15% (or 190,000 tonnes)
- Bricks were down 27% (or 27,000 tonnes)
- Concrete was down 12% (or 100,000 tonnes)
- Asphalt was down 1% (or 2,000 tonnes)

The only exception to reduced resource recovery in the Masonry sector was Plasterboard, where there is currently only minor quantities (600 tonnes) being separately reported.

In 2011-12 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 (99%) were sourced from metropolitan SA (Table 3.2), and the majority were re-processed locally in SA (Table 3.2 overleaf).

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

- In 2011-12, Clay, Fines, Rubble & Soil was again at a historically high level when compared to the period before 2010-11 (see Figure 3.2 overleaf) due to ongoing major government infrastructure projects.
- Asphalt seems to have stabilised at levels above 120,000 tonnes/yr.
- Bricks and Concrete remained within their usual band of fluctuation.
- Plasterboard, which was only introduced in 2010-11, remains a minor quantity, but appears to be slowly building off a very low base.

**Table 3.2 Sector and geographical origins and re-processing locations for recovered Masonry in SA in 2011-12.** *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% | 92% | 8% | 100% | 0% | 0% |
| Concrete | 0.7% | 0.3% | 99% | 98% | 2% | 100% | 0% | 0% |
| Plasterboard | 10% | 4% | 86% | 82% | 18% | 100% | 0% | 0% |
| Total Clay, Fines Rubble & Soil | 2% | 3% | 95% | 100% | 0% | 100% | 0% | 0% |
| **Total** | 1% | 2% | 97% | 99% | 1% | 100% | 0% | 0% |

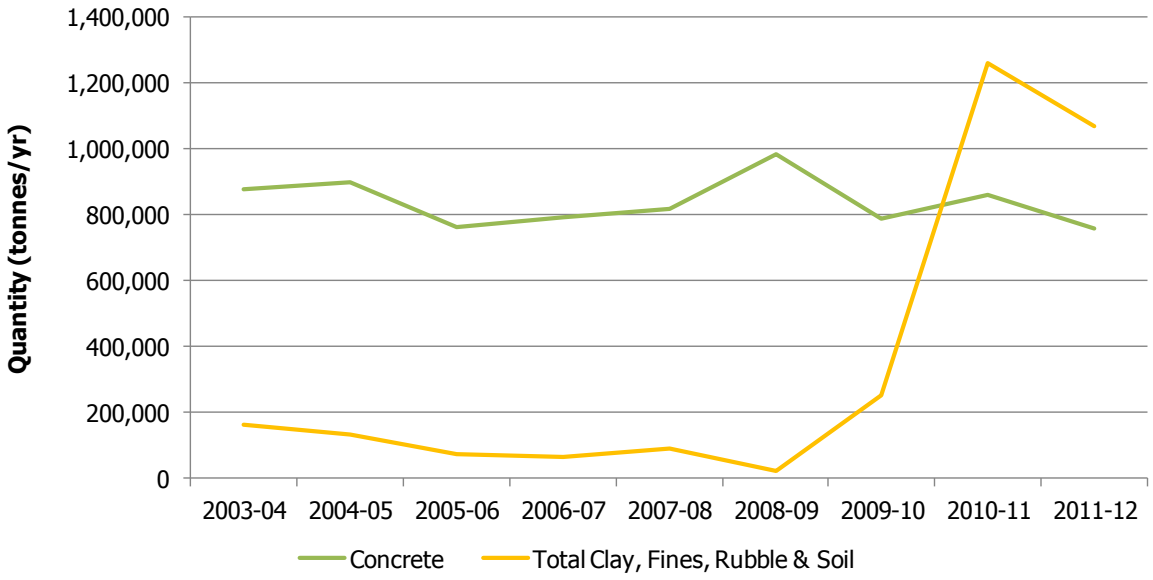


**Figure 3.2 Changes in reported Masonry quantities since 2003-04 – Concrete and Total Clay, Fines, Rubble & Soil.** *This figure shows the recent high levels of recovered Clay, Fines, Rubble & Soil, which have occurred due to major infrastructure projects*


**Figure 3.3** **Changes in reported Masonry quantities since 2003-04 – Asphalt, Bricks and Plasterboard.** *Recovery of Asphalt has stabilised above 120,000 tonnes, whereas Bricks was within its normal range of fluctuation.*

Industry reported that there were still depressed levels of private sector C&D activity during 2011-12. The 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.
- Industry noted that current major infrastructure projects would soon be coming to an end in 2012-13, which could further reduce demand for recycled masonry materials.
- However, there is some industry optimism for a recovery in the C&D sector during the second half of the 2012-13 financial year.
- There are some 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.

## 3.2 Metals

**Highlights:**

- *In 2011-12 the overall quantity of recovered Metals increased slightly despite falling scrap metal prices.*
- *More recovered Metals were being sent overseas for reprocessing.*
- *The immediate outlook for Metals recovery is expected to be poor due to higher Australian dollar, lower commodity values and pressures on local manufacturing.*

The total quantity of recovered Metals reported for SA during 2011-12 was approximately 452,300 tonnes (Table 3.3 below), which is up by 2% from 2010-11. This rise occurred across all Metal materials except Non-ferrous Metals.

- Steel and Aluminium rose by 3% and 6% respectively
- Non-ferrous Metals fell by 11%

This increase in metal recovery occurred despite falling scrap metal prices which affects the profitability of the metal re-processing industry. There are well established networks of scrap recyclers including Container Depots Legislation (CDL) depots, which continue to extract more metals for recycling. There is also some indication of increased recovery of metals through C&I and C&D processing. These factors provided some offset to lower quantities of metals received from manufacturing sources due to reduced industry production.

**Table 3.3** **Quantity of Metals (tonnes) recovered in SA during 2011-12, including estimated reporting error (tonnes & %).** *Steel remained the dominant contributor to recovered Metals in SA.*

| Item | Net Recovery[1] | Reporting Error | |
|---|---|---|---|
| | tonnes | tonnes | % |
| Steel | 404,000 | 61,000 | 15% |
| Aluminium | 20,500 | 1,300 | 6% |
| Non-ferrous Metals | 27,800 | 2,100 | 8% |
| **Total** | **452,300** | **64,000** | **14%** |

1. Net recovery excludes re-processing losses

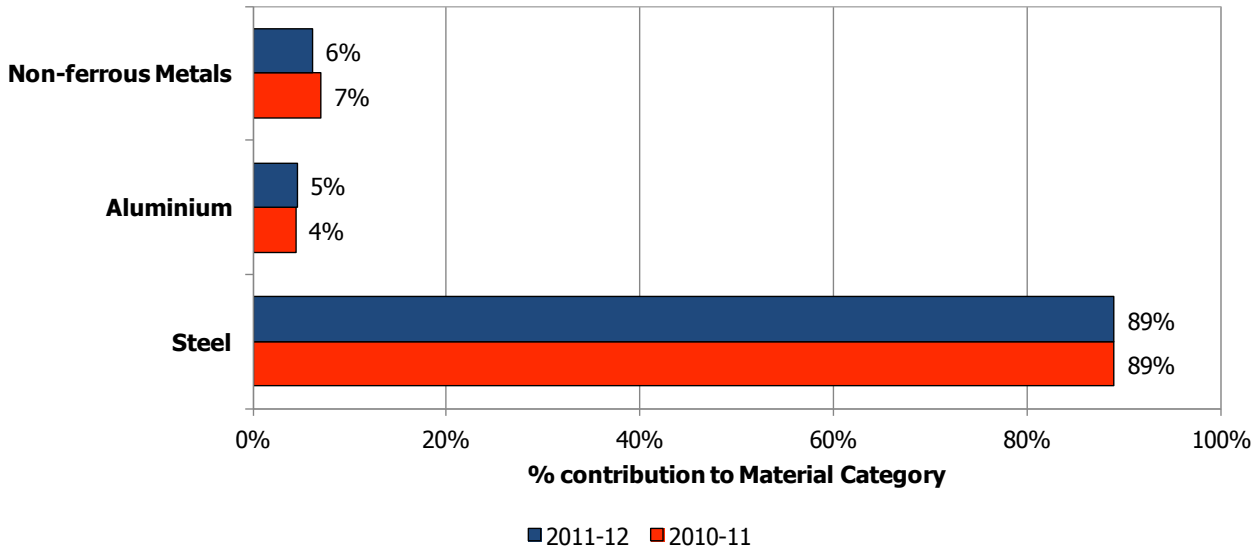


**Figure 3.4** **Changes in percent composition of recovered Metals (by weight), SA, between 2010-11 and 2011-12.** *There was little change in the relative contributions of the different metal types to recovered metals.*

Steel continued to constitute the majority (89%) of Metal recovery (see Figure 3.3 above). Non-ferrous Metals and Aluminium made up 6% and 5% of reported Metal recovery respectively.

The slight increase in Metal recovery during 2011-12 continues the overall upward trend seen for Metals recovery since 2003-04 (see Figures 3.5 and 3.6 overleaf).

During 2011-12, C&I sources made up 64% of reported recovered Metals. Greater quantities of Metals were also reported from regional sources (estimated to make up 17% of metals recovered).

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 (about 25% of Steel in 2011-12) of scrap steel for recycling. All of recovered Aluminium and virtually all (99%) of the Non-ferrous Metals, however, were sent interstate or overseas for re-processing.

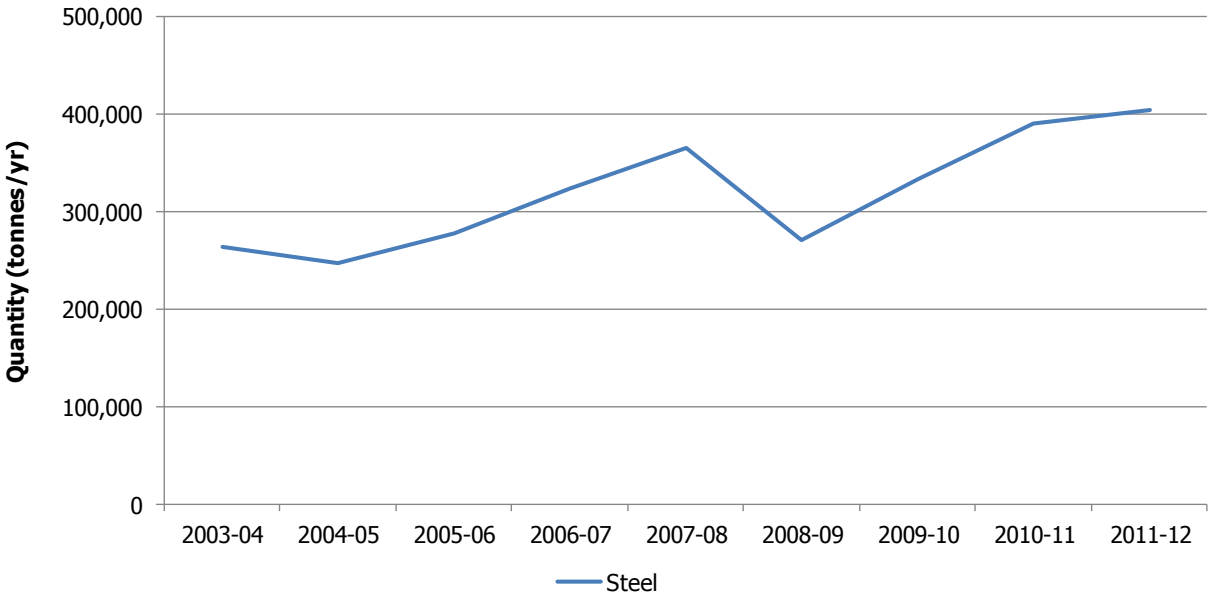


**Figure 3.5** **Changes in reported metal quantities since 2003-04 – Steel.** *There was a slight increase for recovered steel in 2011-12.*

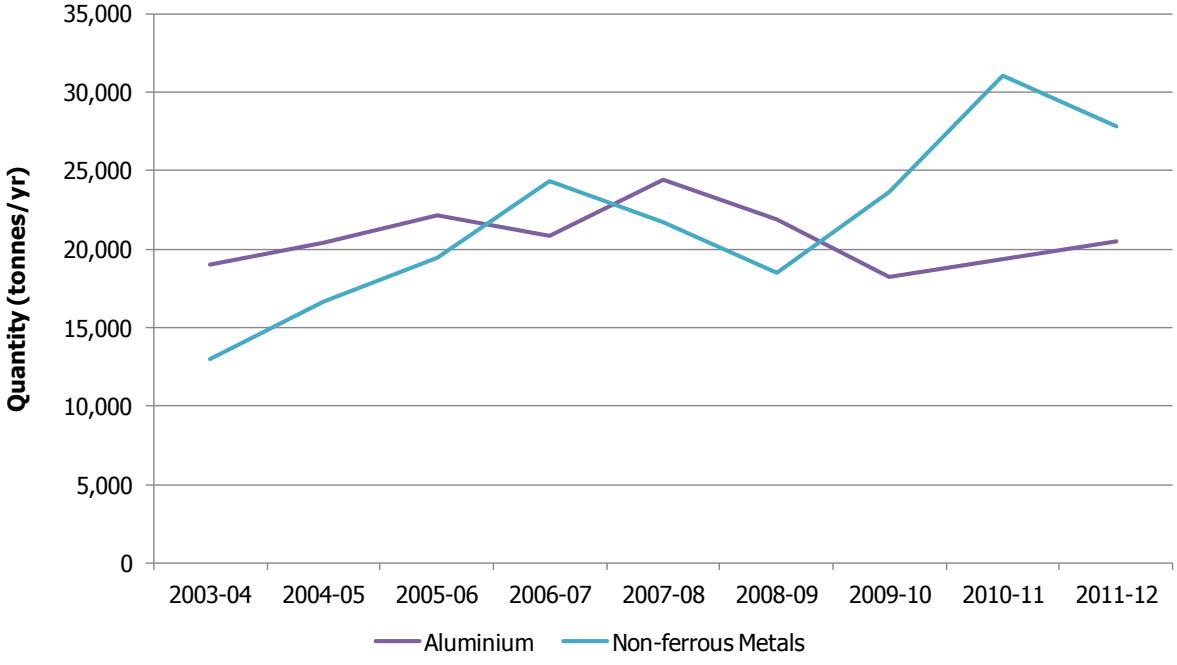


**Figure 3.6** **Changes in reported metal quantities since 2003-04 – Aluminium and Non-ferrous Metals.** *Recovery of Aluminium was up slightly but Non-ferrous Metals fell.*

**Table 3.4** **Sector and geographical origins and re-processing locations for recovered Metals in SA during 2011-12.** *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% | 64% | 21% | 82% | 18% | 25% | 2% | 73% |
| Aluminium | 26% | 60% | 14% | 85% | 15% | 0% | 8% | 92% |
| Non-ferrous Metals | 15% | 64% | 21% | 87% | 13% | 0.4% | 22.7% | 76.9% |
| **Total** | **15%** | **64%** | **21%** | **83%** | **17%** | **22%** | **4%** | **74%** |

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

- Manufacturing outputs have dropped with reports of a significant fall in the Metals recycling market for the first quarter of 2012-13.
- 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 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 2011-12 overall quantities of Organic material recovery fell.*
- *This fall was due to reduced Garden Organics and Other Organics.*
- *The decrease in Garden Organics appears to have resulted from drier weather during this period.*
- *Recovery of Food Organics increased due to an expansion of commercial food collections.*

The total quantity of recovered Organics reported for SA during 2011-12 was approximately 901,600 tonnes (see Table 3.5 below), which is down by 6% from 2010-11.

