Circular Economy Resource Recovery Report 2020-21

Summary of Findings

Government of South Australia
Green Industries SA

Disclaimer

This report has been prepared by Green Industries SA based on the results of a survey of the waste recovery sector by Blue Environment Pty Ltd in accordance with the terms and conditions of appointment dated 10 September 2021, and is based on the assumptions and exclusions set out in the scope of work. Information in this document is current as of 22 May 2022. While all professional care has been undertaken in preparing this report, GISA and Blue Environment Pty Ltd cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

Acknowledgement of country

We acknowledge and respect the Traditional Custodians whose ancestral lands we live and work upon and we pay our respects to their Elders past and present.

We acknowledge and respect their deep spiritual connection and the relationship that Aboriginal and Torres Strait Islanders have to Country. We also pay our respects to the cultural authority of Aboriginal and Torres Strait Islander people and their nations in South Australia, as well as those across Australia.

Contents

Abbreviations and glossary

Alternative fuels and raw materials	Non-traditional fuels and raw materials that are co-processed in cement kilns or other thermal facilities, potentially including refuse derived fuels, solid recovered fuels, spent catalysts, waste solvents and others
Biosolids	Waste organic solids derived from biological wastewater treatment plants
C&D	Construction and demolition
C&I	Commercial and industrial
CDL	Container deposit legislation
CERRR	Circular Economy Resource Recovery Report
Circular economy	Looking beyond the current take-make-waste extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources, and designing waste and pollution out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles: design out waste and pollution; keep products and materials in use (ideally at their highest and best value); and regenerate natural systems.
CO_2-e	Carbon dioxide equivalent
Diversion	Sending waste for recycling or energy recovery instead of landfill
Energy recovery	Processes through which wastes are collected, sorted and processed to recover energy in usable form, for example process heat, steam or in electricity generation.
EPA	Environment Protection Authority
GHG	Greenhouse gas
GSP	Gross state product
kg	Kilogram
kt	Kilotonne
LDPE	Low density polyethylene
LHV	Lower heating value
ML	Megalitre
MSW	Municipal solid waste
PET	Polyethylene terephthalate
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl chloride
RAS	Recycling Activity Survey
Recovered materials	Waste materials separated, sorted or processed for the purposes of waste reuse, recycling or energy recovery

Recycling	Material that has been reprocessed 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, reprocessing, 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. Recycling does not include waste materials that have been received at a recycling facility but have not been processed.
Reprocessing	Processing of recovered materials to make raw materials for use in making new products or direct use. May also be called 'secondary processing'
Resource recovery	Activities through which wastes are collected, sorted, processed (including through composting), and/or converted into raw materials for use in a production system. For data reporting purposes, the quantity of waste allocated to the fate 'resource recovery' is the sum of the quantities allocated to waste reuse, recycling and energy recovery.
Reuse	Reallocation of products or materials to a new owner or purpose without reprocessing or remanufacture, but potentially with some repair (for example, repair of pallets for resale, tyre retreading)
Solid waste	Waste materials ranging from municipal garbage to industrial waste, but excluding gaseous, liquid, hazardous, clinical, and intractable wastes
The survey	The Circular Economy Resource Recovery Survey 2020-21
TJ	Terajoule

Summary

Green Industries SA measures annual recycling and disposal activity in South Australia (SA) to assess how the state is performing on waste management and recycling. The findings are used to track progress against South Australia's state waste targets. This report summarises the results for the 2020-21 financial year.

Summary of 2020-21 results

In SA the waste sector contributes
$478 million
to the state economy

An estimated
5,040,000 tonnes
of waste material was generated in SA in 2020-21

Of recovered materials
89.0%
was reprocessed locally in SA

4,201,000 tonnes
of this material was recovered for further use

840,000 tonnes
was sent to landfill

SA achieved a recovery rate of all materials
83.3%

Energy was recovered from
137,400 tonnes
of waste

Local government collected
674,000 tonnes
of kerbside waste

Environmental savings are estimated to be
1,144,000 tonnes
Greenhouse gas equivalents

14,500 Terajoules
Energy savings

SA local government achieved
47.8%
recovery rate

7,920 Megalitres
Water savings

Adelaide metro councils achieved
50.4%
recovery rate

More than
3,000 employees
Work in the waste recovery sector

Table S1 Summary of resource recovery, landfill disposal and waste generation, SA 2020-21

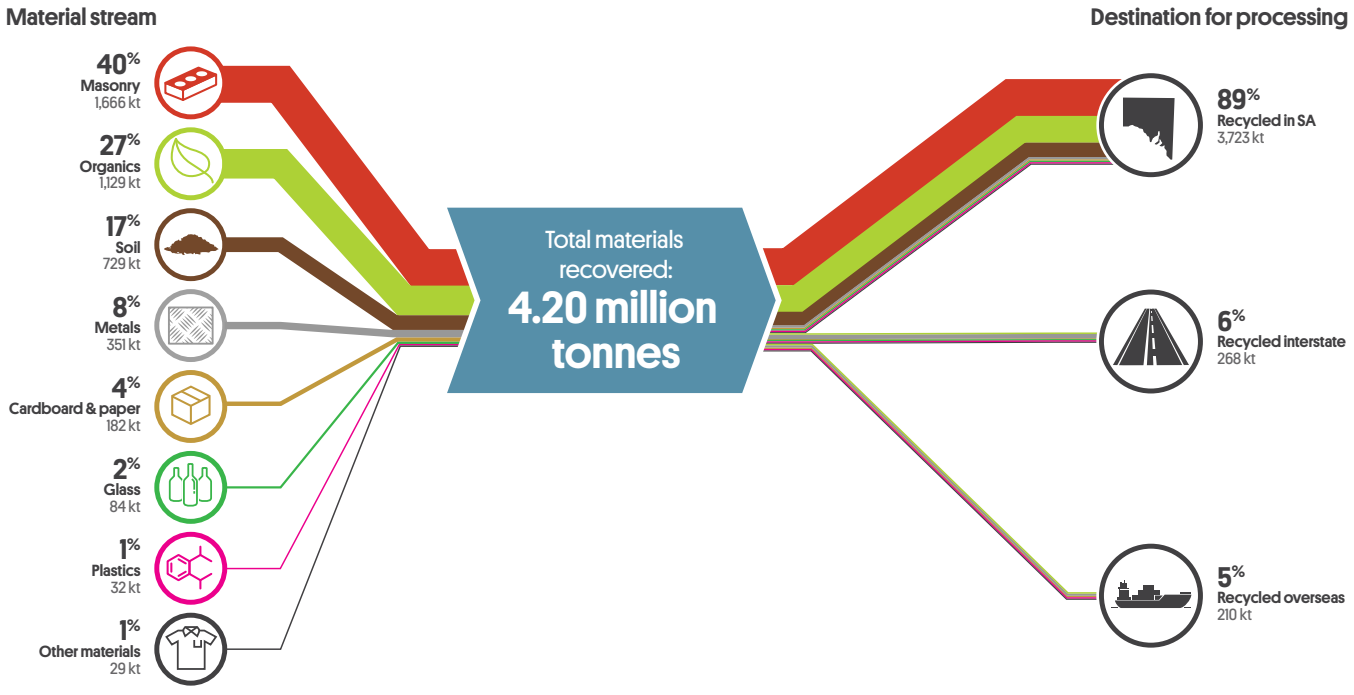
	Standard reporting materials	Separately reported materials	Total
Resource recovery (tonnes)	3.47 million	0.73 million	4.20 million
Landfill disposal (tonnes)	0.64 million	0.20 million	0.84 million
Waste generation (tonnes)	4.11 million	0.93 million	5.04 million
Recovery rate (%)	84.4%	78.6%	83.3%

Recovery by material

Table S2 Summary of resource recovery by material type, 2020-21

Recovered material	Tonnes	Trend (compared to previous year)
Masonry (inc. clays, fines, rubble and soil)	2,400,000	◆▶
Metals	351,000	▲
Organics	1,129,000	▲
Cardboard and paper	182,000	◢
Plastics	32,000	▲
Glass	84,000	◢
Other materials	29,000	▼

Figure S1 Resource recovery in SA, 2020-21, by material and destination



Performance against state waste targets

In 2020, Green Industries SA released *South Australia's Waste Strategy 2020-25*. The strategy defines waste diversion[1] and reduction targets to 2025, which are guided by an overall target of zero avoidable waste to landfill by 2030. A summary of progress so far based on 2020-21 data is provided in Table S3.

Table S3 Summary of state waste targets and progress on these

Topic	Target	Progress
Landfill diversion	Zero avoidable waste to landfill by 2030	SA disposed about 840 kt of waste to landfill in 2020-21, an increase from 827 kt in 2019-20
Waste generation	5% reduction in waste generation per capita from a 2020 baseline	Waste generation per capita increased by 1.6% in 2020-21 compared to 2019-20, however the long-term trend is downwards.
Metropolitan diversion	Diversion by 2023: - MSW 65% - C&I 85% - C&D 90%	Diversion rates achieved by metropolitan SA in 2020-21: - MSW 56.1% - C&I 96.9% - C&D 92.5%

Local government kerbside recovery

South Australia's local government councils collect waste from household kerbside bins for recovery and disposal. This material forms a part of total MSW. Total kerbside material collected is shown below.

Table S4 Total kerbside material collected by local governments, 2020-21

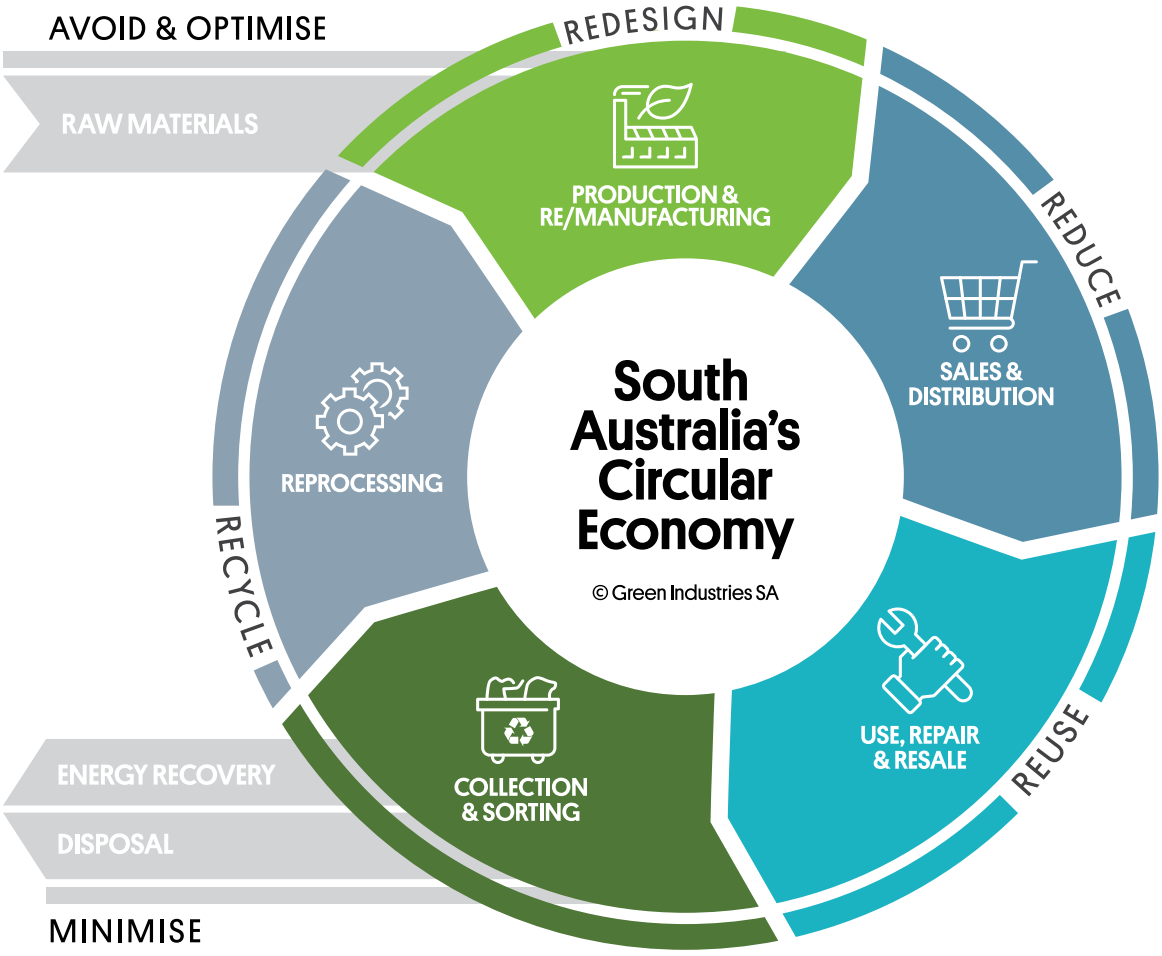
Kerbside waste in SA	Results
Kerbside quantity collected in SA	**674,000 tonnes**
Metropolitan councils	522,000 tonnes
Regional councils	152,000 tonnes
Recovery rate	**47.8%**
Metropolitan councils	50.4%
Regional councils	38.8%

1 In this report, 'diversion' means sending waste for recycling or energy recovery instead of landfill.

1 Introduction

A circular economy utilises resources to their fullest potential. Waste avoidance, reuse and recycling are maximised while raw material extraction and landfilling are minimised. South Australia (SA) continues to lead the way on resource recovery performance as it pushes towards a circular economy. This report provides a summary on the status of SA's resource recovery sector, including data on reuse, recycling and energy recovery, as well as the environmental, social and financial benefits that the sector provides. The findings are used to assess progress on the state waste targets set out in *SA's Waste Strategy 2020-25* (Green Industries SA 2020), which defines targets for waste reduction and waste diversion[2] from landfill to 2025. Table 1 (overleaf) summarises SA's waste targets.