Other Organics continued to constitute the majority (45%) of Organics recovery (see Figure 3.7 overleaf). Timber and Garden Organics made up 31% and 24% of reported Organics recovery respectively.

The main contributors to the fall in Organics recovery were Garden Organics (down 8%) and Other Organics (8%) (see Figures 3.8 and 3.9 overleaf).

- The reported quantity of Garden Organics collected is affected by seasonal weather variations. A drier season in 2011-12 (compared with 2010-11) could be to blame for the lower weight of Garden Organics recovered.

**Table 3.5** **Quantity of Organics (tonnes) recovered in SA during 2011-12, 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 | 5,600 | 1,200 | 21% |
| Garden Organics | 212,000 | 21,800 | 10% |
| Timber | 281,000 | 49,000 | 18% |
| Other Organics | 403,000 | 37,000 | 9% |
| - Meat Rendering | 153,000 | 6,423 | 4% |
| - Waste Grease & Fat | 89,000 | 7,300 | 8% |
| - Waste Sludge & Bio-solids | 50,000 | 14,497 | 29% |
| - Organics- Other | 111,000 | 8,886 | 8% |
| **Total** | **901,600** | **108,200** | **12%** |

1. Net recovery excludes re-processing losses

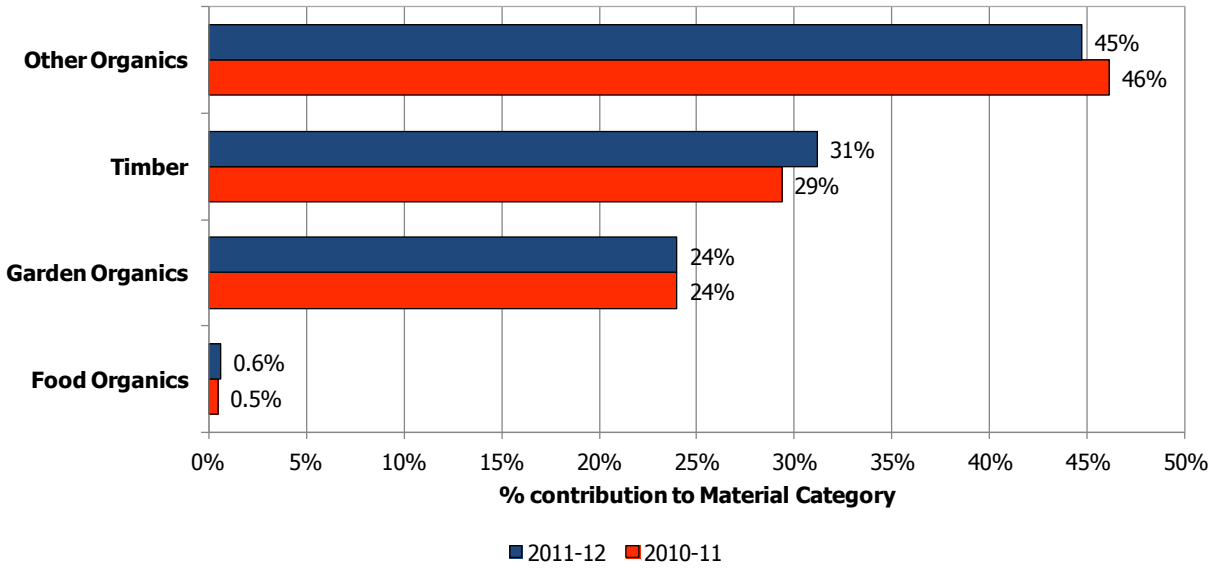


**Figure 3.7** **Changes in percent composition of recovered Organics (by weight), SA, between 2010-11 and 2011-12.** *The relative contributions of each material type to recovered Organics have essentially stayed the same despite the changes in quantities.*

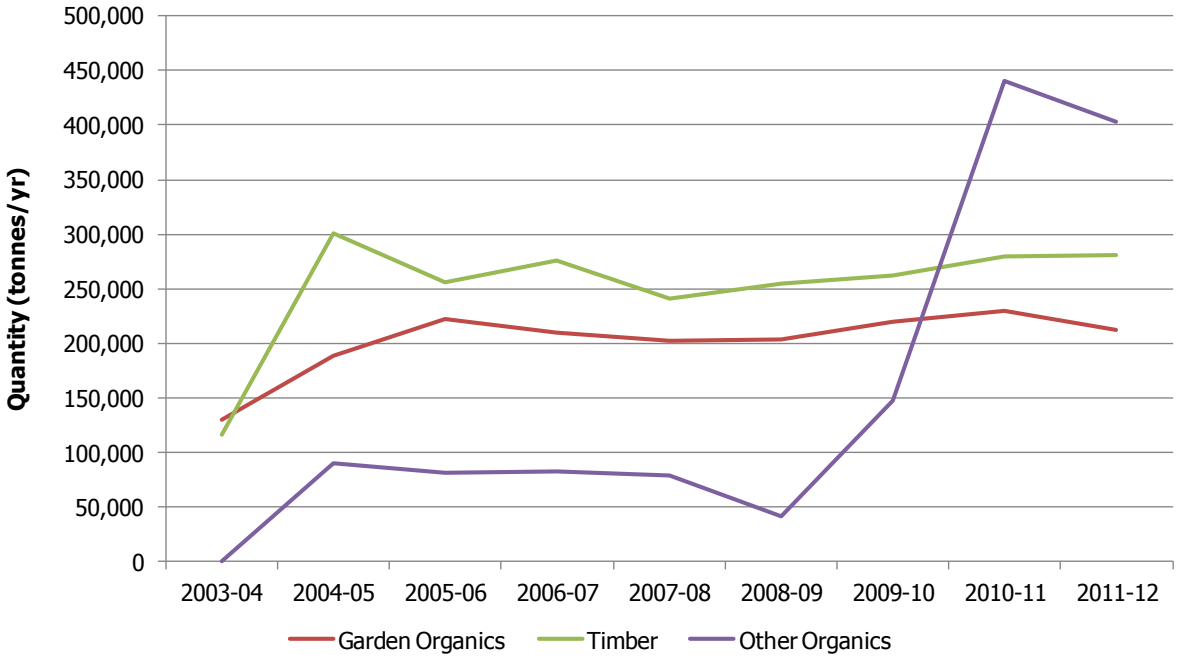


**Figure 3.8** **Changes in reported organics quantities since 2003-04 – Garden Organics, Timber and Other Organics.** *Garden Organics and Other Organics experienced a fall in 2011-12.*

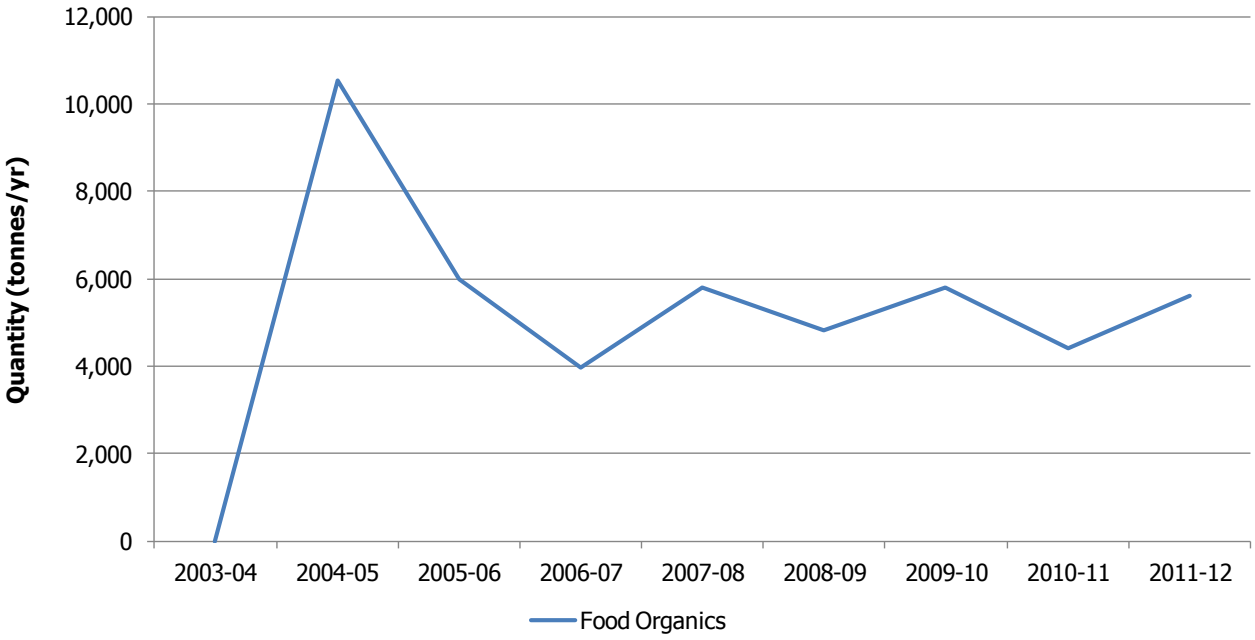


**Figure 3.9** **Changes in reported organics quantities since 2003-04 – Food Organics.** *Food Organics rose on the back of increased commercial services.*

These lower quantities in Garden Organics and Other Organics were slightly offset by an increase in Food Organics recovery (up 27%).

- This higher Food Organics recovery was due to the expansion of commercial food waste recycling collections.
- 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.

In 2011-12, the majority (72%) of recovered Organics originated from C&I sources including material from the timber, meat rendering and wine production industries (Table 3.6). Approximately 21% of recovered Organic materials originated from municipal sources including a large amount of Garden Organics. The rest (7%) 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, nearly half (45%) of recovered Organics was sourced from SA's regional areas (Table 3.6 overleaf).

Most Organic materials (96%) were re-processed locally with only small quantities of Other Organics sent interstate or overseas for recovery (Table 3.6).

The outlook for Organics recovery for the next period is expected to be mixed.

- There is uncertainty around timber industry related recovery in the South East of South Australia, which could be shut down and/or substantially restructured
- Food organic recycling in both the commercial and municipal areas is expected to increase.

**Table 3.6** **Sector and geographical origins and re-processing locations for recovered organics in SA during 2011-12.** *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 (%) | | |
|---|---|---|---|---|---|---|---|---|
| | Municipal | C&I | C&D | Metro | Regional | SA | Interstate | Overseas |
| Food Organics | 0% | 100% | 0% | 89% | 11% | 100% | 0% | 0% |
| Garden Organics | 82% | 12% | 6% | 89% | 11% | 100% | 0% | 0% |
| Timber | 2% | 81% | 17% | 60% | 40% | 100% | 0% | 0% |
| Other Organics | 2.5% | 97.5% | 0% | 34% | 66% | 92% | 6% | 2% |
| **Total** | 21% | 72% | 7% | 55% | 45% | 96% | 3% | 1% |

## 3.4 Cardboard & Paper

**Highlights:**

- *In 2011-12 overall quantities of recovered Cardboard & Paper increased with more material received from industrial C&I sources.*
- *Greater quantities of Cardboard & Paper were reported as being reprocessed locally via composting, vermiculture and waste-to-energy.*

The total quantity of recovered Cardboard & Paper materials reported for SA during 2011-12 was approximately 249,400 tonnes (see Table 3.7 below), which is up by 18% from 2010-11.

This rise occurred across most Cardboard & Paper materials (see Figures 3.11 and 3.12 overleaf).

- Cardboard & Waxed Cardboard was up by 19%
- Printing & Writing Paper was up by 71%
- Magazines was up by 18%
- Liquid Paperboard was up by 3%

The only exception to this increase in recovery was Phonebooks, where the quantity fell by 64%, as printed phone directories are becoming more compact in size and people are opting out of phonebook deliveries (and instead turning to the internet).

The overall increase in material recovery was largely driven by greater reported quantities of Cardboard & Paper from C&I sources. This may also reflect a wider use of cardboard for consumer and pre-consumer packaging in place of polystyrene.

Cardboard & Waxed Cardboard continued to constitute the majority (73%) of Cardboard & Paper recovery (see Figure 3.10 overleaf). Newsprint and Printing & Writing Paper contributed 13% and 9% of recovered Cardboard & Paper recovery respectively.

**Table 3.7** **Quantity of Cardboard & paper (tonnes) recovered in SA during 2011-12, including estimated reporting error (tonnes & %).** *Cardboard, Newsprint and Printing & Writing Paper were the dominant contributors in this sector.*

| Item | Net Recovery [1] | Reporting Error | |
|---|---|---|---|
| | tonnes | tonnes | % |
| Cardboard & Waxed Cardboard | 183,000 | 15,000 | 8% |
| Liquid Paperboard | 3,600 | 190 | 5% |
| Magazines | 6,700 | 260 | 4% |
| Newsprint | 31,900 | 1,700 | 5% |
| Phonebooks | 900 | 50 | 6% |
| Printing & Writing Paper | 23,300 | 1,900 | 8% |
| **Total** | **249,400** | **19,100** | **8%** |

1. Net recovery excludes re-processing losses

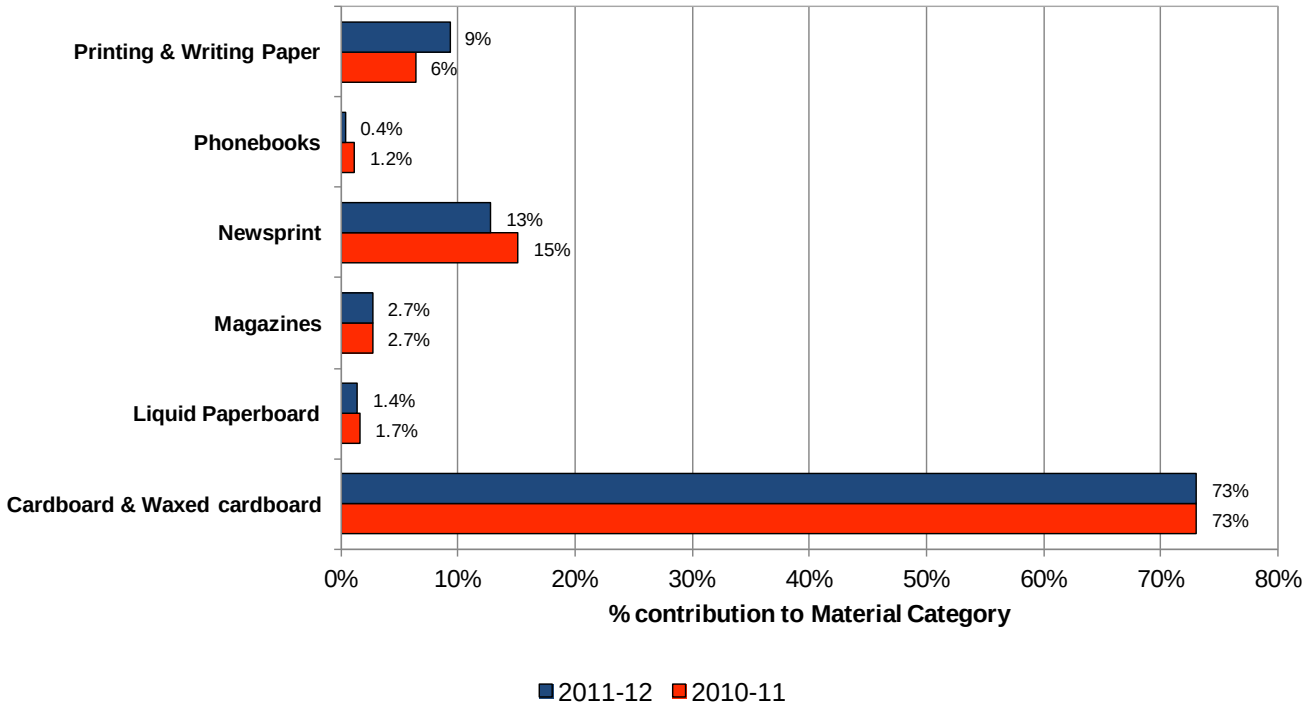


**Figure 3.10** **Changes in percent composition of recovered Cardboard & Paper (by weight), SA, between 2010-11 and 2011-12.** *Relative contributions by the different material types have remained the same despite changed quantities.*

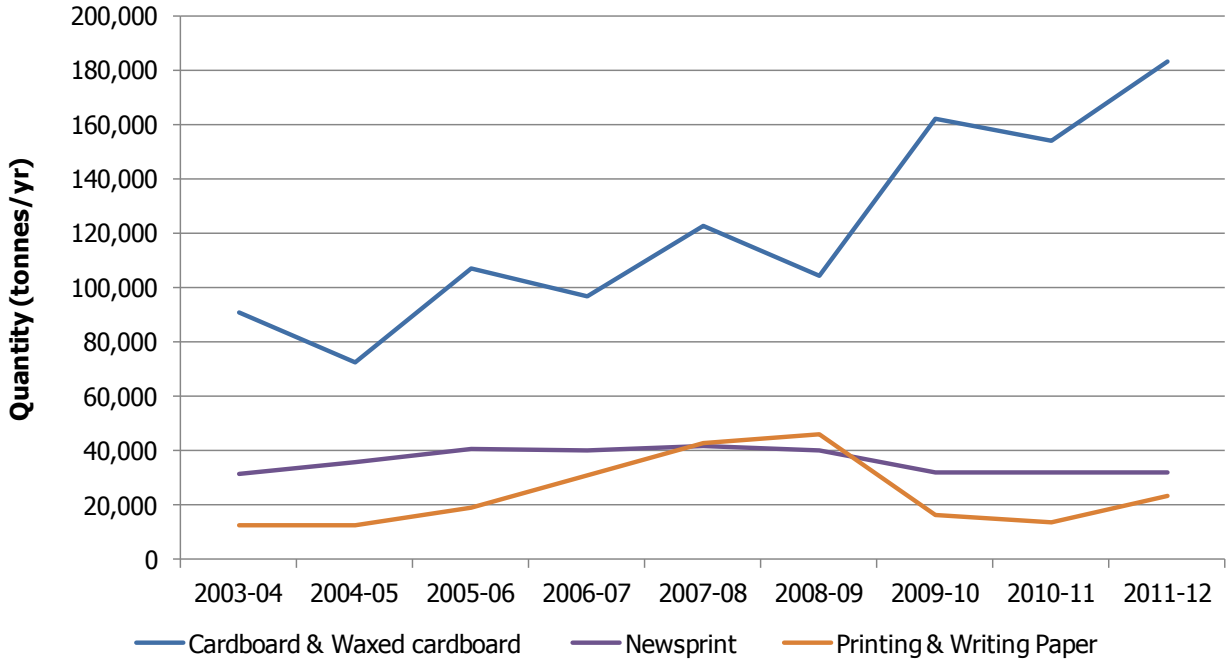


**Figure 3.11** **Changes in reported Cardboard & Paper quantities since 2003-04 – Cardboard & Waxed Cardboard, Newsprint and Printing & Writing Paper.** *Cardboard has continued on its upward trend.*

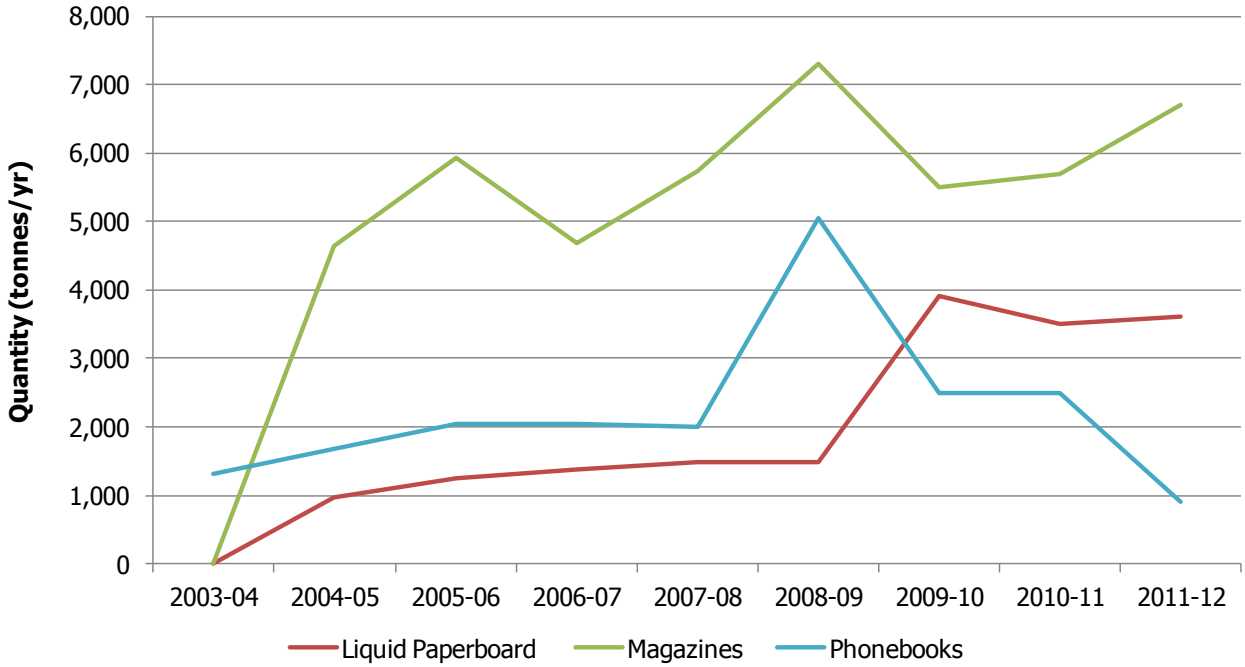


**Figure 3.12** **Changes in reported Cardboard & Paper quantities since 2003-04 – Liquid Paperboard, Magazines & Phonebooks.** *Recovery of Phonebooks has continued to fall.*

In 2011-12 C&I and Municipal sources made up 54% and 44% of reported recovered Cardboard & Paper materials respectively (see Table 3.8 overleaf).

Greater quantities were also reported during 2011-12 from regional sources (estimated to make up 23% of Cardboard & Paper recovered) (Table 3.8).

The majority of Cardboard & Paper (88%) was sent interstate or overseas for recovery (Table 3.8). A significant amount (12%) was reported as being re-processed in SA via composting, vermiculture and waste-to-energy (up from 1% in 2010-11).

The outlook for recovery of Cardboard & Paper is expected to remain relatively stable and slowly expand with growth and increased recycling effort in SA.

- There had been a significant drop in cardboard commodity values in the early part of 2011-12. Industry was expecting an increase in cardboard pricing in the second half of the next financial year.
- Transport costs were cited by some regional collectors as a barrier to recycling.
- The industry did not raise any other major barriers for the Cardboard & Paper recycling sector.

**Table 3.8** **Sector and geographical origins and re-processing locations for recovered Cardboard & Paper in SA during 2011-12.** *Municipal and C&I are the main sources of recovered Cardboard & Paper, but most is sent interstate or overseas for re-processing.*

| Item | Sector Origin (%) | | | Geographical Origin (%) | | Re-processing Location (%) | | |
|---|---|---|---|---|---|---|---|---|
| | Municipal | C&I | C&D | Metro | Regional | SA | Interstate | Overseas |
| Cardboard & Waxed Cardboard | 41% | 56% | 3% | 75% | 25% | 13% | 60% | 27% |
| Liquid Paperboard | 93% | 7% | 0% | 83% | 17% | 0% | 56% | 44% |
| Magazines | 60% | 40% | 0% | 93% | 7% | 0% | 83% | 17% |
| Newsprint | 73% | 27% | 0% | 92% | 8% | 0% | 78% | 22% |
| Phonebooks | 100% | 0% | 0% | 95% | 5% | 0% | 100% | 0% |
| Printing & Writing Paper | 10% | 90% | 0% | 65% | 35% | 26% | 53% | 21% |
| **Total** | 44% | 54% | 2% | 77% | 23% | 12% | 62% | 26% |

## 3.5 Plastics

**Highlights:**

- *In 2011-12 overall quantities of recovered Plastics fell.*
- *In particular HDPE dropped by 30%. This decrease could be due to more accurate reporting by local reprocessors instead of a real change.*
- *PET recovery increased as a result of greater quantities sourced through the Container Deposit system.*
- *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.*
- *SA continues to support substantial local re-processing of recovered Plastics, but there are growing quantities being exported overseas.*

The total quantity of recovered Plastics reported for SA during 2011-12 was approximately 19,620 tonnes (see Table 3.9 overleaf), which is down by 17% from 2010-11. Mixed &/or Other Plastics constituted the majority (26%) of reported Plastics recovery followed by PET (23%) and LDPE (22%) (Figure 3.13 overleaf).

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

- PP was down 48%
- HDPE was down 30%
- Mixed &/or other plastics was down 12%
- LDPE was down 4%
- PS was down 37%
- PVC was down 71%

The only exception was PET, where the quantity of recovered materials increased by 10%, from greater quantities of material recovered through SA's Container Deposit system. This recovered PET material from SA is highly prized by re-processors due to its low contamination (compared to other sources.)

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

- Local re-processors sourcing more of their feedstock material interstate (instead of locally) to meet quality or quantity requirements for specific polymers;
- Changes which are occurring in the use and/or design of plastics packaging types; and/or
- Lower recovery by local resource recovery and/or re-processing facilities.

In this respect, SA based local processing of recovered Plastics continued to grow in 2011-12, but through significant volumes of feedstock sourced from interstate (which is not included in SA's reported tonnes for Plastics recovery).

**Table 3.9** **Quantity of Plastics recovered (tonnes) in SA during 2011-12, 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) | 4,500 | 670 | 15% |
| High density Polyethylene (HDPE) | 3,200 | 200 | 6% |
| Polyvinyl Chloride (PVC) | 50 | 3 | 6% |
| Low density Polyethylene (LDPE) | 4,400 | 180 | 4% |
| Polypropylene (PP) | 2,100 | 30 | 1% |
| Polystyrene (PS) | 270 | 26 | 10% |
| Mixed &/or Other Plastics (MIX) | 5,100 | 640 | 13% |
| **Total** | **19,600** | **2,000** | 10% |

1. Net recovery excludes re-processing losses

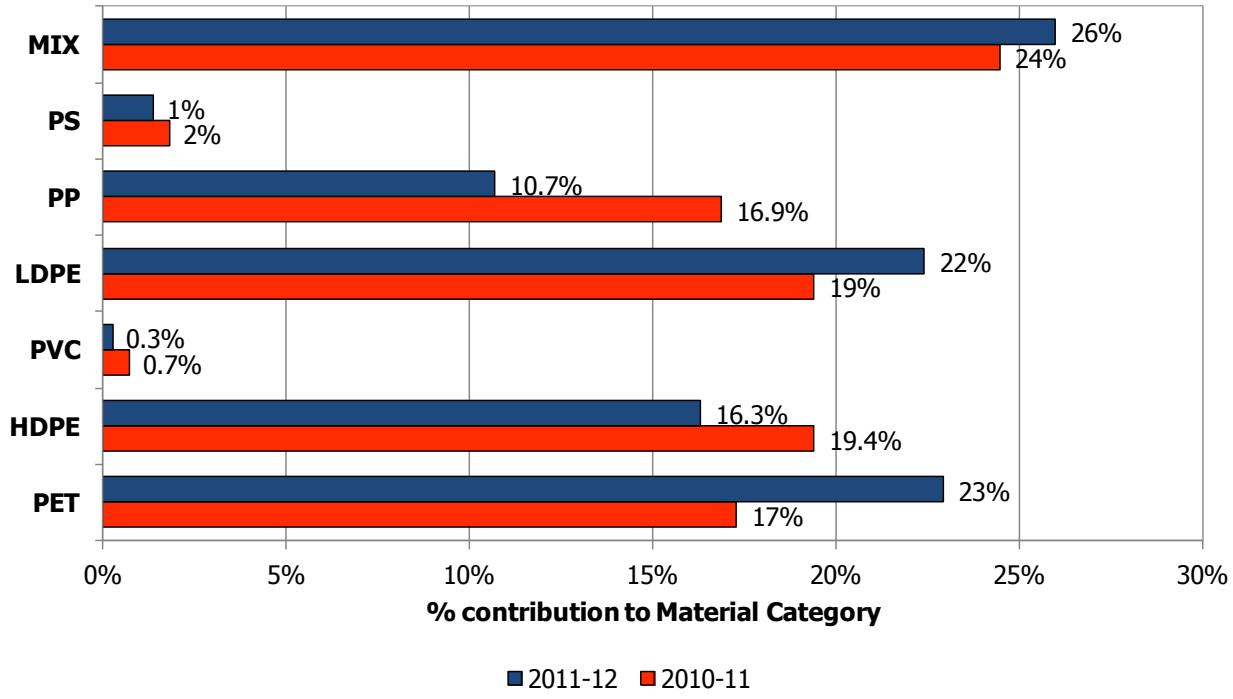


**Figure 3.13** **Changes in percent composition of recovered Plastics (by weight), SA, between 2010-11 and 2011-12.** *The contribution of some plastic materials increased in 2011-12, particularly PET and LDPE, relative to others.*