Figure 1 South Australia's circular economy



Source: South Australia's Waste Strategy 2020-2025 (Green Industries SA 2020)

2 In this report, 'diversion' means sending waste for recycling or energy recovery instead of landfill.

The Circular Economy Resource Recovery Survey 2020-21 (the survey) asked recyclers, reprocessors, the reuse sector and the energy recovery industry in SA about their operations in 2020-21. Data were sought on tonnes of materials recovered, including information on:

- source stream – municipal solid waste (MSW), commercial and industrial (C&I) waste, or construction and demolition (C&D) waste
- geographical origin – metropolitan or regional SA
- final reprocessing location – in SA, interstate or overseas
- value of recovered materials.

Table 1 Summary of SA's waste targets

Overall targets				
2025	Per capita waste generation 5% reduction from a 2020 baseline			
2030	Zero avoidable waste to landfill by 2030			
Metropolitan waste targets				
	% diversion household bin system	% diversion all MSW[3]	% diversion C&I	% diversion C&D
2023	60%	65%	85%	90%
2025	70%	75%	90%	95%
Non-metropolitan waste targets (all source streams)				
2020	Maximise diversion to the extent practically and economically achievable			
2023	Regional Waste Management Plans are in place for all South Australian regional local government areas and/or regional city clusters and set regionally appropriate and progressive waste diversion targets			

3 Quantities arising from total MSW comprising household bin systems, hard waste services, street sweepings, council-operated parks and gardens, public place locations, waste collected at drop-off facilities, and council-operated commercial services.

2 Circular economy resource recovery statistics

2.1 Resource recovery and landfill disposal

Overall waste generation rose to about 5.04 million tonnes and SA recovered about 4.20 million tonnes of material in 2020-21, (compared to last year's 4.96 million tonnes) and about 840,000 tonnes of waste was landfilled. SA achieved a recovery rate of 83.3%.

Table 2 SA resource recovery, landfill disposal and diversion performance for 2020-21, 2003-04 (first survey year)

Parameter	2003-04	2020-21	Change 03-04 to 20-21
Resource recovery (kt)			
Standard reporting materials	1,880	3,472	85%
Separately reported materials	162	729	350%
Total	**2,042**	**4,201**	**106%**
Landfill disposal (kt)			
Standard reporting materials	1,258	641	-49%
Separately reported materials	20	199	894%
Total	**1,278**	**840**	**-34%**
Waste generation (kt)			
Standard reporting materials	3,138	4,114	31%
Separately reported materials	182	928	410%
Total	**3,320**	**5,042**	**52%**
Recovery rate (%)			
Standard reporting materials	59.9%	84.4%	41%
Total	**61.5%**	**83.3%**	**36%**
SA population (persons)	**1,534,000**	**1,773,000**	**16%**
Per capita recovery (kg/person/yr)			
Standard reporting materials	1,230	1,958	59%
Total	**1,330**	**2,370**	**78%**
Per capita disposal (kg/person/yr)			
Standard reporting materials	820	362	-56%
Total	**830**	**474**	**-43%**
Per capita waste generation (kg/person/yr)			
Standard reporting materials	2,050	2,320	13%
Total	**2,160**	**2,844**	**32%**
SA gross state product (GSP) ($ millions)	**$86,754**	**$114,921**	**32%**
Performance metrics per $GSP (tonnes/$ million GSP)			
Total recovery	23.5	36.6	55%
Total disposal	14.7	7.3	-50%
Total waste generation	**38.3**	**43.9**	**15%**

Progress since the first survey year (2003-04)

Waste generation has increased with population. Since 2003-04 resource recovery has shown an increase and landfill disposal decreased. Our recovery rate rose to remain at about 83.5% since 2016-17.

Figure 2 Trend in resource recovery and landfill disposal in SA since 2003-04

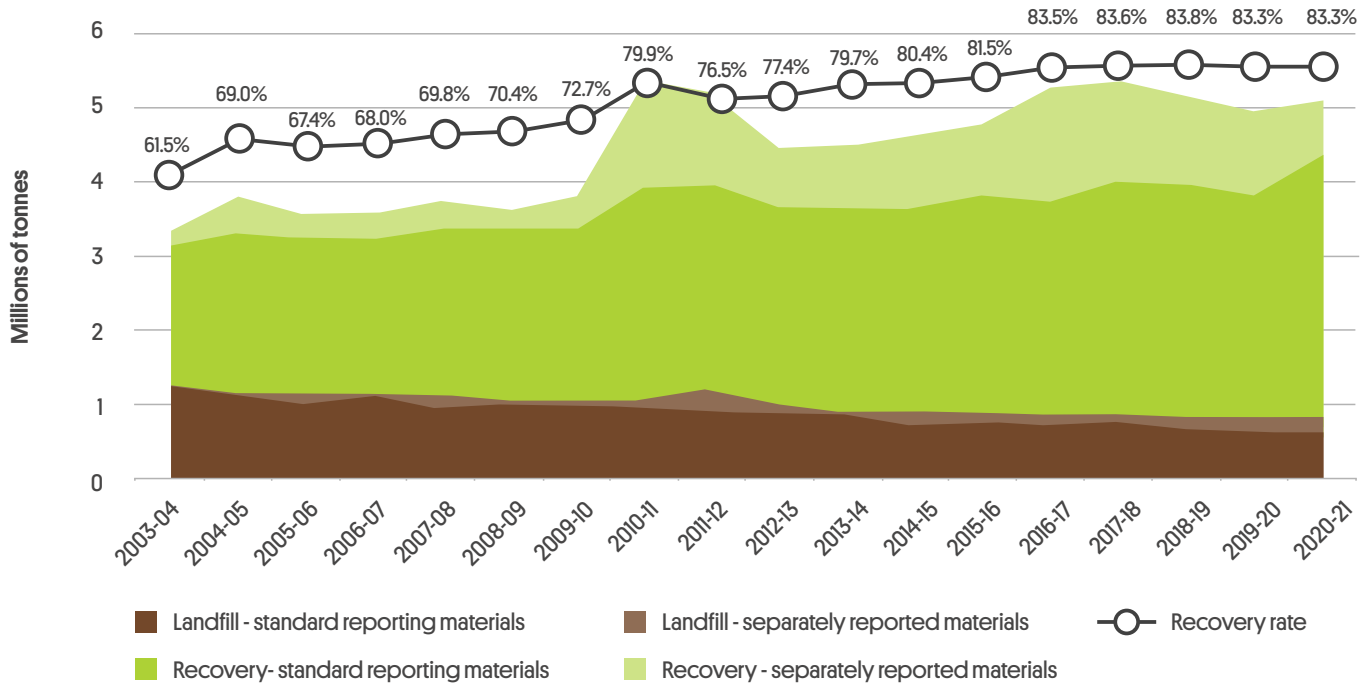


Figure 3 Trend in resource recovery in SA since 2003-04 by material category, including tonnes per $ millions of gross state product (GSP)

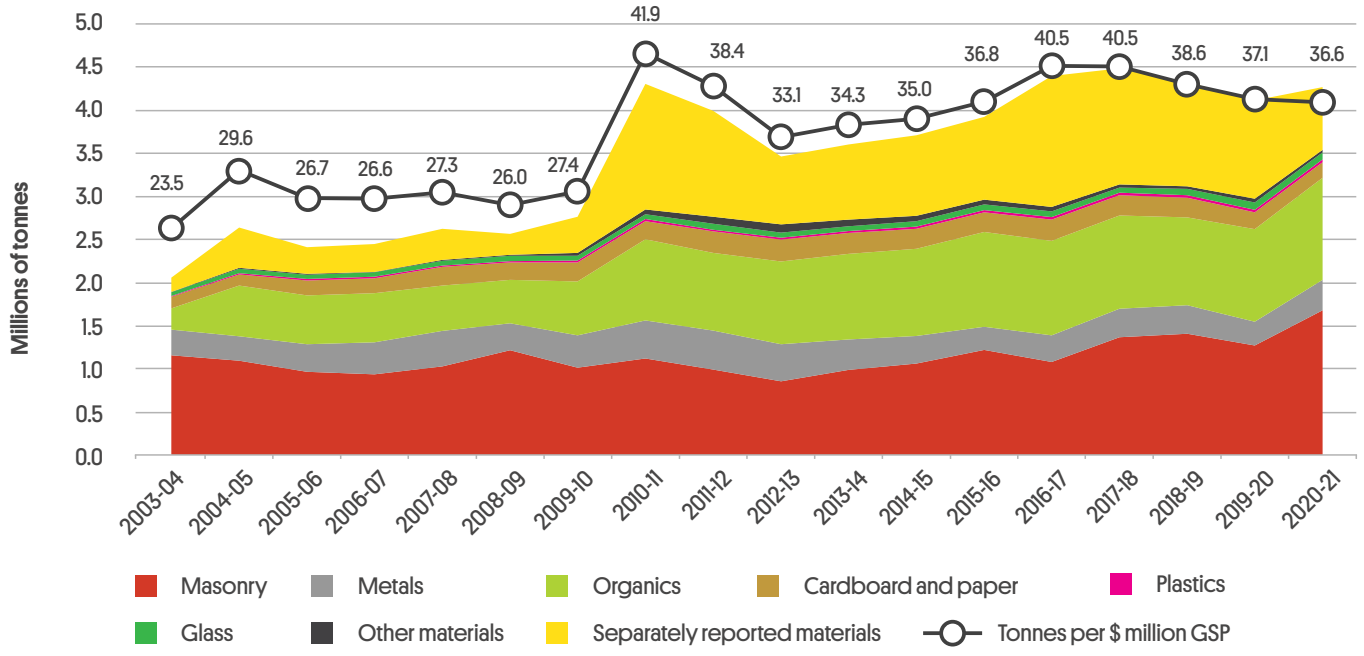
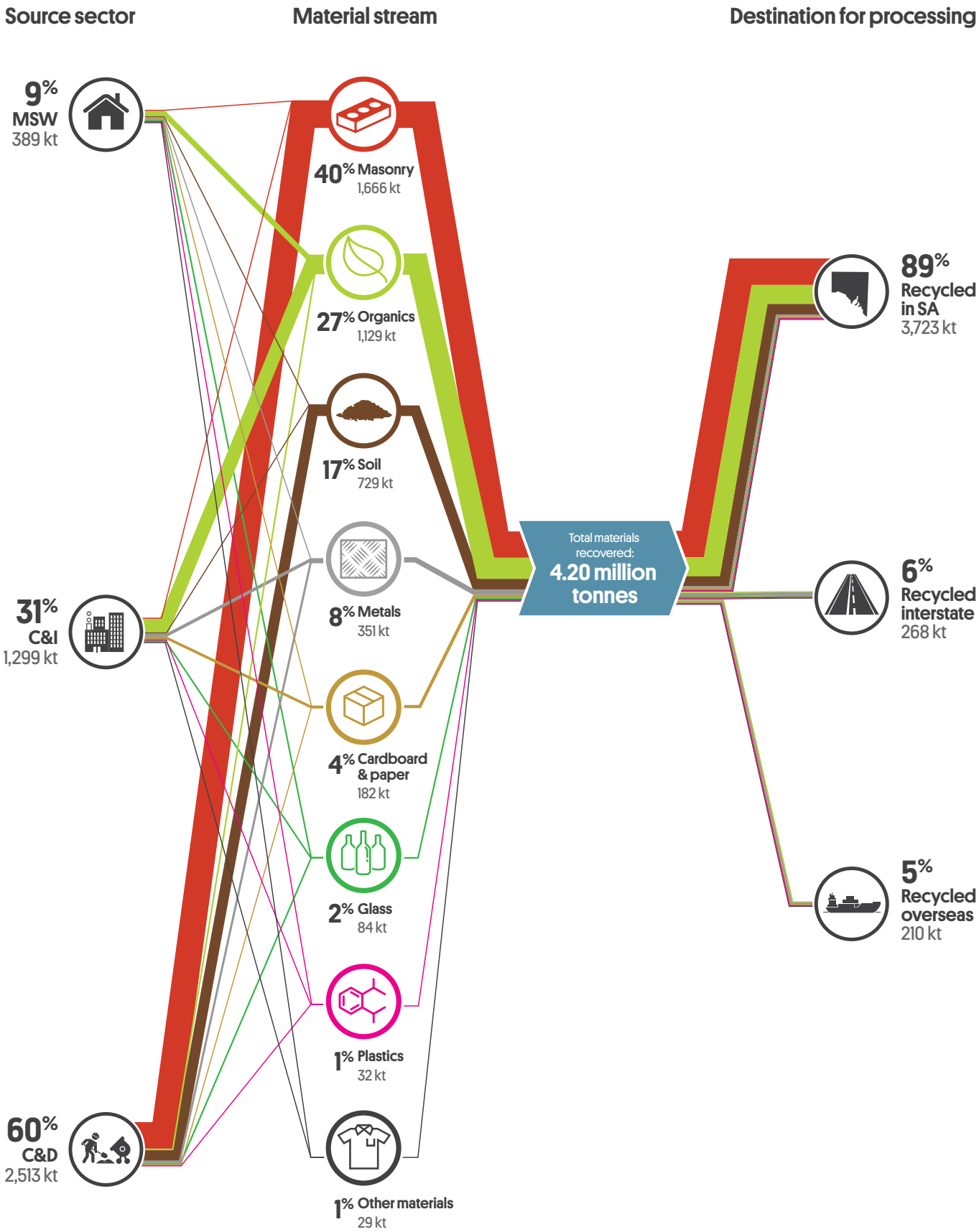