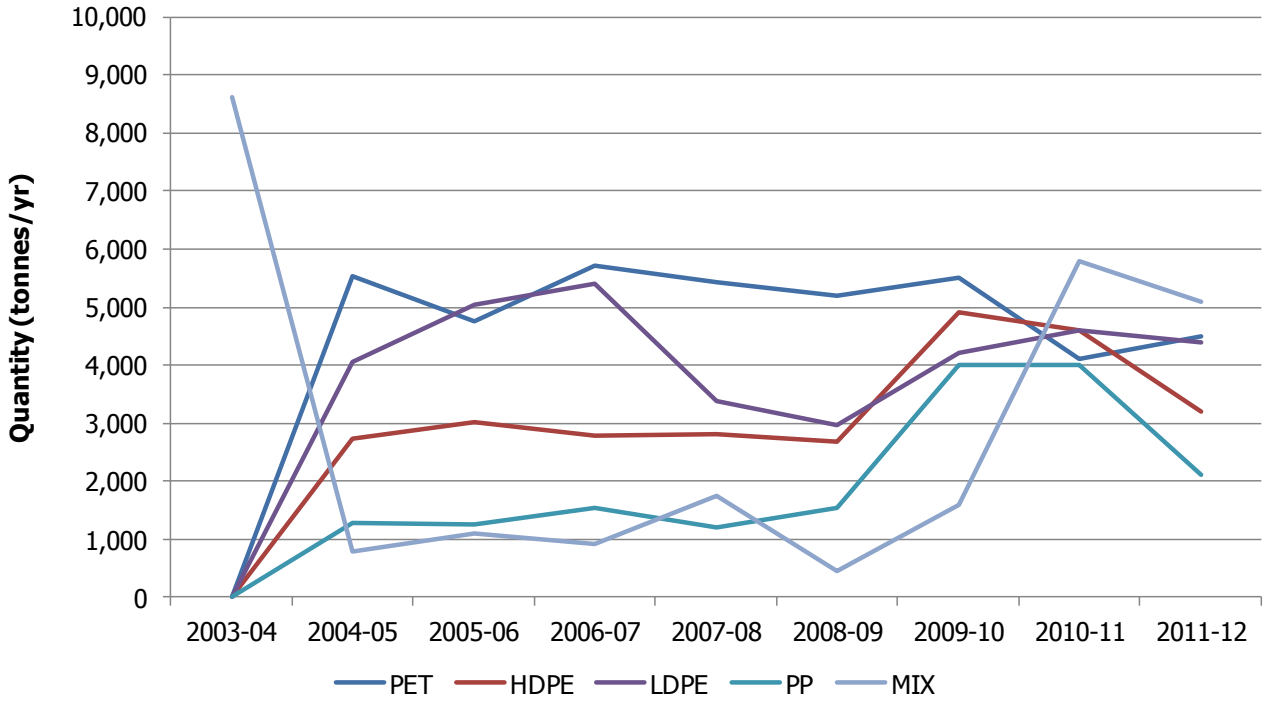


**Figure 3.14** **Changes in reported Plastics quantities since 2003-04 – PET, HDPE, LDPE, PP and MIX.** *PET recovery rose during 2010-11 but other plastic types fell.*

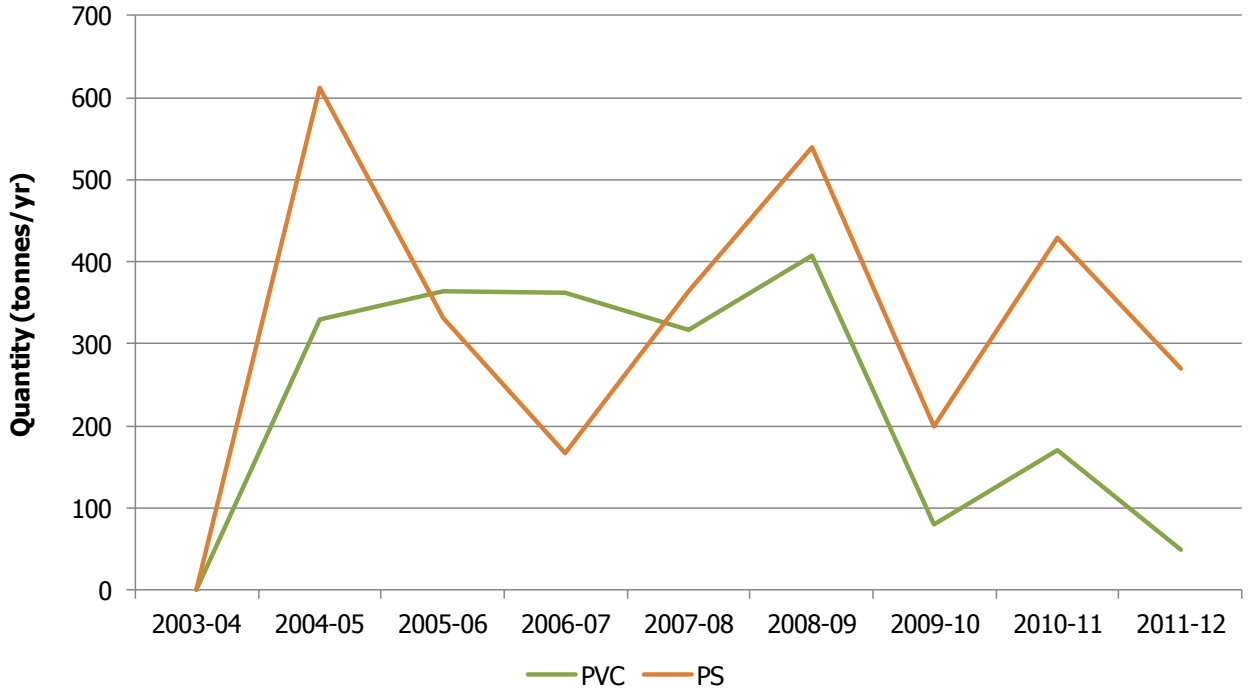


**Figure 3.15** **Changes in reported Plastics quantities since 2003-04 – PVC and PS.** *Both PVC and PS saw a drop in reported quantities.*

In 2011-12 C&I and Municipal sources made up 40% and 49% of reported recovered Plastics materials respectively (see Table 3.10 below). Material sourced from C&D increased to 11% (from 7% in 2010-11).

The split between metropolitan and regional origin for Plastics recovery during 2011-12 was reported at 86% to 14% (Table 3.10).

A substantial amount (49%) of Plastics re-processing continued to occur in SA (see Table 3.10), through a major and several lesser re-processors (Table 3.10). SA re-re-processors take most types of recovered plastic materials with the exception of PET and PVC, where there are no local re-processors. However, an increased proportion of recovered Plastics (at 46%) were being exported overseas, which is a growing trend.

The outlook for recovery of Plastics materials in SA is expected to grow albeit slowly.

- Additional SA based re-processing of recovered Plastics is expected to rise in the next period from new investment in plant and equipment by local re-processors.
- Recovery of Plastics from mixed C&I sorting and source separated generating sites is expected to slowly increase.
- 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 2011-12.**

| Item | Sector Origin (%) | | | Geographical Origin (%) | | Re-processing Location (%) | | |
|---|---|---|---|---|---|---|---|---|
| | Municipal | C&I | C&D | Metro | Regional | SA | Interstate | Overseas |
| Polyethylene Terephthalate (PET) | 70% | 30% | 0% | 68% | 32% | 0% | 1% | 99% |
| High density Polyethylene (HDPE) | 47.7% | 51.7% | 0.6% | 90% | 10% | 87.8% | 1.7% | 10.5% |
| Polyvinyl Chloride (PVC) | 12% | 74% | 14% | 93% | 7% | 0% | 7% | 93% |
| Low Density Polyethylene (LDPE) | 19% | 67% | 14% | 86% | 14% | 38% | 15% | 47% |
| Polypropylene (PP) | 19% | 81% | 0% | 94% | 6% | 93% | 4% | 3% |
| Polystyrene (PS) | 10% | 87% | 3% | 95% | 5% | 8% | 5% | 87% |
| Mixed &/or Other Plastics (MIX) | 36% | 34% | 30% | 94% | 6% | 63% | 1% | 36% |
| **Total** | **40%** | **49%** | **11%** | **86%** | **14%** | **49%** | **5%** | **46%** |

## 3.6 Glass

**Highlights:**

- *In 2011-12 the total quantity of recovered Glass increased above pre-2009 levels.*
- *Most Glass was re-processed locally.*
- *The outlook for Glass is positive but local re-processing is experiencing higher energy costs which could affect future viability.*

The total quantity of recovered Glass reported for SA during 2011-12 was approximately 68,000 tonnes (Table 3.11 below), which is up by 17% from 2010-11 (Figure 3.16 overleaf), and has now recovered to above pre-2009 levels.

In 2011-12 most Glass (61%) was recovered from Municipal sources and the remainder was from C&I (39%) (see Table 3.12 overleaf). The majority (79%) of Glass was from metropolitan sources (Table 3.12). Most Glass was re-processed in SA, with the remainder (2%) sent interstate (Table 3.12).

Since 2003-04, there has on-going upward trend for recovered Glass (Figure 3.16).

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

- Local re-processing demand for the beneficiated Glass is very important to this market stability.
- Rising energy costs and the introduction of the Carbon Price were cited by industry as affecting the viability of glass manufacturing (which would affect demand for recovered Glass waste material).

**Table 3.11 Quantity of Glass recovered (tonnes) in SA during 2011-12, including estimated reporting error (tonnes & %)**

| Item | Net Recovery [1] | Reporting Error | |
|---|---|---|---|
| | tonnes | tonnes | % |
| Glass | 68,000 | 13,000 | 19% |

1. Net recovery excludes re-processing losses

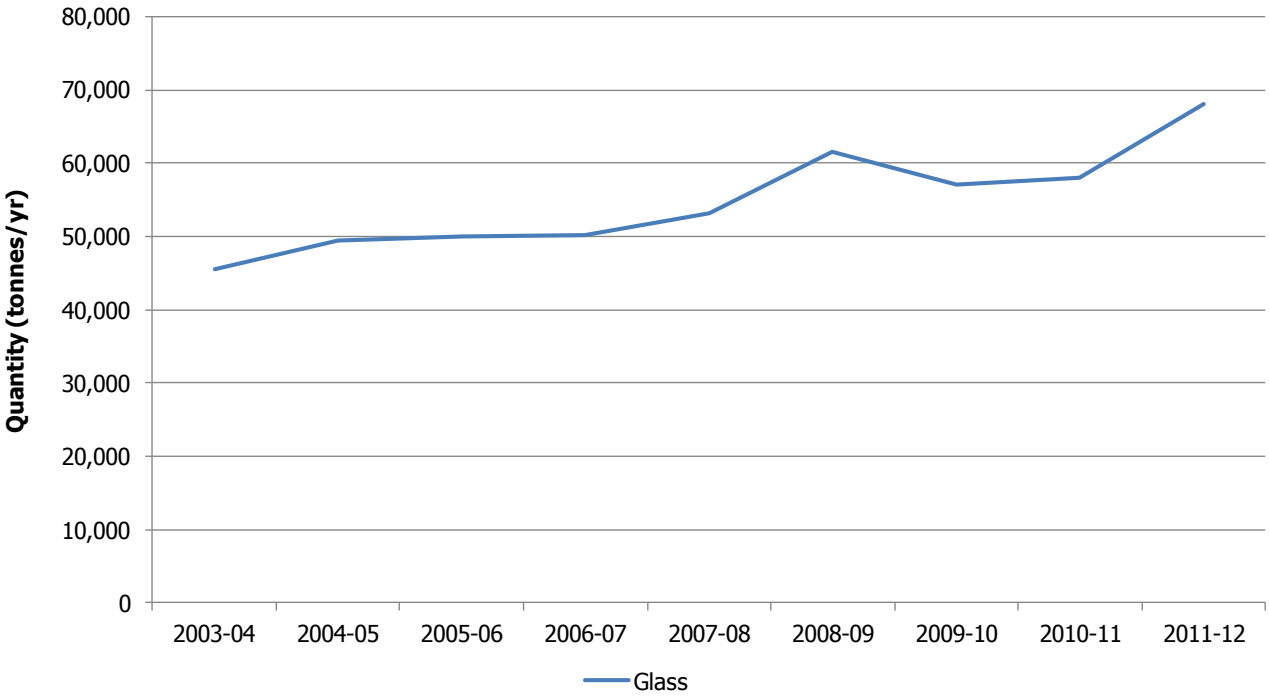


**Figure 3.16** **Changes in reported Glass quantities since 2003-04 – Glass.** *There is has been a consistent upward trend since 2003-04.*

**Table 3.12** **Sector and geographical origins and re-processing locations for recovered Glass in SA in 2011-12.** *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 (%) | | |
|---|---|---|---|---|---|---|---|---|
| | Municipal | C&I | C&D | Metro | Regional | SA | Interstate | Overseas |
| Glass | 61% | 39% | 0% | 79% | 21% | 98% | 2% | 0% |

## 3.7 Other Materials

**Highlights:**

- *In 2011-12 the overall quantity of recovered Other Materials increased, which was largely driven by greater recovery of Foundry Waste.*
- *Recovery of Fly Ash appears to be continuing a downward trend.*

The total quantity of recovered Other Materials reported for SA during 2011-12 was approximately 242,800 tonnes (Table 3.13 below), which is up by 4% from 2010-11.

- This increase was largely driven by greater quantities of recovered Foundry Waste materials (up 92% or 29,100 tonnes from 2010-11), which includes foundry sand and slag waste (see Figures 3.18 overleaf).
- Increases were also reported for Leather & Textiles (up 15%) and Tyres & Other Rubber (up 2%) (Figure 3.18).
- The only exception to this upwards trend was Fly Ash (down 20% from 2010-11), which shows an on-going downward trend (Figure 3.19 overleaf).