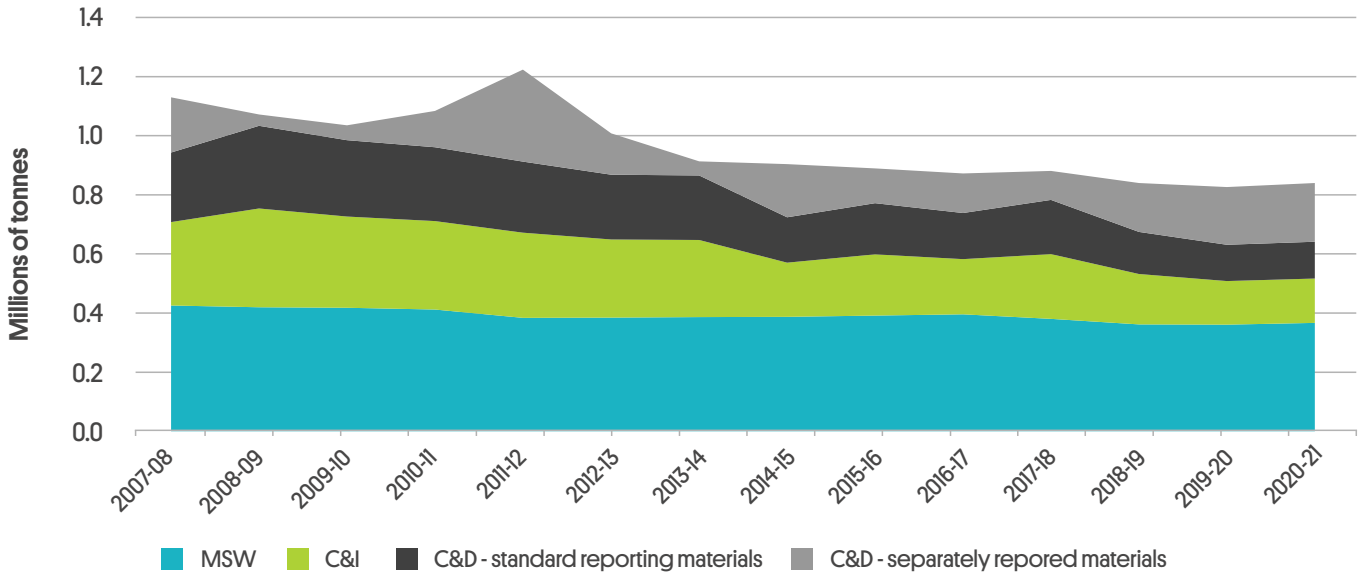
Figure 4 Resource recovery in SA, 2020-21, by material, source stream and destination



Landfill disposal

SA disposed about 840 kt of waste to landfill in 2020-21, an increase from the 827 kt landfilled in 2019-20. Figure 5 displays trends for disposal by source stream, and shows that most landfill waste is from the municipal stream.

Figure 5 Landfill disposal in SA since 2007-08 by source stream



Source stream

Recovered materials mostly comprised C&D waste (60%), followed by C&I (31%) and MSW (9%). Waste disposed to landfill was mostly MSW (44%), followed closely by C&D (39%) and lastly C&I (18%).

The recovery rates for the C&I and C&D streams were high and both close to 90%, but the rate for MSW was much lower at 51%.

Table 3 SA recovery and landfill disposal by source stream in 2020-21

	Recovery		Landfill disposal		Recovery rate
Source stream	'000 t	% of total	'000 t	% of total	
MSW	389	9%	367	44%	51.5%
C&I	1,299	31%	150	18%	89.7%
C&D	2,513	60%	324	39%	88.6%
Total	**4,201**	**100%**	**840**	**100%**	**83.3%**

Figure 6 Resource recovery in SA since 2007-08 by source stream

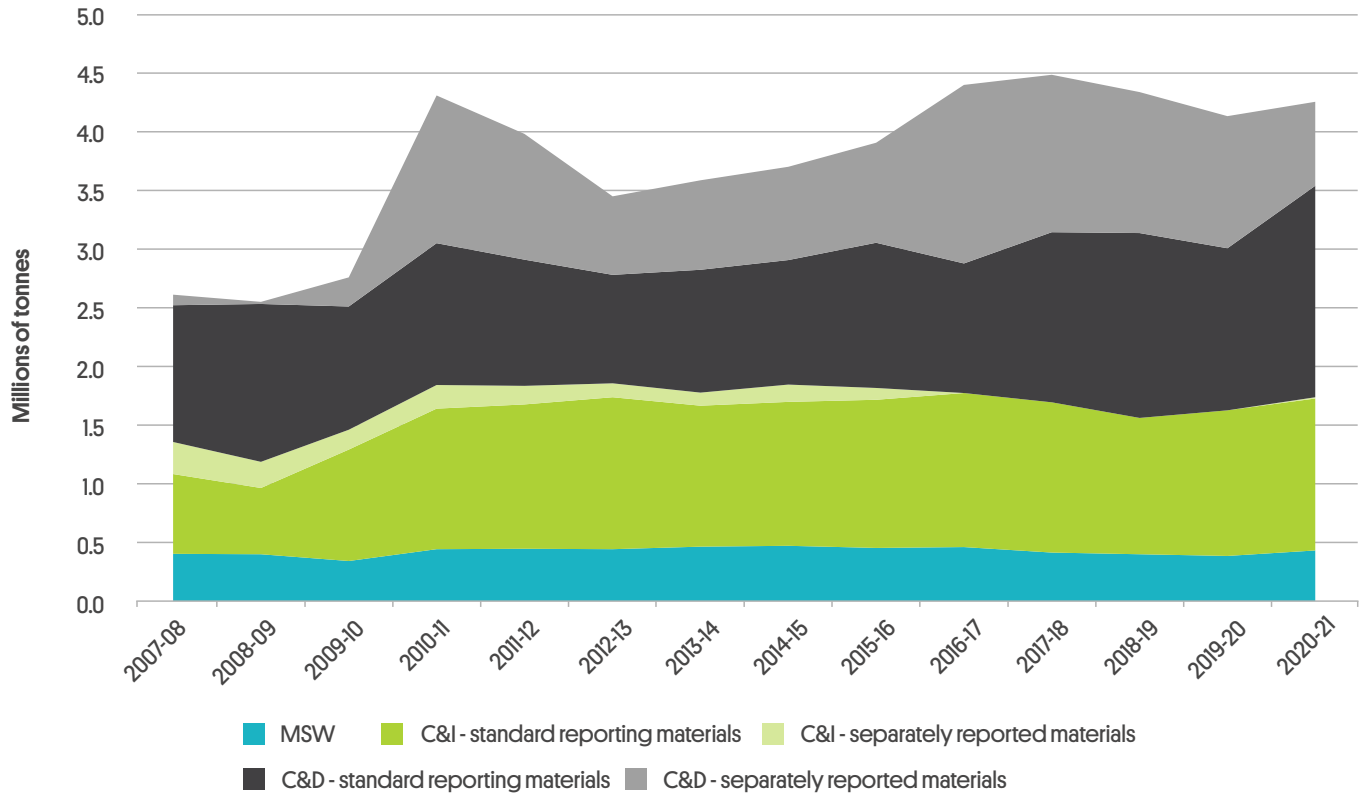
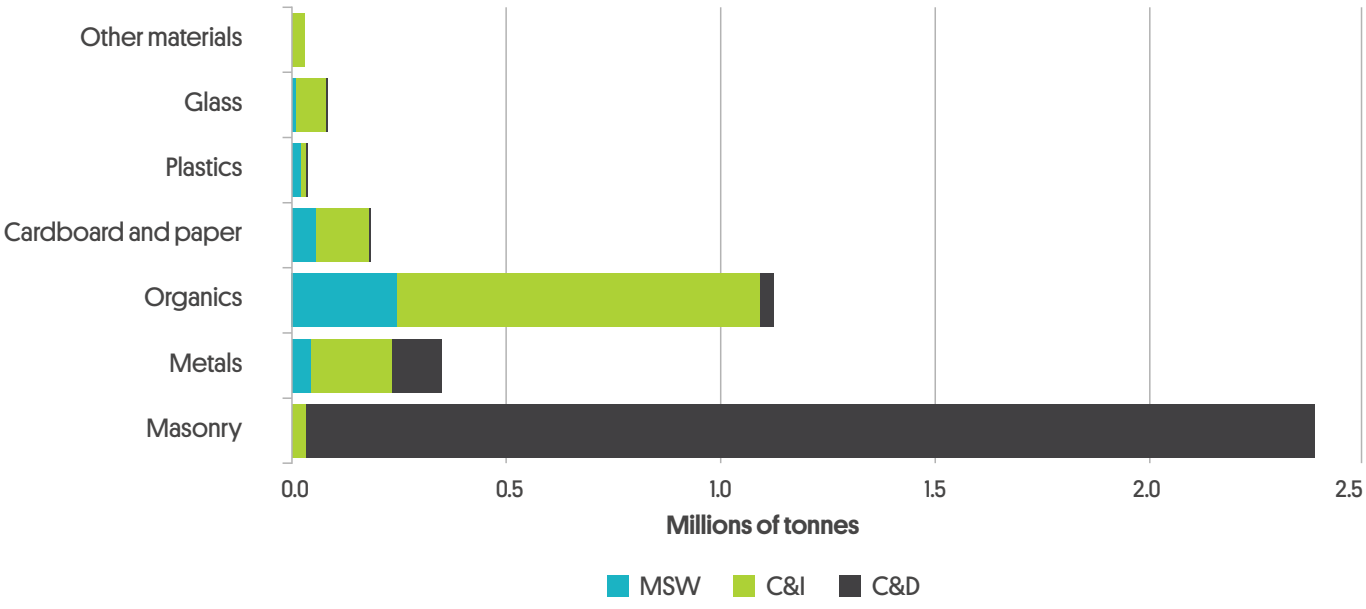


Figure 7 Source stream of recovered materials by material category, SA 2020-21



Geographical origin

Metropolitan SA contributed about 3,518,000 t of the state's total recovered materials in 2020-21, and 599,000 t of total disposed waste. Metro SA achieved an 85.4% recovery rate.