Fly Ash continued to constitute the majority (66%) of reported other materials recovery followed by Foundry Waste (25%) (see Figure 3.17 overleaf).

Nearly all of the Other Materials in 2011-12 were collected from C&I sources (see Table 3.14 two pages over). The majority (87%) of these Other Materials were sourced from regional SA (Table 3.14). This included the 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 2011-12, 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 | 160,000 | 5,000 | 3% |
| Foundry Waste | 60,900 | 800 | 1% |
| Leather & Textiles | 4,500 | 800 | 18% |
| Tyres & Other Rubber | 17,400 | 2,100 | 12% |
| **Total** | **242,800** | **8,700** | 4% |

1. Net recovery excludes re-processing losses

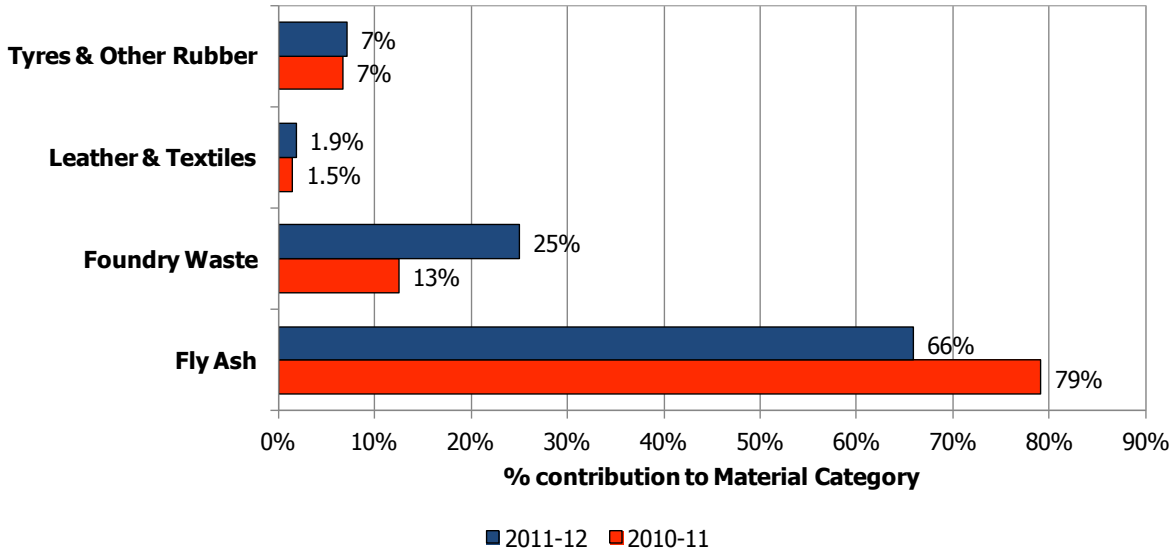


**Figure 3.17** **Changes in percent composition of recovered Other Materials (by weight), SA, between 2010-11 and 2011-12.** *The relative contribution of Foundry Waste increased during 2011-12.*

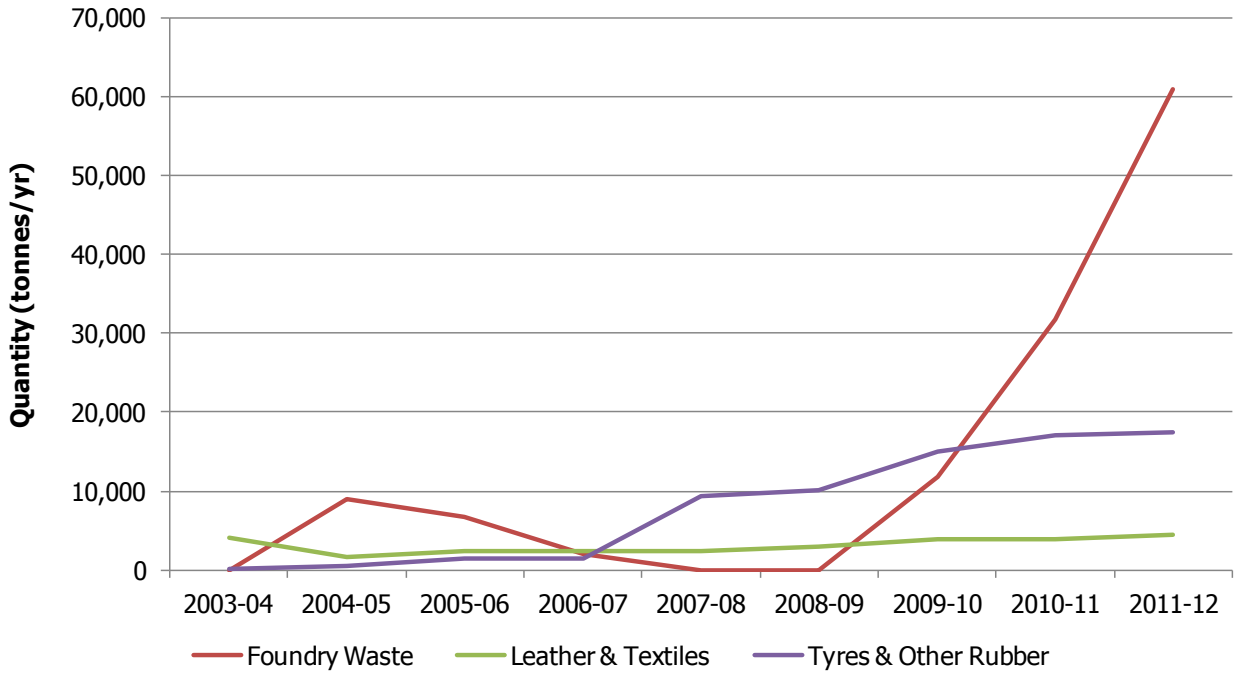


**Figure 3.18** **Changes in reported Other Materials quantities since 2003-04 – Foundry Waste, Leather & Textiles and Tyres & Other Rubber.** *Foundry Waste has seen significant rises since 2008-09.*

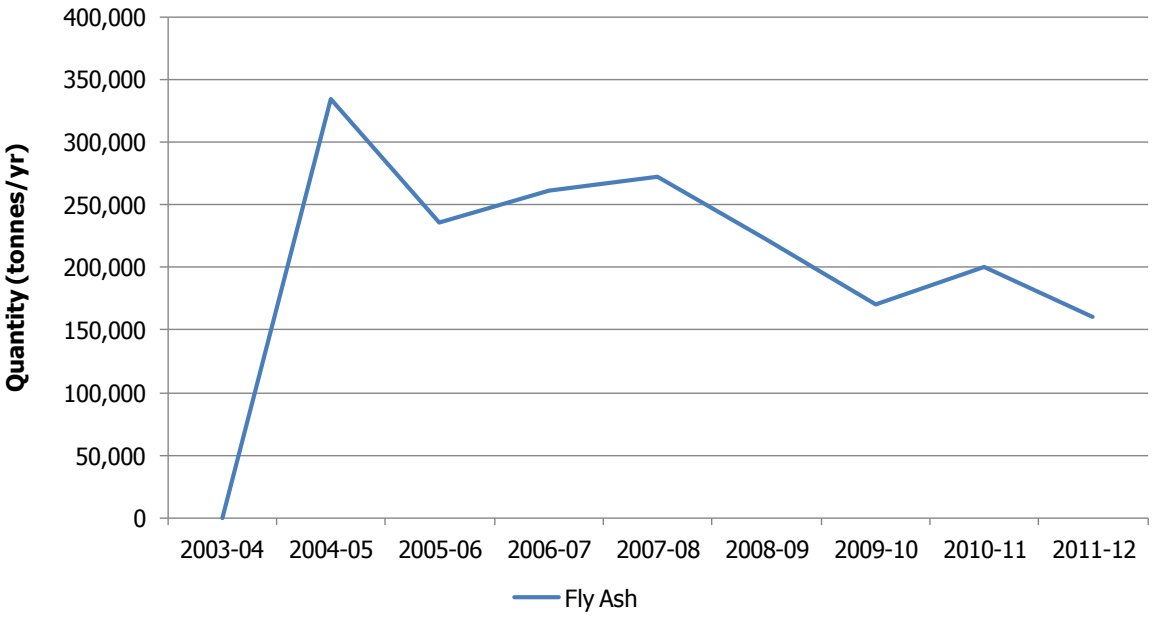


**Figure 3.19** **Changes in reported Other Materials quantities since 2003-04 – Fly Ash.** *Fly Ash appears to be slowly trending downwards.*

Nearly all of this Fly Ash and Foundry Waste were re-processed in SA for cement production (see Table 3.14). Most of the Leather & Textiles were sent interstate (77%) or overseas (23%) for processing into cleaning cloths. The majority of Tyres & Other Rubber (91%) were exported interstate or overseas 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 recovery of Foundry Waste and other heavy industrial waste streams is expected to continue to increase in the next period.
- Fly Ash is expected to continue reducing in line with decreased use of coal-fired power generation in the State.

**Table 3.14** **Sector and geographical origins and re-processing locations for recovered other materials in SA in 2011-12.**

| Item | Sector Origin (%) | | | Geographical Origin (%) | | Re-processing Location (%) | | |
|---|---|---|---|---|---|---|---|---|
| | Municipal | C&I | C&D | Metro | Regional | SA | Interstate | Overseas |
| Fly Ash | 0% | 100% | 0% | 0% | 100% | 100% | 0% | 0% |
| Foundry Waste | 0% | 100% | 0% | 21% | 79% | 100% | 0% | 0% |
| Leather & Textiles | 0% | 100% | 0% | 85% | 15% | 0% | 77% | 23% |
| Tyres & Other Rubber | 2% | 98% | 0% | 91% | 9% | 0% | 17% | 83% |
| **Total** | 0% | 100% | 0% | 13% | 87% | 91% | 3% | 6% |

# 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 2011-12 the total quantity of recovered E-waste increased in advance of SA landfill bans and the new End-Of-Life (EOL) TV/Computer National Product Stewardship scheme.*
- *Greater recovery for E-waste was achieved from Municipal 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 2011-12 was approximately 5,000 tonnes (Table 4.1), which is up by 57% from 2010-11. This increase was largely driven by greater quantities of Computers (up 333% or 2,220 tonnes), which may be attributed to:

- Greater recovery from council collections; and
- Increased recovery activity associated with early preparation for introduction of the End-Of-Life (EOL) TV/Computer National Product Stewardship Scheme and e-waste landfill bans for metropolitan Adelaide.

Increases in recovery were also reported across a number of other e-waste streams.

- Compact Fluorescent Lamps were up 244%
- Printer Cartridges were up 15%

**Table 4.1 Changes in reported quantities of E-waste between 2010-11 and 2011-12.**
*TVs/Monitors and Computers were major contributors to E-waste recovery in SA.*

| Item | 2010-11 | 2011-12 | % change 10-11 to 11-12 |
|---|---|---|---|
| Printer Cartridges | 130 | 150 | 15% |
| Compact Fluorescent Lamps | 18 | 62 | 244% |
| Batteries | 1 | 1 | - |
| Computers | 660 | 2,860 | 333% |
| Televisions / Monitors | 1,840 | 1,800 | -2% |
| Mobile Phones | 6[7] | 4 | -31% |
| Other E-waste | 540 | 120 | -78% |
| **Total** | **3,190[2]** | **5,000** | **57%** |

1. Net recovery excludes re-processing losses
2. This value has a reporting error of 300 tonnes (+/-6%).

[7] This figure has been adjusted from that reported in the 2010-11 SA Recycling Activity report.

However, other e-waste quantities fell (down 78% or 420 tonnes), which may be due to different classification of this waste stream by industry across reporting periods.

Reported quantities of Televisions & Monitors also fell slightly (down 2%) along with Mobile Phones (down 31%).

With respect to Mobile Phones, industry indicated that national Mobile Phone recovery has increased across this period. It is also therefore likely that SA quantities have also increased even though reported values were down.

In 2011-12, the major E-waste constituents by weight were Computers (57%) and Televisions & Monitors (36%) (see Figure 4.1 overleaf). Printer Cartridges also made a sizeable contribution (3%), reflecting its high use as a consumable item. The higher quantities of Computers being recovered significantly increased its relative contribution to e-waste recovery during 2010-11 (Figure 4.1).

The majority (79%) of e-waste recovered originated from municipal sources through E-waste or hazardous waste collections organised by Local Government and/or Zero Waste SA in metropolitan, peri-urban and regional areas (Table 4.2 overleaf). TVs were a major contributor to municipal E-waste collected in some of these areas during 2011-12, due to the Australian Government's Digital TV Switchover. The balance of E-waste came from C&I sources via commercial collections from government or business.

A significant proportion (37%) of E-waste was sourced from regional SA (Table 4.2).

Whilst the destination for 78% of the materials was reported as South Australia (Table 4.2), this does not necessarily involve re-processing. 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.

The growth in E-waste recovery during 2011-12 can be attributed to a number of factors including:

- Preparations for SA landfill bans for e-waste in September 2012 leading to increased awareness of the public and other organisations for the need to direct e-waste to recyclers.
- Recycling opportunities and services presented to SA residents and businesses through Zero Waste SA and Council facilitated collections (campaign and on-call) and commercial waste contractors.
- Entry of new organisations into the SA E-waste recovery market.
- 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.
- Continued roll out of the Digital TV Switchover, which commenced in regional areas of South Australia during 2010-11.

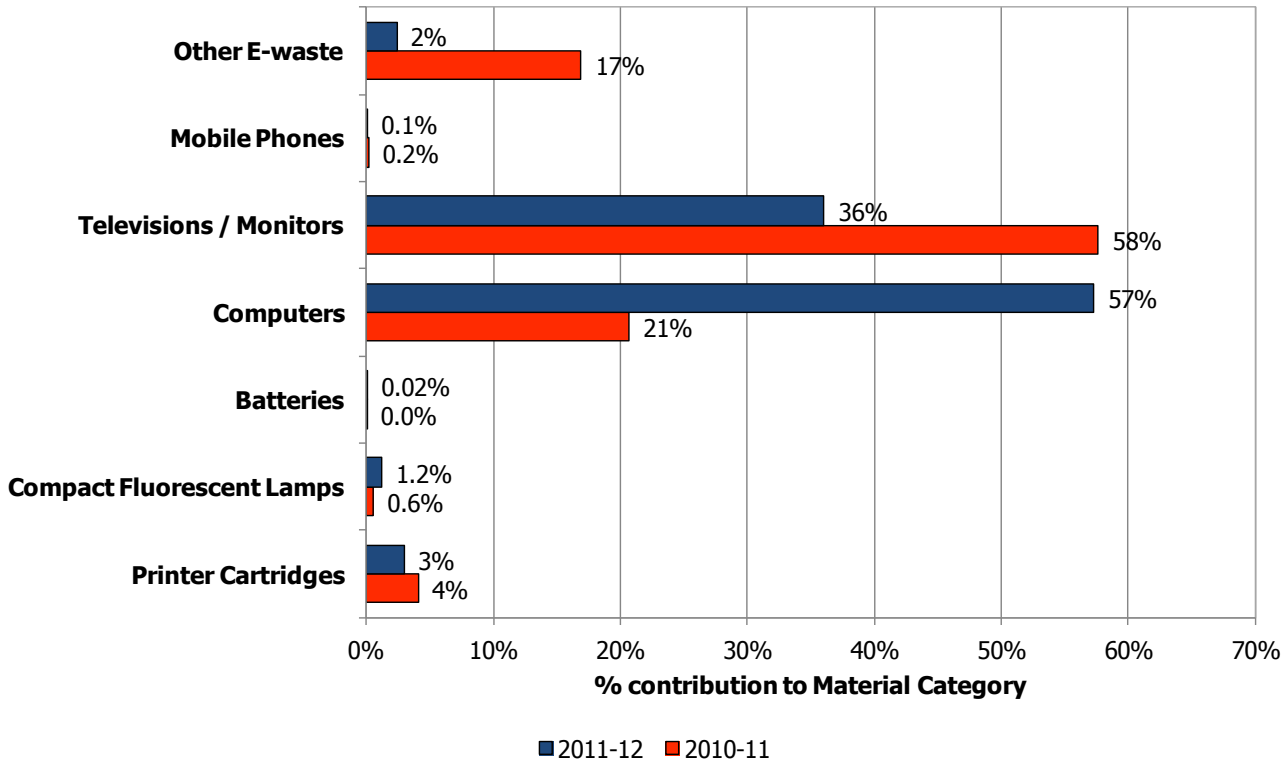


**Figure 4.1** **Changes in percent composition of recovered E-waste (by weight), SA, between 2010-11 and 2011-12.** *The relative proportion of Computers in E-waste recovery significantly increased during 2011-12.*

**Table 4.2** **Sector and geographical origins and re-processing locations for recovered E-waste in SA in 2011-12.** *Majority E-waste recovery comes from Municipal sources, and regional areas made a disproportionate contribution.*

| Item | Sector Origin (%) | | | Geographical Origin (%) | | Re-processing Location (%) | | |
|---|---|---|---|---|---|---|---|---|
| | Municipal | C&I | C&D | Metro | Regional | SA | Interstate | Overseas |
| Total E-waste | 79% | 21% | 0% | 63% | 37% | 78% | 20% | 2% |

The growth in E-waste recovery is anticipated to accelerate in 2012-13 due to the new End-Of-Life (EOL)/TV National Product Stewardship Scheme and the landfill bans in South Australia which have since been introduced; specifically:

- In September 2012, the South Australian EPA introduced a ban on all computer monitors & televisions and fluorescent lighting across landfills in metropolitan Adelaide. These bans will be extended in September 2013 to a state-wide ban on other electrical or electronic equipment (SA Government, 2010b).
- The new End-Of-Life (EOL)/TV National Product Stewardship Scheme to manage end-of-life televisions / monitors was underway in the second half of 2012. Since this time a number of free public drop-off locations have been set up across SA.

Challenges to future E-waste recovery, however, could include:

- The general public is still largely uneducated about correct recovery and the benefits of recycling e-waste.
- Collection depots, systems and infrastructure are still largely undeveloped and inconvenient for the public to access. The roll-out the new End-Of-Life (EOL)/TV National Product Stewardship Framework for televisions and computers is expected to improve this situation.

# 5 Packaging Materials

**At a glance:**

- *This report section specifically assesses resource recovery of packaging waste materials in SA, including SA's for SA's Container Deposit scheme.*
- *2011-12 saw a reported increase in the recovery of packaging materials in SA.*
- *The major contributor to this increase was due to higher recovery cardboard materials, which have substantially risen since 2003-04.*
- *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 256,620 tonnes, of which 47,530 tonnes (18.5%) was recovered through the container deposit system, and 209,090 tonnes (81.5%) was recovered from other sources (see Table 5.1 overleaf).

This outcome is a substantial increase from last year's reported packaging recovery of 219,940 tonnes. The most significant factor in this increase was the rise in reported cardboard packaging waste recovery (which rose by 30,000 tonnes in 2011-12). Improved container deposit recovery also contributed to this increase (up 1.1% from 2010-11).

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 2011-12;
- PET packaging was 99% of total PET recycling activity;
- Cardboard packaging was 90.1% of the total amount of cardboard recycling activity;
- Liquid Paperboard packaging was 94.4% of total liquid paperboard recycling activity; etc.

**Table 5.1** **Estimated packaging recovery, SA 2011-12.** *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) of total material recovered |
|---|---|---|---|---|
| | Container Deposit | Other | | |
| Steel Cans | | 1,040 | 1,040 | 0.3% |
| Aluminium Cans | 3,900 | 200 | 4,100 | 20.0% |
| Cardboard Packaging | | 164,800 | 164,800 | 90.1% |
| Liquid Paperboard Cartons | 800 | 2,600 | 3,400 | 94.4% |
| PET Packaging | 4,420 | 40 | 4,460 | 99% |
| HDPE Packaging | 210 | 2,260 | 2,470 | 77.2% |
| PVC Packaging | | 9 | 9 | 18.0% |
| LDPE Packaging | | 4,100 | 4,100 | 93.2% |
| Polypropylene Packaging | | 1,770 | 1,770 | 84.3% |
| Polystyrene Packaging | | 120 | 120 | 44.4% |
| Other Plastics Packaging | | 2,350 | 2,350 | 46.1% |
| Glass bottles & Jars | 38,200 | 29,800 | 68,000 | 100% |
| **Total** | **47,530** | **209,090** | **256,620** | |

## 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 2011-12, glass containers represented 80% (by weight) of returned recycled deposit containers in SA (see Figure 5.1). The average return rate for container deposits in 2011-12 was 83% (by weight) from approximately 742 million containers (estimated as used in SA during this period).This return rate is slightly up from the value (82%) reported in 2010-11 (for 738 million containers used).

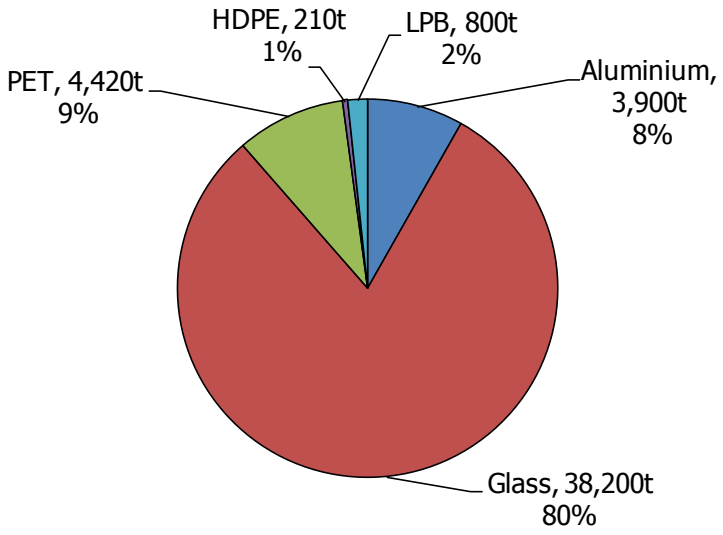


**Figure 5.1** **Relative proportions of returned recycled deposit containers (by weight), SA 2011-12.** *Glass is the major contributor by weight.*

**Table 5.2** **Return rates for recycled deposit containers, SA 2010-11.** *SA achieves high return rates of recycled deposit containers.*

| Material | Recovered (tonnes) | Return rate (%) |
|---|---|---|
| Aluminium | 3,900 | 88% |
| Glass | 38,200 | 84% |
| PET | 4,420 | 78% |
| HDPE | 210 | 59% |
| LPB | 800 | 58% |
| **Total** | **47,530** | 83% |

## 5.3 Other Packaging Materials

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

Cardboard and glass materials (95%) were the dominant contributors to resource recovery of other packaging materials, but plastic packaging materials, which includes film wrap-type packaging, make an important contribution (at *ca.* 8,000 tonnes).

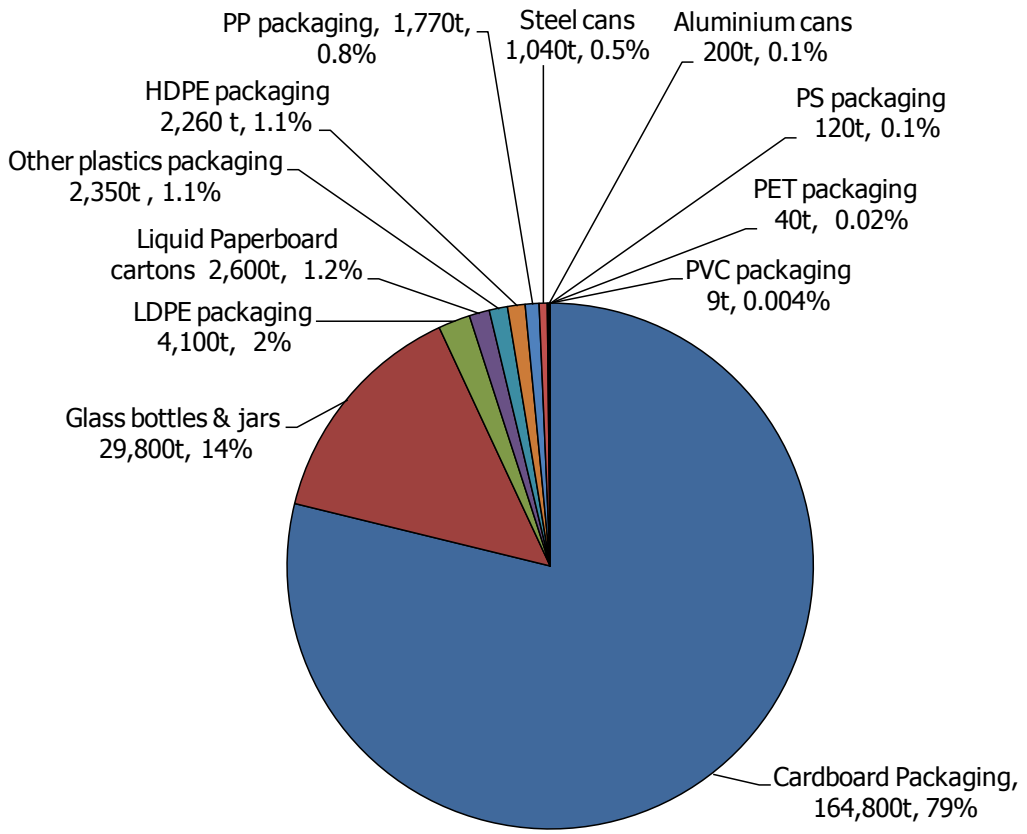


**Figure 5.2** **Relative proportions of recovered other packaging materials by weight, SA 2011-12.** *Cardboard, glass and plastic materials are the major contributors to recovery for other packaging materials.*

# 6 Resource Recovery Value

**At a glance:**

- *This section quantifies the resource value of recovered materials reported in 2011-12.*

**Highlights:**

- *The resource value of recovered materials in 2011-12 was estimated at $313 million.*
- *Metals was the major contributor to this value comprising 58% or $180.9 million.*
- *The average resource value for recovered materials was $79 per tonne.*

Based on the quantities reported during this year's Recycling Activity survey, the estimated value of resource recovery for South Australia during 2011-12 was $313 million, or $79 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 Organics (at 10%) and Cardboard & Paper (at 18%) 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, 2011-12 [(a)].**

| Material category | Resource recovery (tonnes) | Estimated on-sale price[(a)] ($/tonne) | Estimated Resource Value ($ millions) | Price data source[(a)]: |
|---|---|---|---|---|
| **Masonry** | 976,600 | $15 | $14.6 | WME (2011) |
| **Metals** | 452,300 | $400 | $180.9 | WME (2011) |
| **Organics** | 901,600 | $35 | $31.6 | WME (2011) |
| **Cardboard & Paper** | 249,400 | $225 | $56.1 | WME (2011) |
| **Plastics** | 19,620 | $250 | $4.9 | WME (2011) |
| **Glass** | 68,000 | $90 | $6.1 | Authors' estimate |
| **Other Materials** | 82,800 | $10 | $0.8 | Authors' estimate |
| **Separately Reported Materials** | 1,230,000 | $15 | $18.5 | Authors' estimate |
| **TOTAL ALL Materials** | 3,980,320 | $79 | $313.5 | |

Notes:

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

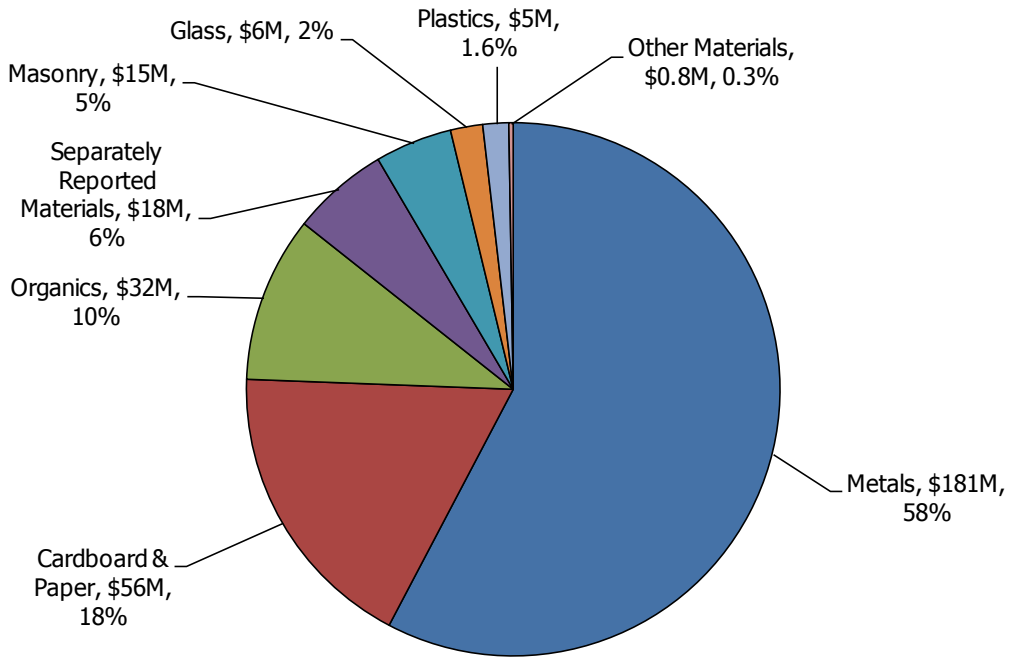


**Figure 6.2 Estimated resource value for recovered materials in South Australia from the 2011-12 Recycling Activity Survey**

# 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 2011-12 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** – 1.28 million tonnes of CO2-e*
  - ***Cumulative Energy Demand saved** – 16,400 Tera-Joules (TJ)*
  - ***Water Savings** – 13,700 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 2011-12 is about 1.28 million tonnes of $CO_2$-e (see Tables 7.1 and 7.2 on following pages).