Regional SA contributed 684,000 t of total recovered materials and also sent 241,000 t of waste to landfill, achieving a recovery rate of 73.9%.

Table 4 SA recovery and landfill disposal by geographical origin in 2020-21

	Recovery		Landfill disposal		Recovery rate	
Geographical origin	'000 t	% of total	'000 t	% of total	Percentage	Trend
Metro	3,518	84%	599	71%	85.4%	◀▶
Regional	684	16%	241	29%	73.9%	◥
Total	**4,201**	**100%**	**840**	**100%**	**83.3%**	◥

Destination for recovered materials

In 2020-21, of 4,201,000 tonnes of material recovered, 89% of reported materials were reprocessed in SA. About 6% of materials were reprocessed interstate and 5% overseas.

Figure 8 Destination of SA sourced materials in 2020-21

All masonry and separately reported materials (clays, fines, rubble and soil) were reprocessed locally, as well as almost all organics.

Glass (88%), other materials (72%) and plastics (54%) were mainly reprocessed in SA. Most metals (56%) were sent interstate for reprocessing, and most cardboard and paper (63%) were sent overseas.

Table 5 Destination of SA sourced materials in 2020-21 by material category

	Percent of material recovered (%)		
Material category	**SA**	**Interstate**	**Overseas**
Masonry	100%	0%	0%
Separately reported materials	100%	0%	0%
Organics	100%	0%	<1%
Glass	88%	12%	0%
Other materials	72%	13%	15%
Plastics	54%	18%	28%
Metals	21%	56%	23%
Cardboard and paper	9%	28%	63%
Total	**89%**	**6%**	**5%**

Energy recovery

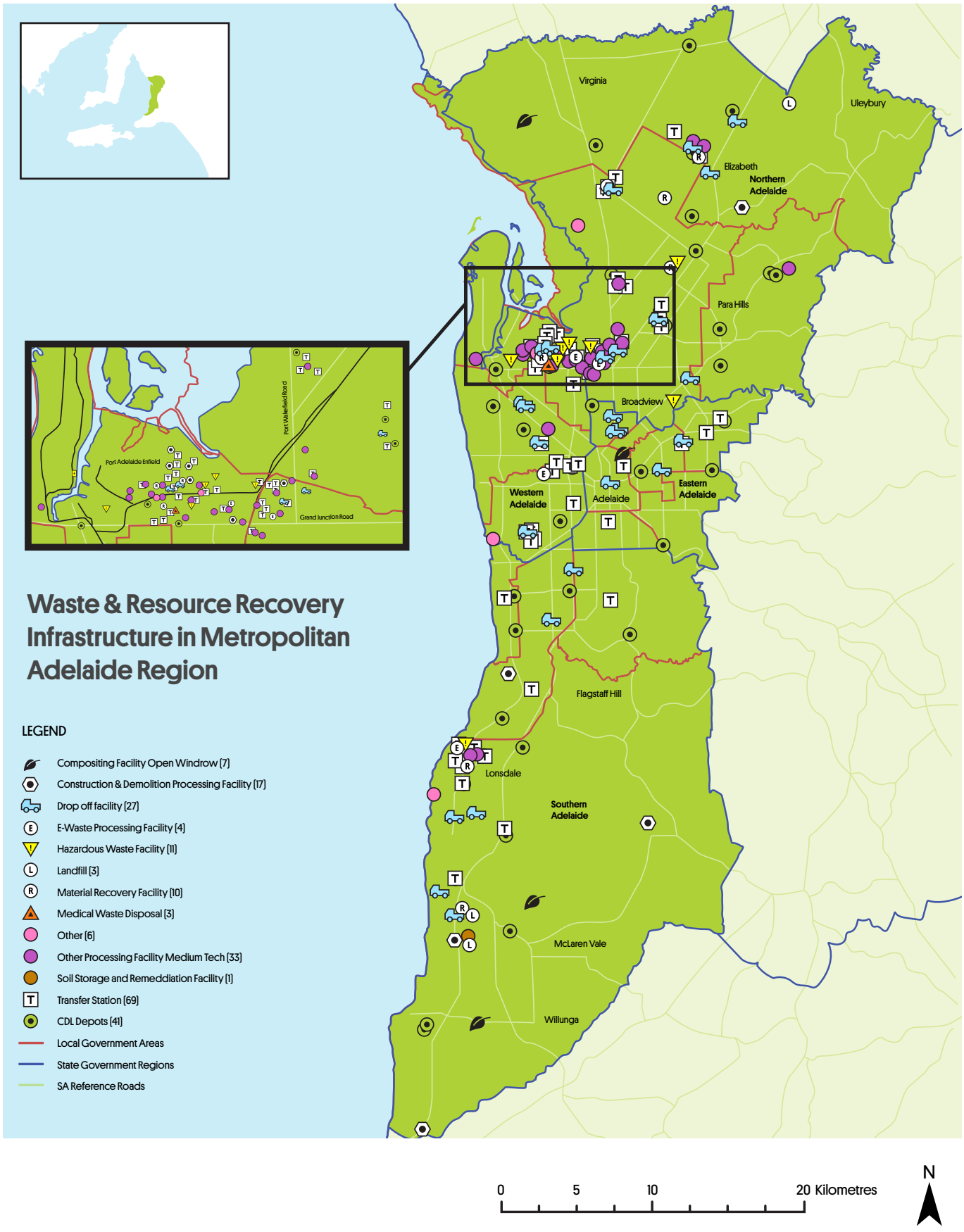
During energy recovery wastes are collected, sorted and processed to recover energy in usable form, for example process heat, steam or in electricity generation.

About 137 kt of SA materials were recovered for energy in 2020-21, which equated to about 3.3% of total recovered volumes.

Table 6 Material and energy recovery, SA 2020-21

Recovery type	Tonnes	Contribution to recovery rate (%)
Material recovery	4,064,000	96.7%
Energy recovery	137,400	3.3%
Total (resource recovery)	**4,201,000**	**100%**

Figure 9 Approximate geographical location of main sites of recyclers and reprocessors in Adelaide



Imports

Industry also imports waste materials from interstate or overseas, however these do not count towards SA's recycling performance. Already reprocessed materials imported into SA for manufacturing are also not included.

Table 7 Materials reported as imported to SA for resource recovery in 2020-21

	Imported tonnes								
Material category	ACT	NSW	NT	Qld	Tas	Vic	WA	Overseas	Total
Masonry	0	0	0	0	0	0	0	0	0
Metals	0	0	5,900	0	0	8,900	0	30	14,800
Organics	0	1,800	0	0	0	60,400	0	0	62,200
Cardboard and paper	0	0	20	0	0	0	0	300	320
Plastics	0	0	200	0	0	0	0	80	280
Glass	0	0	0	0	0	0	0	6,400	6,400
Other materials	0	0	0	0	0	0	0	34,100	34,100
Total	**0**	**1,800**	**6,100**	**0**	**0**	**69,300**	**0**	**40,900**	**118,100**

Market value of resource recovery

The total market value of resource recovery in SA in 2020-21 was $478 million. This is due to increased recovery overall, higher reported values for some materials, and industry bounce-back from COVID-19.

Metals ($223 million) are a high-value commodity and represented the largest share of market value amongst recovered materials in SA. This increase from $183 million in 2019-20 was attributed to iron and steel recovery which increased in both quantity and value in 2020-21.

Organics was the second greatest contributor to total value in 2020-21 ($144 million), predominantly due to a strong value per tonne for meat rendering products (e.g. tallow). This is an increase from last year's $100 million.

Cardboard and paper prices increased considerably in 2020-21 compared to 2019-20, from $109 to $224 per tonne. The material's total estimate value followed suit, increasing from $21 million to $40 million.

Masonry contributed a good portion of total value in 2020-21, estimated at $39 million, an increase from 2019-20 due to increased tonnes.

Of the remaining material categories, plastics recovery was estimated to contribute a total value of $15 million in SA in 2020-21, glass $7 million, other materials $6 million and separately reported materials (clay, fines rubble and soil) $5 million.

Disaster waste

SA recorded 145 tonnes of bushfire waste sent to landfill in 2020-21.

2.2 Performance against state targets

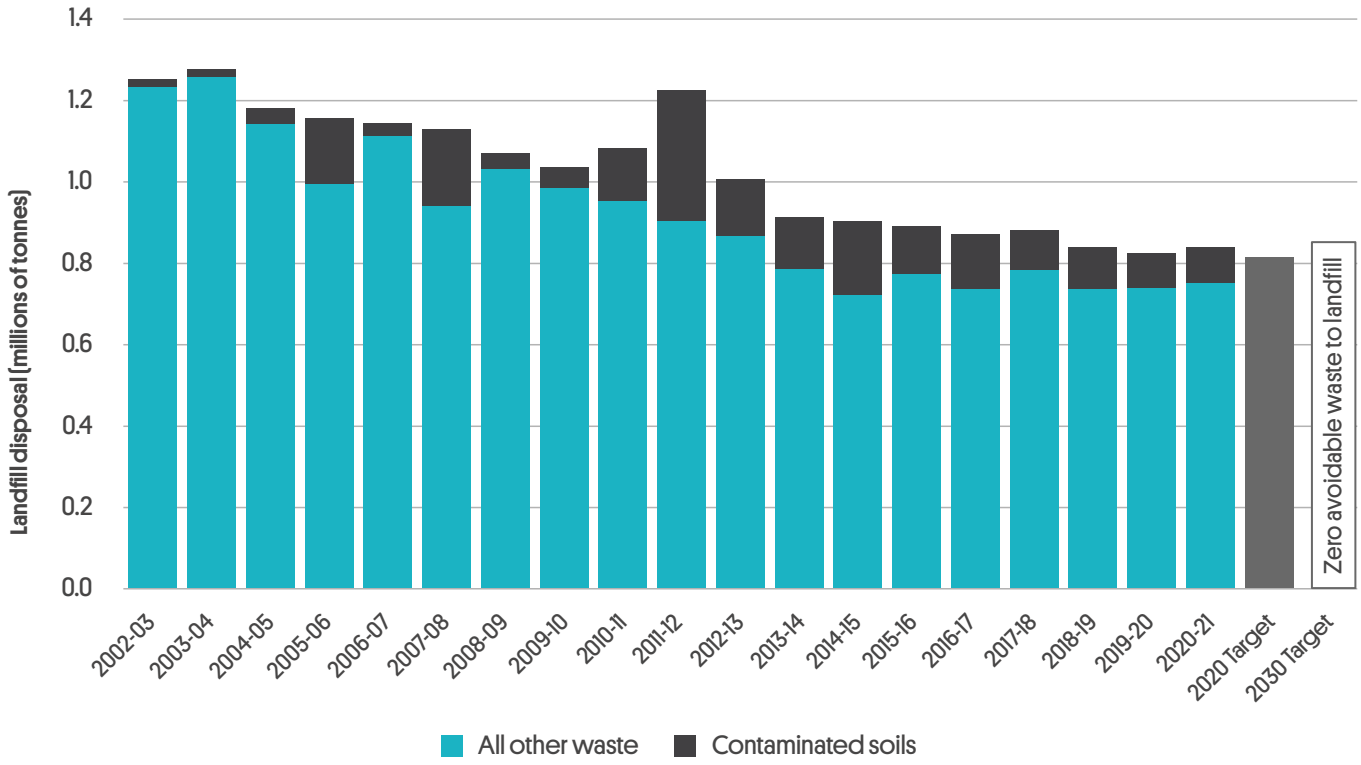
In 2020, Green Industries SA released *South Australia's Waste Strategy 2020-25*. The strategy defines waste diversion and reduction targets to 2025, which are guided by an overall target of zero avoidable waste to landfill by 2030[4]. This section details SA's progress in achieving these targets.