- This is a decrease of about 1% on the value reported for 2010-11
- The lower estimated greenhouse gas savings was a combination of several factors:
  - The overall decrease in reported material recovery.
  - Specific decreases in reported recovery for plastics and organic materials.
- Metals (at 51%) contributed disproportionately to greenhouse gas savings because a virgin metal is highly energy intensive to manufacture (Figure 7.1). 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 2 million trees that would have to be planted to absorb the same amount of CO2.
  - The greenhouse gas emissions that 290,000 cars would produce in a single year[8].
- The greenhouse gas savings from SA recycling, 2011-12, equate to:
  - Approximately 18% of South Australia's total Community sector GHG emissions in 2009[9].

[8] 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, 2011-12[(a)]**

| | Material | Material Quantity tonnes | GHG Emissions Saved[(a)] tonnes CO2-e | Energy Saved[(a)] TJ LHV | Water Saved[(a)] ML |
|---|---|---|---|---|---|
| | **Masonry** | | | | |
| 1 | Asphalt | 143,000 | 2,300 | 291 | 126 |
| 2 | Bricks | 73,000 | 700 | 9 | 92 |
| 3 | Concrete | 760,000 | 22,000 | 420 | 973 |
| 4 | Plasterboard | 600 | 28 | 136 | -18 |
| 5 | Clay, fines, rubble & soil | 1,070,000 | 92,500 | 722 | 471 |
| | **Metals** | | | | |
| 6 | Steel | 404,000 | 248,500 | 3,208 | -953 |
| 7 | Aluminium | 20,500 | 302,800 | 3,508 | 3,726 |
| 8 | Non-ferrous metals | 27,800 | 94,400 | 1,003 | 166 |
| | **Organics** | | | | |
| 9 | Food Organics | 5,600 | 2,900 | 9 | 4 |
| 10 | Garden Organics | 212,000 | 48,900 | 100 | 102 |
| 11 | Timber | 281,000 | 92,300 | 370 | 152 |
| 12 | Organics - Other | 403,000 | 193,800 | 873 | 93 |
| | **Cardboard & paper** | | | | |
| 13 | Cardboard & waxed cardboard | 183,000 | 55,700 | 2,293 | 6,046 |
| 14 | Liquid Paperboard | 3,600 | 2,300 | 33 | 58 |
| 15 | Magazines | 6,700 | 3,100 | 61 | 149 |
| 16 | Newsprint | 31,900 | 14,800 | 289 | 707 |
| 17 | Phonebooks | 900 | 200 | 11 | 30 |
| 18 | Printing & Writing Paper | 23,300 | 13,500 | 303 | 725 |
| | **Plastics** | | | | |
| 19 | Polyethylene terephthalate | 4,500 | 4,600 | 228 | -95 |
| 20 | High density polyethylene | 3,200 | 2,200 | 179 | -11 |
| 21 | Polyvinyl chloride | 50 | 100 | 2 | 3 |
| 22 | Low density polyethylene | 4,400 | 3,000 | 246 | -15 |
| 23 | Polypropylene | 2,100 | 3,500 | 123 | -27 |
| 24 | Polystyrene | 270 | 400 | 16 | -5 |
| 25 | Mixed &/or Other plastics | 5,100 | 7,000 | 309 | -90 |
| | **Glass** | | | | |
| 26 | Glass | 68,000 | 40,600 | 436 | 165 |
| | **Other Materials** | | | | |
| 27 | Fly Ash | 160,000 | 4,600 | 88 | 202 |
| 28 | Foundry Waste | 60,900 | | | |
| 29 | Leather & Textiles | 4,500 | | | |
| 30 | Tyres & Other Rubber | 17,400 | 20,600 | 1,169 | 912 |
| | **Total** | **3,980,000** | **1,277,328** | **16,436** | **13,686** |

Notes:

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

[9] The Community sector includes GHG emission 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, 2011-12[(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 | 117,528 | 176,000 | 27,000 |
| Metals | 645,700 | 965,000 | 148,500 |
| Organics | 337,900 | 505,000 | 77,700 |
| Cardboard & paper | 89,600 | 134,000 | 20,600 |
| Plastics | 20,800 | 31,000 | 4,800 |
| Glass | 40,600 | 61,000 | 9,300 |
| Other Material | 25,200 | 38,000 | 5,800 |
| Total | 1,277,328 | 1,910,000 | 293,700 |

Notes:

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

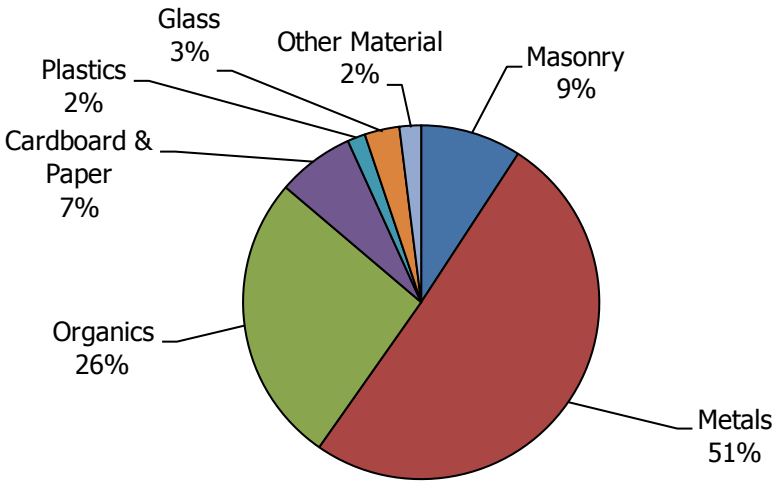


**Figure 7.1 Avoided greenhouse gas emissions (by material category), as a result of recycling in SA 2011-12**

## 7.2 Energy savings

The total projected energy savings (in Terajoules or TJ[10]) from recycling in South Australia during 2011-12 was about 16,400 TJ (see previous Table 7.1 and Table 7.3 below).

- Metals again contribute disproportionately, at 47%, to projected energy savings even though it represents only 11% of the material being recovered in SA (see Figure 7.2 overleaf).
- Similarly, plastics contribute to 7% of energy savings even though it is only 0.5% of total resource recovery.
- Behind metals, Cardboard & paper (at 18%) is the next most significant contributor to energy savings.
- These energy savings are considered approximately equivalent to:
  - Energy use by 319,900 average households in one year[11].
  - The energy supplied by 2.9 million barrels of oil.
- The energy savings from SA recycling, 2011-12, equate to:
  - Approximately 4.7% of South Australia's total energy consumption reported for 2009-10.[12]

**Table 7.3 Estimated energy savings as a result of recycling in SA, 2011-12[(a)]**

| Sector Origin | Energy Saved TJ LHV | Equivalent households (1 year) [(a)] | Barrel of Oil Equivalents (BOE) [(a)] |
|---|---|---|---|
| Masonry | 1,578 | 30,700 | 277,000 |
| Metals | 7,719 | 150,200 | 1,354,000 |
| Organics | 1,352 | 26,300 | 237,000 |
| Cardboard & paper | 2,990 | 58,200 | 525,000 |
| Plastics | 1,104 | 21,500 | 194,000 |
| Glass | 436 | 8,500 | 77,000 |
| Other Material | 1,257 | 24,500 | 221,000 |
| Total | 16,436 | 319,900 | 2,885,000 |

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

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

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

[12] Source: Schultz, A and Petchey, R 2011, Energy update 2011, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, June.

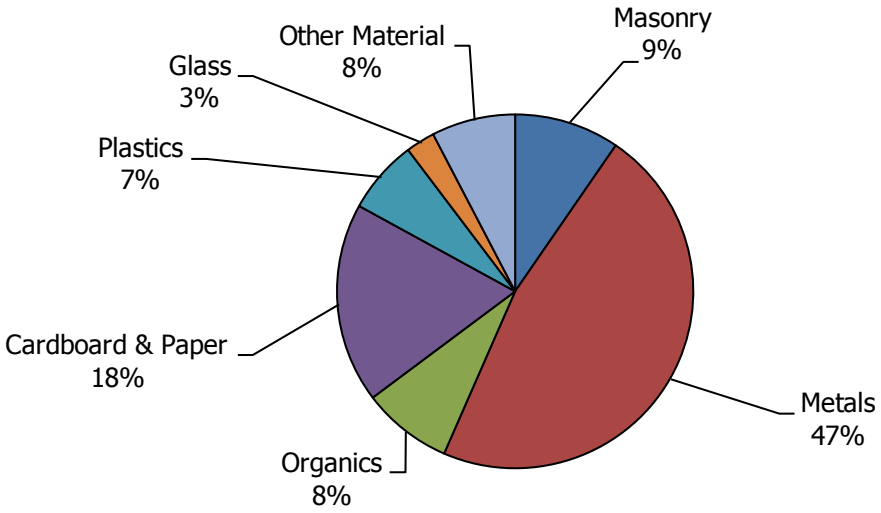


**Figure 7.2 Avoided energy consumption (by material category) as a result of recycling in SA, 2011-12**

## 7.3 Water savings

The total projected water savings (in Megalitres or ML[13]) from recycling in South Australia during 2011-12 was approximately 13,700 ML (see Tables 7.1 and 7.4 overleaf).

- Cardboard & paper contribute most significantly (at 54%) to water savings achieved from recycling (see Figure 7.3 overleaf) as manufacture of virgin cardboard and paper materials consumes large volumes of water.
- Metals are also a significant contributor at 21% (Figure 7.3). 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.
- These water savings are considered approximately equivalent to:
  - Water use by about 72,000 average Adelaide households in one year[14].
  - The water contained in about 5,500 Olympic-sized swimming pools[15].
- The water savings from SA recycling, 2011-12, equate to:
  - Approximately 9% of Metropolitan Adelaide's total water consumption reported for 2011-12[16].

[13] 1 Megalitre or ML = $10^6$ Litres (J) = 1,000 kilo-Litres (kL)

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

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

[16] Source: SA Water (2012); South Australian Water Corporation Annual Report: For the year ending 30 June 2012

**Table 7.4 Estimated water savings as a result of recycling in SA, 2011-12[(a)]**

| Sector Origin | Water saved ML | Equivalent households (1 year) [(a)] | Olympic Swimming Pools[(a)] |
|---|---|---|---|
| Masonry | 1,643 | 8,650 | 660 |
| Metals | 2,939 | 15,470 | 1,180 |
| Organics | 350 | 1,840 | 140 |
| Cardboard & paper | 7,715 | 40,600 | 3,090 |
| Plastics | -240 | -1,260 | -100 |
| Glass | 165 | 870 | 70 |
| Other Material | 1,114 | 5,860 | 450 |
| Total | 13,686 | 72,030 | 5,490 |

Notes:

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

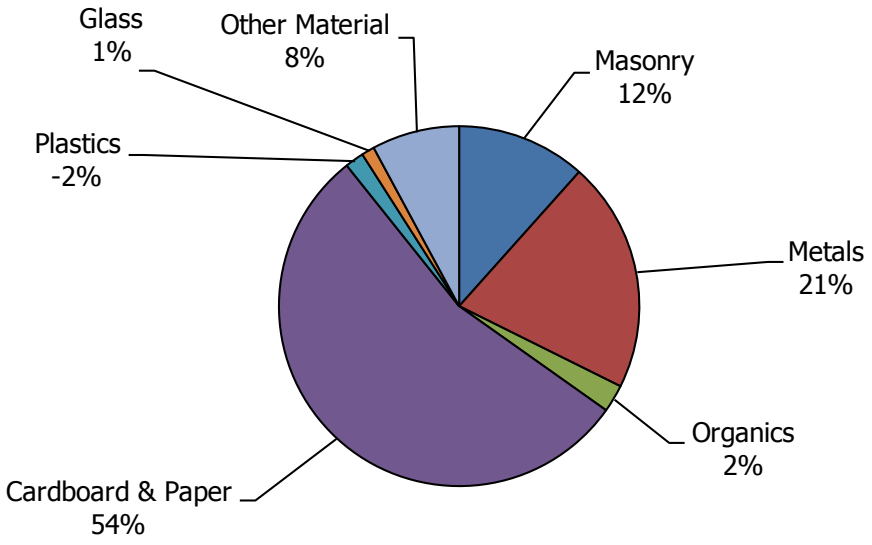


**Figure 7.3 Avoided water consumption (by material category) as a result of recycling in SA, 2011-12**

# 8 Acknowledgements

Zero Waste SA and Rawtec would like to recognise and thank the following participants in the 2011-12 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 City Council*
- *Adelaide Hills Region Waste Management Authority*
- *Adelaide Resource Recovery*
- *Adelaide Pallet Recycling*
- *Advanced Plastic Recycling*
- *Alinta Energy*
- *Amcor Recycling*
- *Aspitech*
- *Bin-It Waste Transport & Recycling*
- *Chemsal*
- *Close the Loop*
- *CMA EcoCycle*
- *Coolfoam*
- *Department of Planning, Transport and Infrastructure*
- *Downer Group*
- Eccosave
- *E-Cycle Recovery*
- *Exide Technologies*
- *Foodbank SA*
- *Fleurieu Regional Waste Authority*
- *Green Team*
- *Integrated Waste Services*
- *Intercast & Forge*
- *Jeffries Group*
- *Master Butchers Co-operative*
- *MobileMuster*
- *Naracoorte Lucindale Council*
- *Naracoorte Recycables*
- *Norske Skog Paper Mills (Australia)*
- *Nuleaf Organics*
- *O-I Asia Pacific*
- *Paramount Machinery (Browns')*
- *Peats Soil & Garden Supplies*
- *Plastics Granulating Services*
- *Plastic Recyclers International*
- *ResourceCo*
- *Recall*
- *SA Water*
- *Sensis*
- *SITA Australia*
- *SITA ResourceCo*
- *Southern Region Waste Resource Authority*
- *Southern Tyre Disposals*
- *Southern Waste ResourceCo*
- *St Vincent de Paul Society*
- *T&R Pastoral*
- *Tarac Technologies*
- *The Salvation Army*
- *Tyrecycle*
- *Visy Recycling*
- *Worms Work Technologies*
- *YCA Recycling*

# 9 Glossary[17]

| | |
|---|---|
| **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. |
| **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. |
| **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. |

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

| | |
|---|---|
| **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 References

ARRB Group (2010); Sustainable Aggregates – CO2 Emission Factor Study

Australian Bureau of Statistics (ABS) (2011); 3101.0 – Australian Demographic Statistics, June 2011, Latest ISSUE Released at 11:30 AM (CANBERRA TIME) 19/12/2011

ACT Department of Territory & Municipal Services (ACT DTMS); 2011-12 ACT Waste and Recycling Statistics (unpublished), Date received 11/01/13.

Australian Department of the Environment, Heritage, Water and the Arts (DEHWA) (2010); A Study of Australia's Current and Future E-Waste Recycling Infrastructure Capacity and Needs

Australian Department of Sustainability, Environment, Water, Population & Communities (DSEWPC) (2012a); Waste and recycling in Australia 2011—Incorporating a revised method for compiling waste and recycling data

Australian Department of Sustainability, Environment, Water, Population & Communities (DSEWPC) (2012b); The Australian recycling sector - Report

EcoRecycle Victoria (2005); Life Cycle Impact Data for Resource Recovery for Commercial and Industrial and Construction and Demolition Waste in Victoria

Environment Protection and Heritage Council (EPHC) (2009); Decision Regulatory Impact Statement: Televisions and Computers.

Environment Protection and Heritage Council (EPHC) (2010); National Waste Report 2010

National Appliance and Equipment Energy Efficiency Committee (1998); Household Energy Use in Australia: End Uses, Greenhouse Gas Emissions and Energy Efficiency Program Coverage

National Timber Product Stewardship Group (NTPSG) (2012); Carbon Benefits of not Landfilling Wood Pallets and Packaging – Web-based Calculator: www.timberstewardship.org.au/calculator ; Accessed 15/2/2012

NSW Department of Environment, Climate Change and Water (NSW DECCW) (2010); Environmental benefits of recycling DECC 2010/58

NSW Department of Environment, Climate Change and Water (NSW DECCW) (2011); Waste Avoidance & Resource Recovery Strategy Progress Report 2010.

QLD Department of Environment & Resource Management (DERM) (2009); The state of waste and recycling in Queensland 2008, Technical Report

SA Department of Environment and Natural Resources (2011), Report on the operation of the 'Climate Change and Greenhouse Emissions Reduction Act 2007

SA Environment Protection Authority (2007); EPA Guidelines Environmental management of landfill facilities (municipal solid waste and commercial and industrial general waste)

SA Environment Protection Authority (2009); Draft Guidelines for the assessment, classification and disposal of solid

SA Government (2009); News Release, 3 December 2009: NEW WATER PRICES FOR 2010-11; Released by: Hon. Karlene Maywald, Minister for Water Security & Hon Kevin Foley, Treasurer

SA Government (2010a); Report to the NEPC on the implementation of the National Environment Protection (Used Packaging Materials) Measure for South Australia by Hon. Paul Caica MP, Minister for Environment and Conservation for the reporting year ended 30 June 2010

SA Government (2010b); Environment Protection (Waste to Resources) Policy 2010, Version: 2.9.2010

SA Government (2011); SA's Strategic Plan 2011

SA Water (2012); South Australian Water Corporation Annual Report: For the year ending 2012

Schultz, A and Petchey, R 2011, Energy update 2011, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, June

Sustainability Victoria (undated); Victorian Recycling Industries Annual Survey, 2009–2010

WA Waste Authority (2011); Recycling activity in Western Australia, 2009-10

WME Magazine (2012); Inside Waste – Industry Report 2011-12

Zero Waste SA (2009); Benefits of Recycling in South Australia

Zero Waste SA (2010); Recycling Activity in South Australia, 2008-09 Financial Year

Zero Waste SA (2011); Recycling activity in South Australia 2009-10 Financial Year

Zero Waste SA (2012); South Australia's Waste Strategy 2011-2015

# Appendix 1: Survey Methodology

Rawtec was engaged by Zero Waste SA to undertake the Recycling Activity (survey) in South Australia for the financial year 2011-12. 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 2011-12 recycling activity survey.

- *This approach and methodology was similar to that used for the 2010-11 recycling activity survey, which was 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 114 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 newly developed Zero Waste SA Environment Users System (ZEUS)[18]
- 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. The 2011-12 Questionnaire was slightly modified from that used during 2010-11.

- *The material category Clay, fines, rubble & soil was split into sub-categories Waste Fill (or "clean" fill) and Intermediate Waste Soil (or "contaminated" fill)*
- *A new survey question (Question 12) was included regarding annual sales revenue (turnover) from material collections, resource recovery and/or recycling activities.*
- *A new survey question (Question 15) was added asking if the survey respondent wishes to attend a Zero Waste SA industry seminar*
- *Some minor refinements were made to text, formatting and/or presentation.*

### A1.2.4 Survey Deployment

The survey was deployed to the survey respondents during October and early November 2011.

- *The deployment method was by email except in several instances where it was faxed to respondents without internet access.*
- *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 2011-12.*

[18] ZEUS is a new 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. The system is currently being piloted for collection of resource recovery data with a select group of industry sectors.

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

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

The collection of survey data was closed in mid-December 2012.

### 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 2011-12 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 – 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 2011-12, the only exception to this approach was:

- Cardboard & paper material from Adelaide Material Recovery Facilities (MRFs) where SA LGA Packaging[19] and metropolitan kerbside data were used to interpolate some material stream compositions.

➢ 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[20].

- *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, an 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 2011-12 is the same as that for 2010-11; 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) (2011).

➢ The relevant reporting periods and sources of recycling activity data were:

- SA: 2011-12, as reported in this survey;
- ACT: 2011-12, sourced directly from ACT NOWASTE, Jan 2013 (unpublished)
- VIC: 2009-10, as reported by: Victorian Recycling Industries Annual Survey, 2009–2010 (Sustainability Victoria, undated);
- WA: 2009-10, as reported by: Recycling Activity in Western Australia, 2009-10 (WA Waste Authority, 2010);
- NSW: 2008-09, as reported by: Waste Avoidance and Resource Recovery Strategy Progress Report, 2010 (NSW DECCW, 2010);
- QLD: 2007-08, as reported by: The State of Waste and Recycling in Queensland 2008 – Technical Report (QLD DERM, 2009).

[19] SA Government (2010a), Report to the NEPC on the implementation of the National Environment Protection (Used packaging Materials) Measure for South Australia

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

- Adjustments were made to the above data to present recycling data in accordance with the new 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 2011-12 CDL data reported by industry to the South Australian EPA.
- Cardboard packaging:
  - Derived from cardboard material recovery data which was adjusted to account for pre-consumer material.
- Other plastic packaging:
  - Derived from industry data for plastic packaging materials recovered by Adelaide MRFs and other sources.
- Other glass packaging:
  - Determined from balance between CDL data and industry-reported glass recovery and re-processing data.

### A1.3.5 Environmental Benefits Analysis

#### *A1.3.5.1 General Approach*

The methodology for this analysis was aligned as much as possible to the approach applied in previous recycling activity surveys developed for 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) H2O) –*** 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.

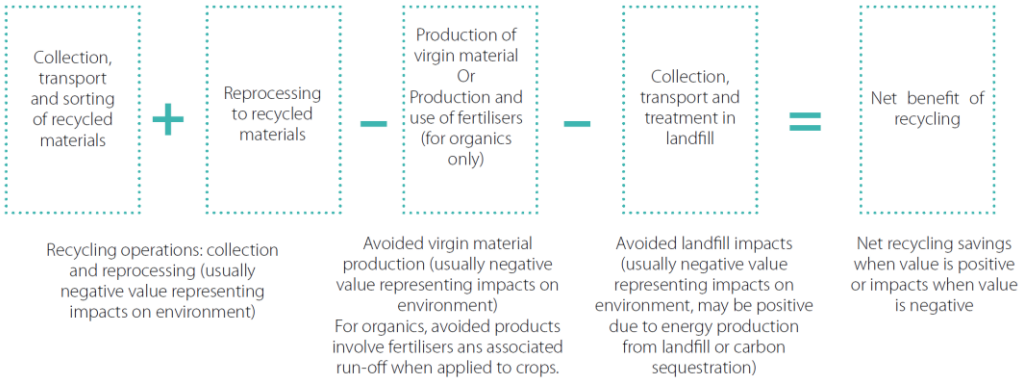


**Figure A1.1 Method for calculating the net environmental impacts in the recycling process. Source: NSW DECCW (2010)**

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)
- 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
- Reuse items

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

The 2011-12 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 2011-12 recycling activity survey are listed in Appendix 2.

Some brief notes on the sources and key assumptions made in deriving these conversion and emission factors are included in Appendix 2.

#### *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 2011-12 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 2011-12 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 2011-12 used to estimate resource market value. (For references in the Table below, refer to Section 11)**

| ***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 | $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 2011-12.

## A2.1 Survey Participation & Reported data

Table A2.1 below summarises the survey participation and reported data points for 2011-12.

- The survey questionnaire was successfully deployed to approximately 103 or 90% of the initial list of 114 companies or organisations potentially involved with recycling activity.
- The survey returns produced recycling activity data or information sets for 84 of these companies or organisations.
- Of these 84 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.
    - 6 were reference &/or aggregated data sets from industry bodies or government agencies
    - 21 data sets came from companies or organisations that generated the material that was being recovered for recycling
    - 66 data sets were companies or organisations involved in collection or aggregation of recovered material
    - 56 data sets were for companies or organisations undertaking re-processing activities
    - 44 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 | | 114 | | |
| Surveys Deployed* | | 103 | 90% | of Sample Size |
| Survey Data Points | | 84 | 82% | of Surveys Deployed |
| Activity Type | Industry Reference Data | 6 | 6% | of Survey Data Points |
| | Source | 21 | 20% | of Survey Data Points |
| | Aggregator/Collector | 66 | 64% | of Survey Data Points |
| | Recycler | 56 | 54% | of Survey Data Points |
| | Manufacturer | 44 | 43% | 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[21] – 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 | | 84 | |
| Material Activity | Masonry | 22 | 26% |
| | Metals | 30 | 36% |
| | Organics | 25 | 30% |
| | Cardboard & paper | 20 | 24% |
| | Plastics | 20 | 24% |
| | Glass | 13 | 15% |
| | Other Materials | 20 | 24% |
| | E-waste | 14 | 17% |
| | Reuse Materials | 14 | 17% |
| Material Destination | SA | 67 | 80% |
| | Interstate | 33 | 39% |
| | Export | 20 | 24% |
| Waste Hierarchy | Reuse | 19 | 23% |
| | Recycle | 51 | 61% |
| | Material Recovery | 62 | 74% |
| | Energy Recovery | 4 | 5% |

[21] 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: 2011-12 Recycling Activity Survey Questionnaire

# Data Entry Form – Recycling Activity in SA, 2011-12

Issued: 03 October 2012

**Survey Company & Contact Details**


| |
|---|
| Rawtec Pty Ltd (www.rawtec.com.au) |
| • Chris Colby, Principal Consultant, p: (08) 8294 5571, m: 0410 088 839, e: chris.colby@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 |


**Survey Questions for Period 1 July 2011 - 30 June 2012**

| | |
|---|---|
| 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. *[Enter details here]* |
| 2. | **Please fill in Table 1 (overleaf) for each relevant material listed in Table 2 (two pages over).** ***This is the critical information required for the survey. All data will be kept confidential and anonymised for reporting purposes.*** |
| | **For following questions, please enter responses directly into table below.** |
| 3. | What is the estimated accuracy of the data provided in Table 1, e.g. ±5%? *[Enter response here]* |
| 4. | Were any of the reported materials derived from packaging? If yes, (for each material) approximately what proportion (as % of total)? *[Enter response here]* |
| 5. | Have there been any significant changes in quantities, sources or destinations from last financial year? *[Enter response here]* |
| 6. | Where do you receive most of your material from, e.g. Councils, manufacturing, retail, hospitality, etc.? *[Enter response here]* |
| 7. | 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.? *[Enter response here]* |
| 8. | Your opinion about the market strength/prospects for recycled materials. *[Enter response here]* |
| 9. | 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? *[Enter response here]* |
| 10. | Are there any significant barriers, e.g. market, regulatory, technology, for your SA operations? *[Enter response here]* |
| 11. | The number of people 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. *[Enter response here]* |
| 12. | Approximate Annual Sales Revenue (Turnover) from material collection, resource recovery and/or recycling activities. *[Enter response here]* |
| 13. | What are the names of other recyclers in your area of the SA recycling industry? *[Enter response here]* |
| 14. | Are you happy for your company to be recognised in the report as participating in the 2011-12 SA Recycling Activity survey? *[Yes/No]* |
| 15. | Would you like to be invited to an industry seminar by Zero Waste SA summarising the findings of the 2011-12 SA Recycling Activity survey? *[Yes/No]* |

**Table 1: Data entry of estimated quantities of relevant materials for 2011-12**

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

| | | MATERIAL SOURCE/INPUT | | | | | MATERIAL DESTINATION/OUTPUT | | | | STOCKPILE | 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 %) | | | | Quantities stockpiled (in tonnes) at beginning and end of financial year | % waste by-product (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 | Not applicable | 10% |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**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 2011-12 Recycling Activity Survey**

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

# Appendix 4: 2011-12 Environmental Benefits Conversion & Emission Factors

**Table A4.1 Emission and conversion factors adopted for estimation of environmental benefits of recycling, SA 2011-12. (For references in the Table notes, refer to Section 11)**

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

**Notes:**

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

**Rawtec**

56 Bath St, Glenelg South, SA 5045
PO Box 1159, Glenelg South, SA 5045
T: 61 8 8294 5571



**Document Status**

| Revision | Date | Prepared by | Checked by | Approved by |
|---|---|---|---|---|
| Draft | 25/1/2013 | K Heinrich/ M Rawson /C Colby | M Rawson/C Colby | C Colby/M Rawson |
| Final Draft | 14/3/2013 | C Colby | K Heinrich | C Colby/M Rawson |
| Issue Report | 2/4/2013 | C Colby | K Heinrich | C Colby |