Landfill diversion target

South Australia's Waste Strategy 2020-25 sets out a goal for zero avoidable waste to landfill by 2030[4]. The state disposed about 840 kt of waste to landfill in 2020-21, an increase from 827 kt in 2019-20. A portfolio of actions must be implemented to achieve SA's ambitious landfill target for 2030, however significant work is underway. Increased domestic reprocessing and energy recovery capacity are expected to help improve landfill diversion rates in the coming years.

SA recently surpassed its target for reducing waste to landfill by 35% by 2020 from a 2002-03 baseline. In 2019-20, the state achieved an overall reduction of waste to landfill compared to 2003-04 of 34%, but when excluding contaminated soils this increased to a 49% reduction. Therefore, depending on whether landfilled contaminated soils is included, SA either fell just short of its 2020 target or easily achieved it.

Figure 10 Landfill disposal trend since 2002-03, including state targets for 2020 and 2030



4 Zero avoidable waste to landfill equates to the diversion of all waste from landfill where it is technologically, environmentally, and economically practicable to do so. 'Unavoidable' waste therefore refers to wastes for which no other current treatment is available including (but not limited to) asbestos, toxic and quarantine waste.

Waste generation target

South Australia's Waste Strategy 2020-25 sets a 5% reduction in waste generation per capita from a 2020 baseline. Table 8 summarises a five-year trend in waste generation per capita. Waste generation per capita increased by 44 kilograms (1.6%) in 2020-21 compared to the year before, but over the whole period, waste generation rates appear to be trending downwards. COVID-19 may have affected overall waste generation in 2019-20 and 2020-21 (e.g. lower volumes of business waste due to intermittent lockdowns).

Table 8 Waste generation per capita since 2016-17, including the state target for 2025

						Change (%)	Target
Recovery type	2016-17	2017-18	2018-19	2019-20	2020-21	19-20 to 20-21	2025
Waste generation per capita (kg/person/yr)	3,060	3,090	2,960	2,800	2,844	1.6%	5% reduction from 2020

Metropolitan diversion target

The state is moving towards its 2023 goals of 65% diversion for MSW, 85% diversion for C&I, and 90% diversion for C&D. Table 9 presents the diversion rate achieved by metropolitan SA in 2020-21, together with state targets for 2023 and 2025.

Our C&I sector achieved a very high diversion rate at 96.9%, already surpassing both the 2023 and 2025 targets of 85% and 90%, respectively. Our C&D sector achieved a diversion rate of 92.5%, also surpassing the 2023 target of 90% and close to the 2025 target of 95%. In SA, out of the three waste streams, MSW historically has the lowest diversion rate, and this continued in 2020-21 with a rate of 56.1%. The municipal stream has the most room for improvement but is not too far from the 2023 target of 65%. Further diversion of food organics will help close the gap towards the target.

Table 9 Metropolitan diversion rate for SA in 2020-21, including state targets to 2025

	Metro diversion rate for 2020-21	Metro diversion target	
Source stream		2023	2025
MSW	56.1%	65%	75%
C&I waste	96.9%	85%	90%
C&D waste	92.5%	90%	95%

2.3 Local government kerbside recovery

Local governments capture data on materials collected in household bins at kerbside for disposal or recycling. These data are presented and discussed in this section. The data represent a subset of the MSW tonnes discussed elsewhere in this report, which also includes non-kerbside municipal waste such as hard waste, street sweepings and domestic materials dropped off at transfer stations.

Overall kerbside collections

Table 10 shows data on materials collected in household residual, recycling and organics bins at kerbside in SA in 2020-21. About 674,000 t of kerbside materials were collected in SA, including 522,000 t from the metro region and 152,000 t from regional areas. Most kerbside waste was collected in residual bins (352,000 t).

SA's recovery rate for kerbside waste in 2020-21 was 47.8% whereas metropolitan councils achieved 50.4% with regional councils 38.8%. Performance in 2020-21 was similar for metropolitan councils but improved for regional SA.

Table 10 Materials collected from households at kerbside in SA in 2020-21

Region	Collected at kerbside (kt)				Recovery rate (%)
	Residual	Recycling	Organics	Total	
Metro	259	101	162	522	50.4%
Regional	93	29	30	152	38.8%
SA	352	130	192	674	47.8%

Recovery by region

Table 11 shows population and kerbside data for 2020-21 at the region level, including kilograms of kerbside waste per capita.

Table 11 Population and kerbside data statistics by region

Region	Population[5]	Kerbside waste collected (kt)	Kerbside waste per capita (kg/capita)	Recovery rate
Metro	1,326,411	522	393	50.50%
Regional	443,866	152	342	38.80%
SA	**1,770,277**	**674**	**381**	**47.80%**

Coverage

Nearly all households in SA are provided a kerbside service, as summarised in Table 12. Note that coverage percentages in Table 12 are based on figures used in the *Recycling Activity Survey 2017-18 Report*.

Table 12 Kerbside service coverage for SA households

Stream	Number of services in SA	Coverage
Residual	715,689	98.7%
Recycling	699,736	96.5%
Organics	660,580	91.1%
Total households in SA	725,115[6]	100%

5 ABS (2022) *Population estimates by LGA, Significant Urban Area, Remoteness Area and electoral division, 2001 to 2021*, available from: www.abs.gov.au/statistics/people/population/regional-population

6 ABS (2019) *3236.0 Household and Family Projections, Australia, 2016 to 2041 (Series II)*, online at: www.abs.gov.au/statistics/people/population/household-and-family-projections-australia/2016-2041

2.4 Comparative performance with other jurisdictions

SA has led recycling and resource recovery performance in Australia for many years.

The methods used by states and territories to measure and report waste vary. The *National Waste Report 2020* (Blue Environment 2020), released by the Department of Agriculture, Water and the Environment in 2020, adjusts these methods to provide a consistent comparison of recovery rates across states and territories. These data are discussed in this section.

Figure 11 is taken from the *National Waste Report 2020* and shows resource recovery and recycling rates for each Australian jurisdiction in 2018-19. SA had the highest of both rates with a recovery rate of 85% and a recycling rate of 80%.

In 2020-21, SA maintained similar rates to those in Figure 11.

Figure 11 Resource recovery and recycling rates by jurisdiction, 2018-19

	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Australia
Recovery rate	79%	68%	23%	45%	85%	45%	68%	62%	63%
Recycling rate	75%	65%	19%	42%	80%	39%	65%	60%	60%

Source: National Waste Report 2020 (Blue Environment 2020)

2.5 Employment in the SA resource recovery sector

SA's resource recovery sector employs thousands of people across a wide range of jobs. The data represents a sub-set of total employment in SA's waste and resource recovery industry, which includes a wider range of positions (e.g. landfill operators).

Table 13 shows that reported full-time equivalent employees increased from 2,098 in 2019-20 to 2,108 in the latest year. Companies and organisations that reported employee numbers in 2020-21 made up 69% of the year's total recovered tonnes, suggesting the true number may be around 3,000.

Table 13 Reported full-time equivalent employees in SA's resource recovery sector based on survey results

	2017-18	2018-19	2019-20	2020-21
Total full time equivalent employees	1,831	1,850	2,098	2,108

Overall, the percentage of reported employees by employee type remained roughly the same. Machinery operators were the most commonly reported employee classification, followed by drivers and administration.

Table 14 Full time equivalent employees in SA's resource recovery sector by employee type

Employment type	Percentage	Employment type	Percentage
Unskilled	9%	Technical support	8%
Administration	13%	Sales/ marketing	5%
Construction /design	0.2%	Supervisor	7%
Driver	18%	Other	6%
Machinery operator	31%	Sorting	3%

2.6 Reuse and the circular economy

Reuse

Reuse is the reallocation of products or materials to a new owner or purpose without reprocessing or remanufacture (but potentially with some repair). The practice promotes the cycling of material without the need to consume new resources. There is a longstanding reuse network that includes charities, non-government organisations (e.g. food rescue organisations), community groups and online trading platforms (e.g. Gumtree). Items and products commonly recirculated via the reuse economy include clothing, food, home furniture, whitegoods, vehicles and electronics.

Australians divert about 310 kt of clothing for reuse to charitable organisations nationally. Almost 10% of this is attributed to South Australians. Reusing clothes instead of landfilling them reduces an estimated carbon emissions by 66%, water consumption by 57% and energy use by 59%. Reused clothing also generates an estimated revenue of $1,700 per tonne.

The COVID-19 pandemic highlighted the importance of food reuse. Intermittent lockdowns led to a rise in food donations from hospitality, manufacturing, and farming industries. The hunger relief organisation, Foodbank, reported a 47% increase in demand for food and groceries in 2020 as a result of the pandemic (Foodbank 2020). In South Australia, more than 126,000 people are assisted every month by Foodbank.

Key players in SA's charitable network and reuse economy reported quantities from 2020-21 together with estimated values for the reuse materials. Table 18 is expected to represent a large portion of reuse in SA, but certainly not the entire picture. Some excluded items would contribute significant volumes to overall reuse in SA but are difficult to measure (e.g. Facebook Marketplace, Gumtree, etc.). Still, the quantities and estimated values in Table 15 highlight the importance of the reuse economy from both an environmental and economic standpoint.

Table 15 Reuse in SA in 2020-21 based on survey results

Reuse material	Reported reuse tonnes in 2020-21	Estimated value of reuse materials ($/tonne)	Estimated value of reported reuse materials in 2020-21 ($/yr)
Food products	4,700	$6,000	$28,272,000
Clothes resold as clothes locally and overseas	4,600	$1,700	$7,749,000
Home furnishings and goods	1,400	$15,000	$21,600,000
Books	500	$1,000	$456,000
Electronic items	200	$11,800	$1,888,000
Other donations (toys, etc.)	1,100	n/a	n/a

7 Based on values applied in the *Recycling Activity Survey 2019-20 Report.*

3 Material resource recovery reports

3.1 Masonry

About 2.40 million tonnes of masonry was recovered in SA in 2020-21. Asphalt and concrete increased significantly while clay, fines, rubble and soil decreased. Recovery of bricks and plasterboard remained similar to last year. Masonry is mostly from infrastructure projects in the metropolitan region, and all recovered masonry is reprocessed in South Australia.

Table 16 Masonry recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Asphalt	339	10	810	300
Bricks	44	0.9	10	50
Concrete	1,283	26	450	1,640
Plasterboard	0.9	0.03	0.5	-0.03
Clay, fines, rubble and soil	729	64	1,040	320
Clay, fines, rubble and soil – clean fill	659			
Clay, fines, rubble and soil – intermediate waste soil	70			
Total	**2,395**	**101**	**2,311**	**2,310**

Figure 12 Masonry recovered since 2003-04 – concrete and clay, fines, rubble and soil

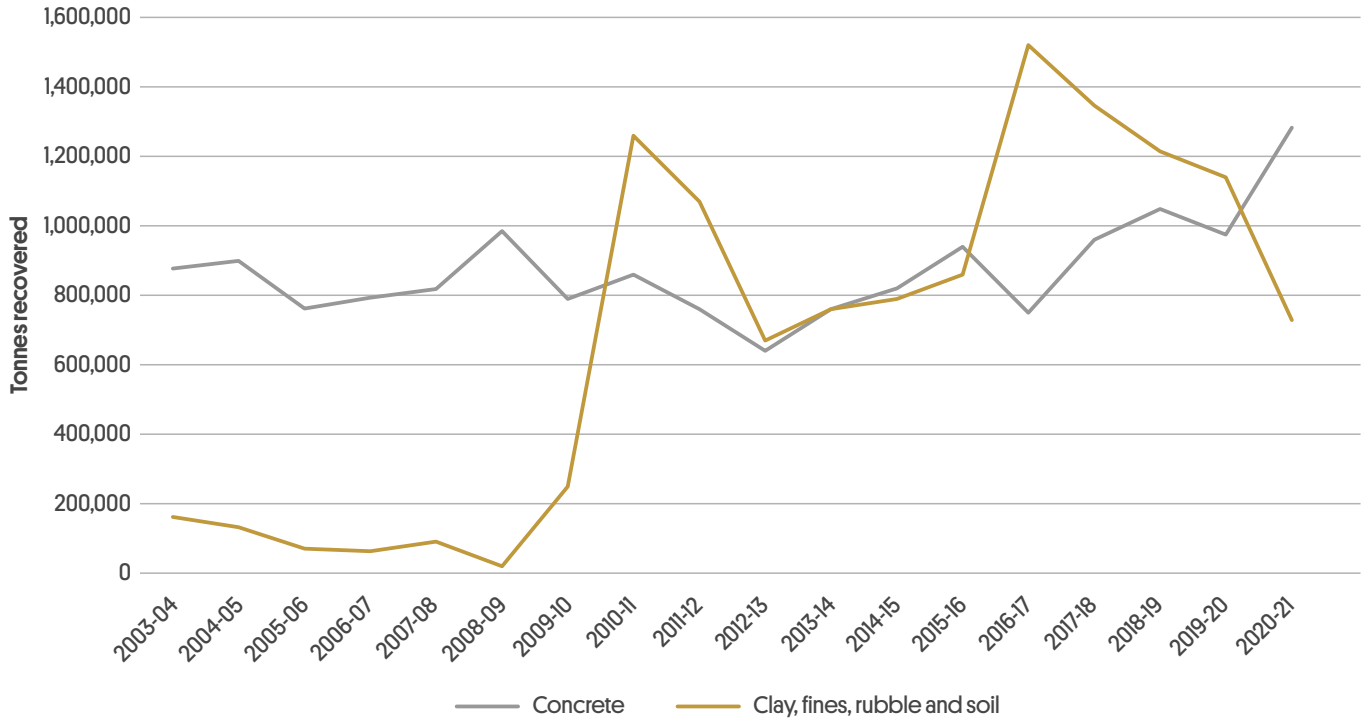
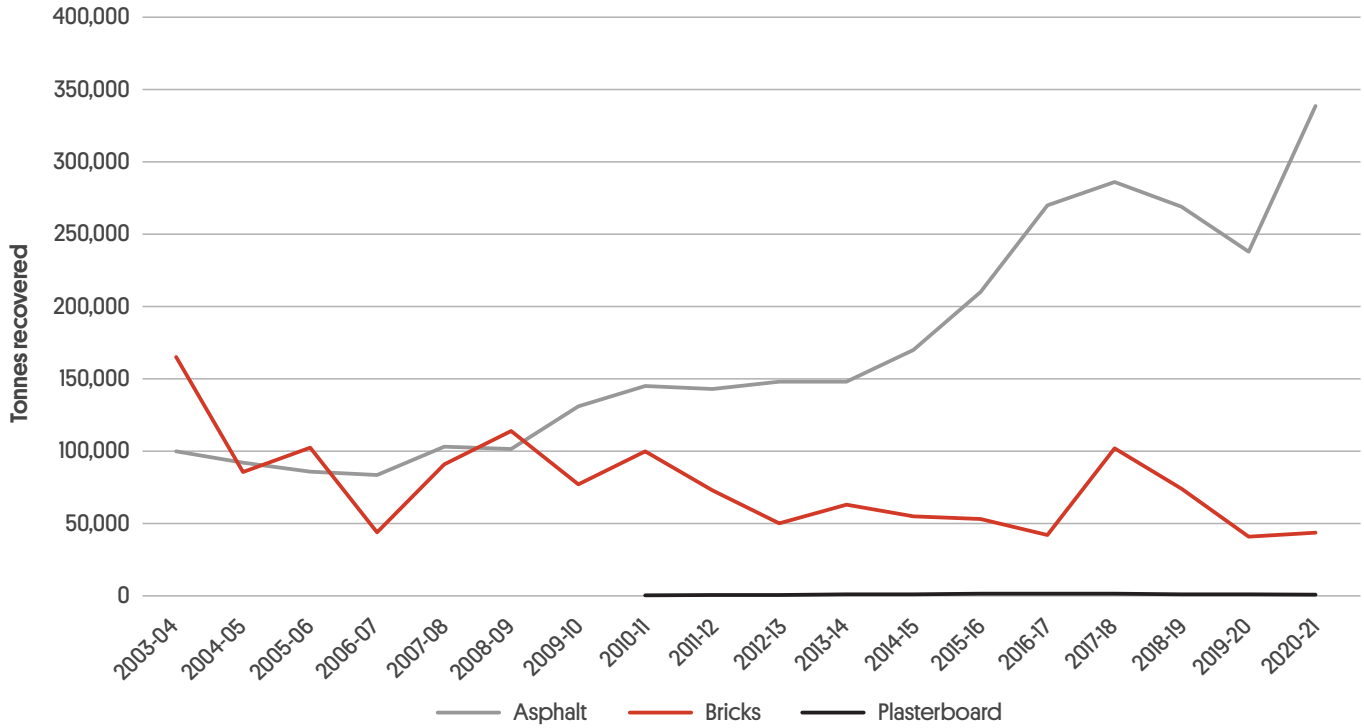


Figure 13 Masonry recovered since 2003-04 – asphalt, bricks and plasterboard



3.2 Metals

Total metals recovery was 351 kt and were mostly iron and steel (327 kt), aluminium (12 kt) and non-ferrous metals (11 kt).

Table 17 Metals recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Iron and steel	327	144	2,450	-770
Aluminium	12	203	2,510	360
Non-ferrous metals	11	10	410	70
Copper	0.8			
Non-ferrous metals (other)	11			
Total	**351**	**357**	**5,370**	**-340**

Figure 14 Metals recovered since 2003-04 – iron and steel

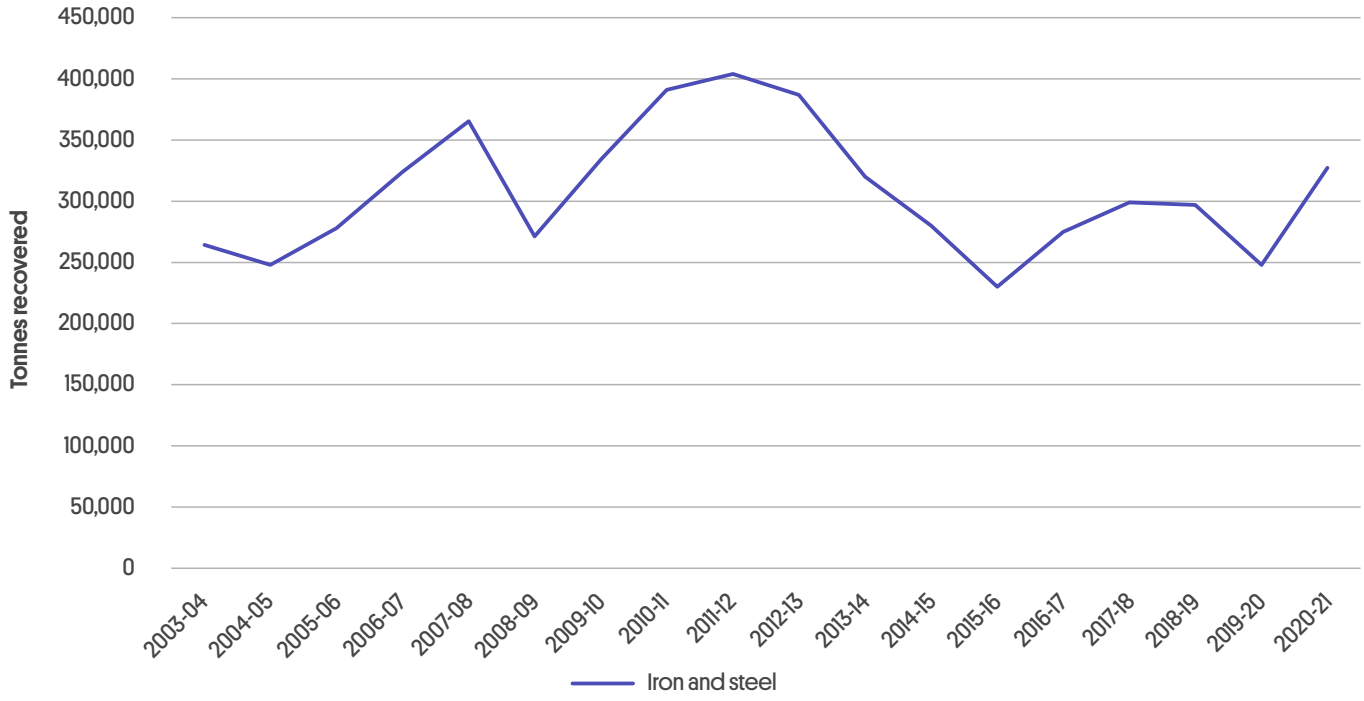
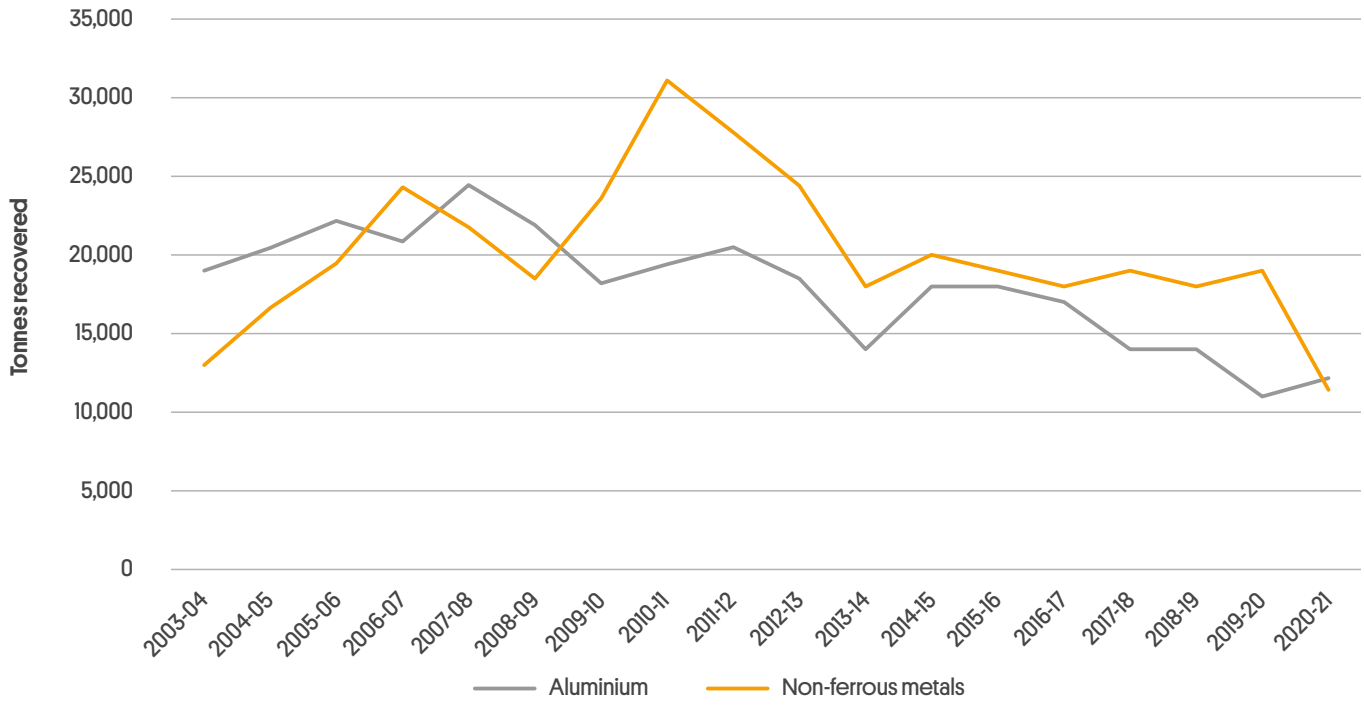


Figure 15 Metals recovered since 2003-04 – aluminium and non-ferrous metals



Recovered metals are mostly within the C&I stream but C&D still contributes about a third of overall quantities. Recovered SA metals are sent interstate for reprocessing (56%)[8], with 23% reprocessed overseas and 21% in SA.

8 Much of this material is likely to have been exported from interstate ports.

3.3 Organics

About 1.13 million tonnes of organic materials were recovered in SA in 2020-21 including 277,000 tonnes of garden organics which contributed about 25% towards overall organics recovery. Most organics came from SA's C&I stream (75%), followed by the MSW stream (22%). Almost all SA organics that were recovered were recycled in SA. The majority of organics came from the metro region, but regional SA remains an important contributor for organic materials and recovery. Diverting food organics out of MSW residual bins has the most potential to increase recovery rates.

Table 18 Organics recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Food organics	16	16	3	7
Garden organics	277	186	86	1,550
Timber	202	36	2,160	-8.1
Other organics	634	305	1,370	150
Meat rendering	179			
Waste grease and fat	71			
Waste sludge and biosolids	79			
Miscellaneous organics	305			
Total	**1,129**	**543**	**3,600**	**1,700**

Figure 16 Organics recovered since 2003-04

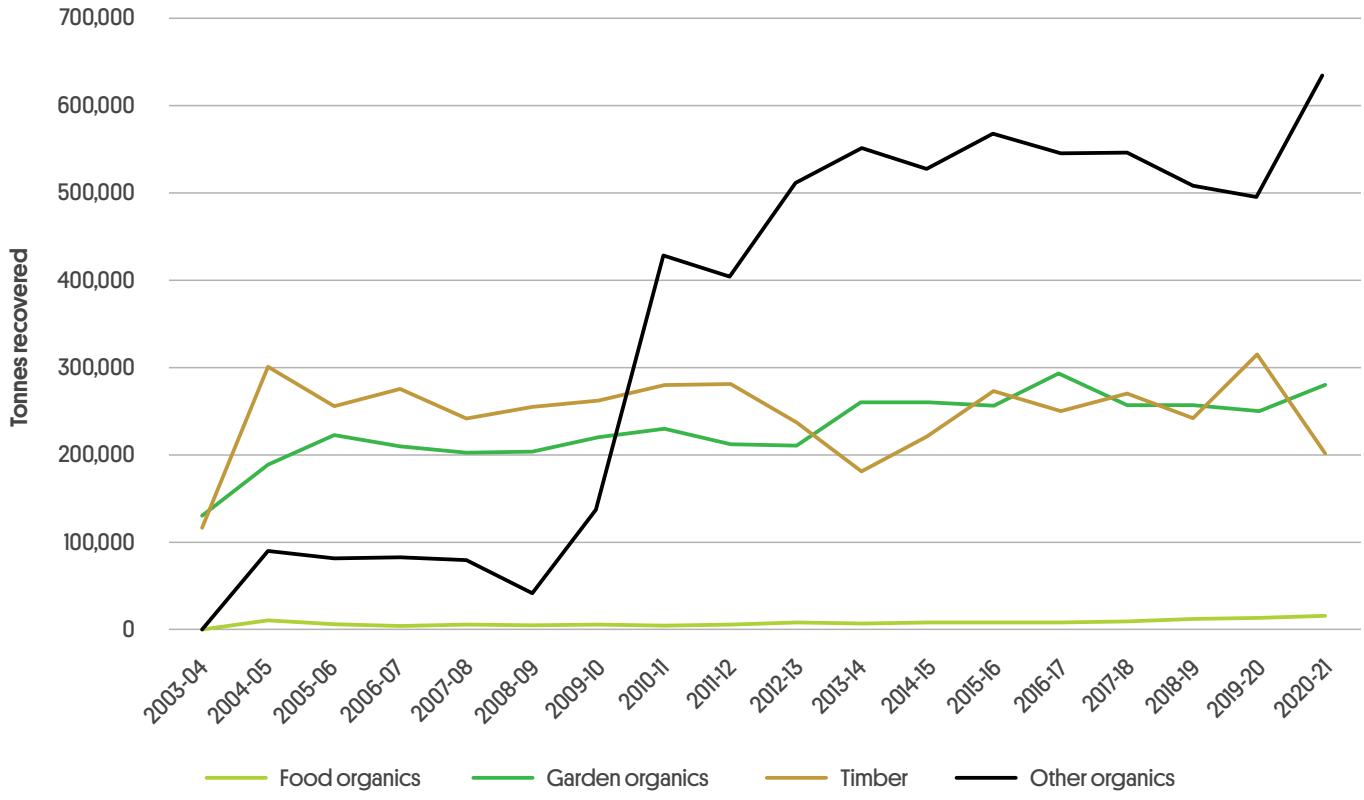
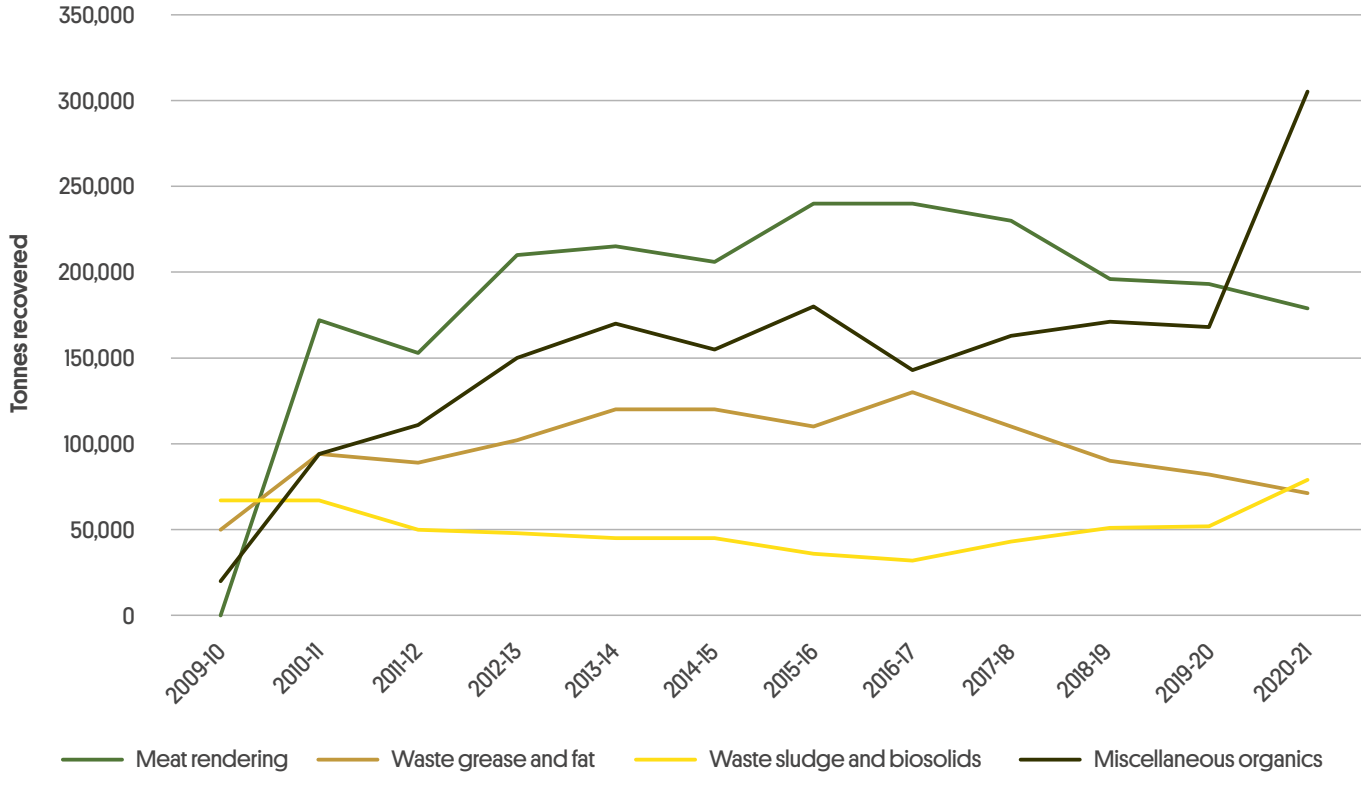


Figure 17 Other organics recovered since 2009-10 (when data first became available)



3.4 Cardboard and paper

Overall, 182 kt of cardboard and paper were recovered in SA in 2020-21. Cardboard and waxed cardboard dominated recovery volumes, contributing 76% of the total. Cardboard and paper were mostly from the C&I stream and reprocessing was mostly undertaken overseas (63%) while 28% was sent interstate.

Table 19 Cardboard and paper recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Cardboard and waxed cardboard	138	23	60	1,530
Liquid paperboard	0.8	0.1	0.4	10
Magazines and newsprint	32	14	10	340
Printing and writing paper	12	15	-10	130
Total	**182**	**52.1**	**60.4**	**2,010**

Consumption of paper and cardboard – and particularly newsprint and magazines – is declining due to digitisation.

Figure 18 Cardboard and paper recovered since 2003-04 – cardboard and waxed cardboard, magazines and newsprint and printing and writing paper

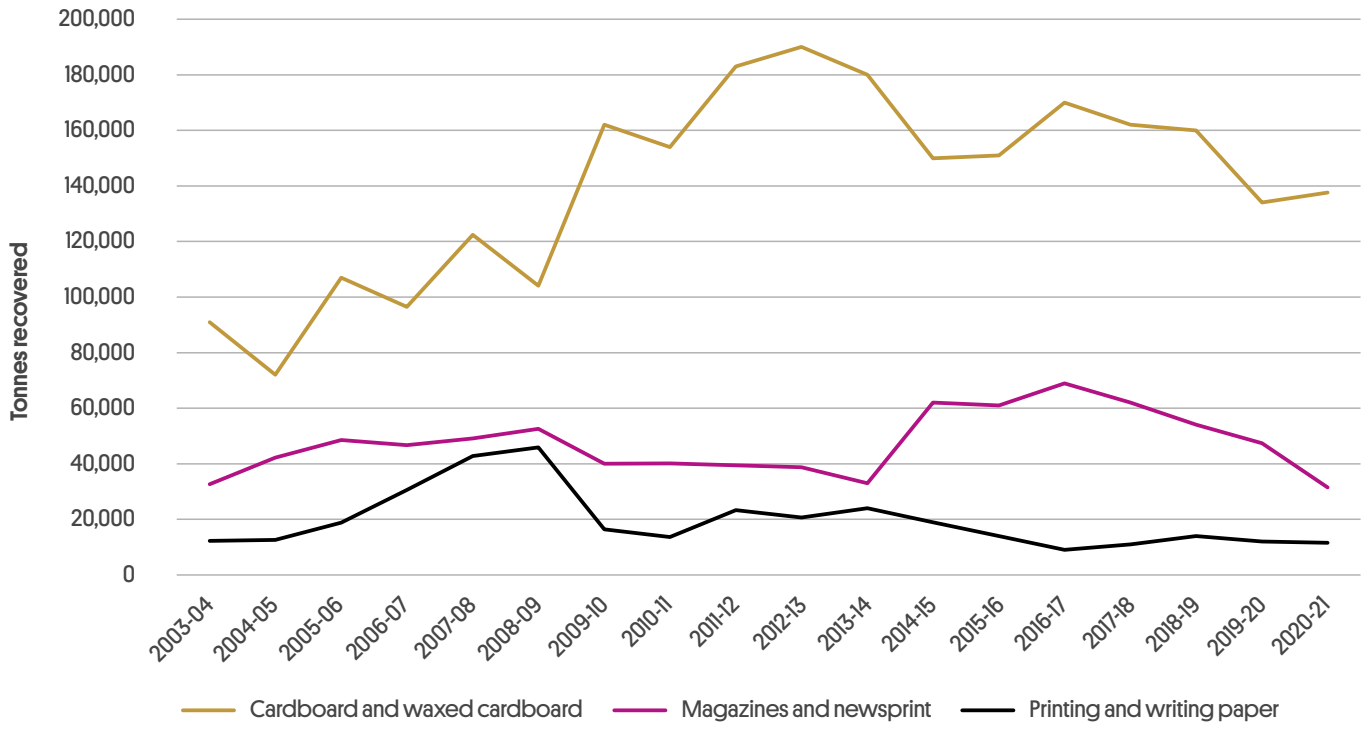
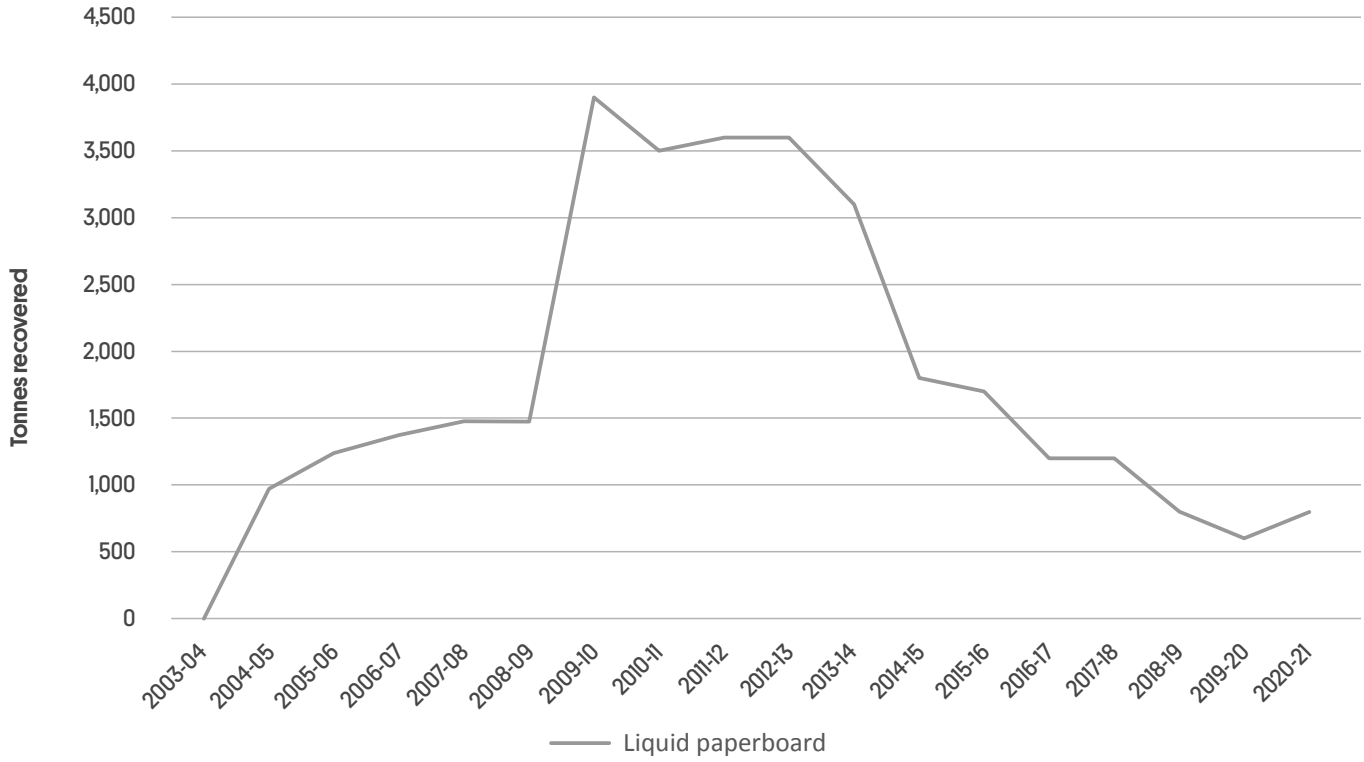


Figure 19 Cardboard and paper recovered since 2003-04 – liquid paperboard



3.5 Plastics

SA recovered 32,000 t of plastics in 2020-21. There was a sharp decrease in mixed and/or other plastics recovered coupled with sharp increases in individual plastic polymer types. Most recovered plastics in 2020-21 were high-grade polymers such as HDPE (37%) and PET (27%). The rise in certain separated plastic polymers is attributed to the Commonwealth Government's ban on the export of mixed plastics and also to increased capacity from one of SA's major plastics reprocessors.

About two thirds of recovered plastics came from the MSW stream, with the remaining third from C&I sources. Over half (54%) is reprocessed in SA and 28% is sent overseas.

Table 20 Plastics recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Polyethylene terephthalate	8.9	11	490	610
High density polyethylene	12	10	600	270
Polyvinyl chloride	0.02	0.01	0.6	0.5
Low density polyethylene	4.5	3.7	230	100
Polypropylene	4.9	1.5	150	130
Polystyrene	0.4	0.1	10	10
Mixed and/or other plastics	1.7	0.5	50	40
Total	**32**	**26.8**	**1,531**	**1,161**

Figure 20 Plastics recovered since 2003-04 – PET, HDPE, LDPE, PP and mixed and/or other plastics

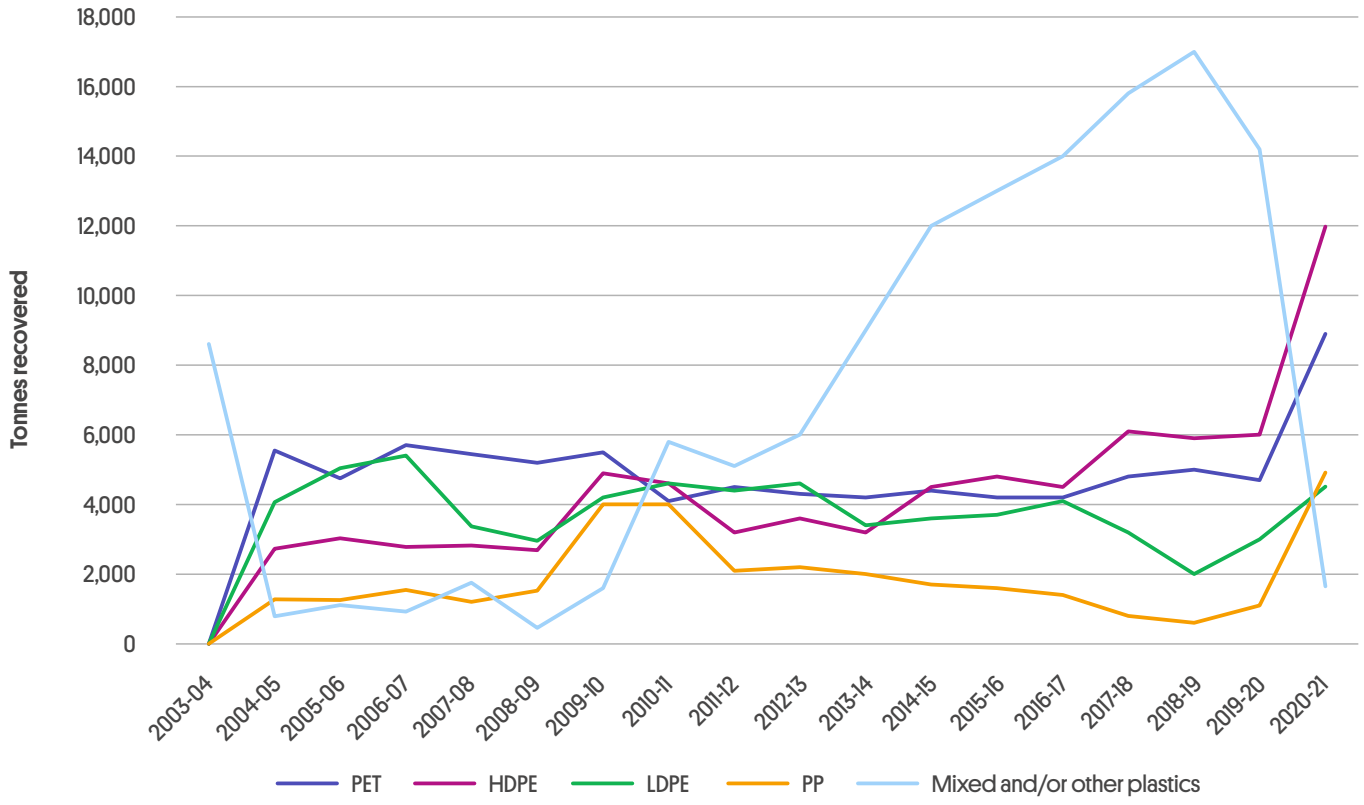
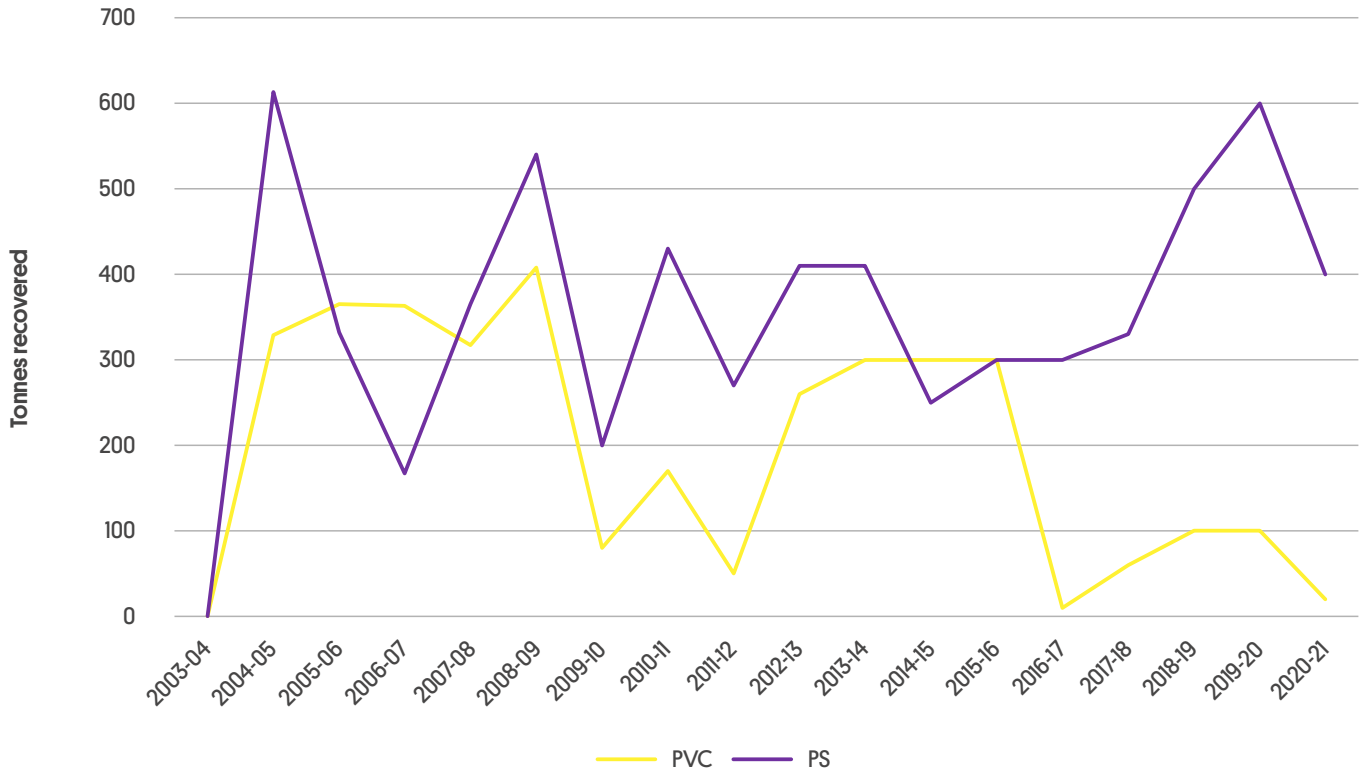


Figure 21 Plastics recovered since 2003-04 – PVC and PS



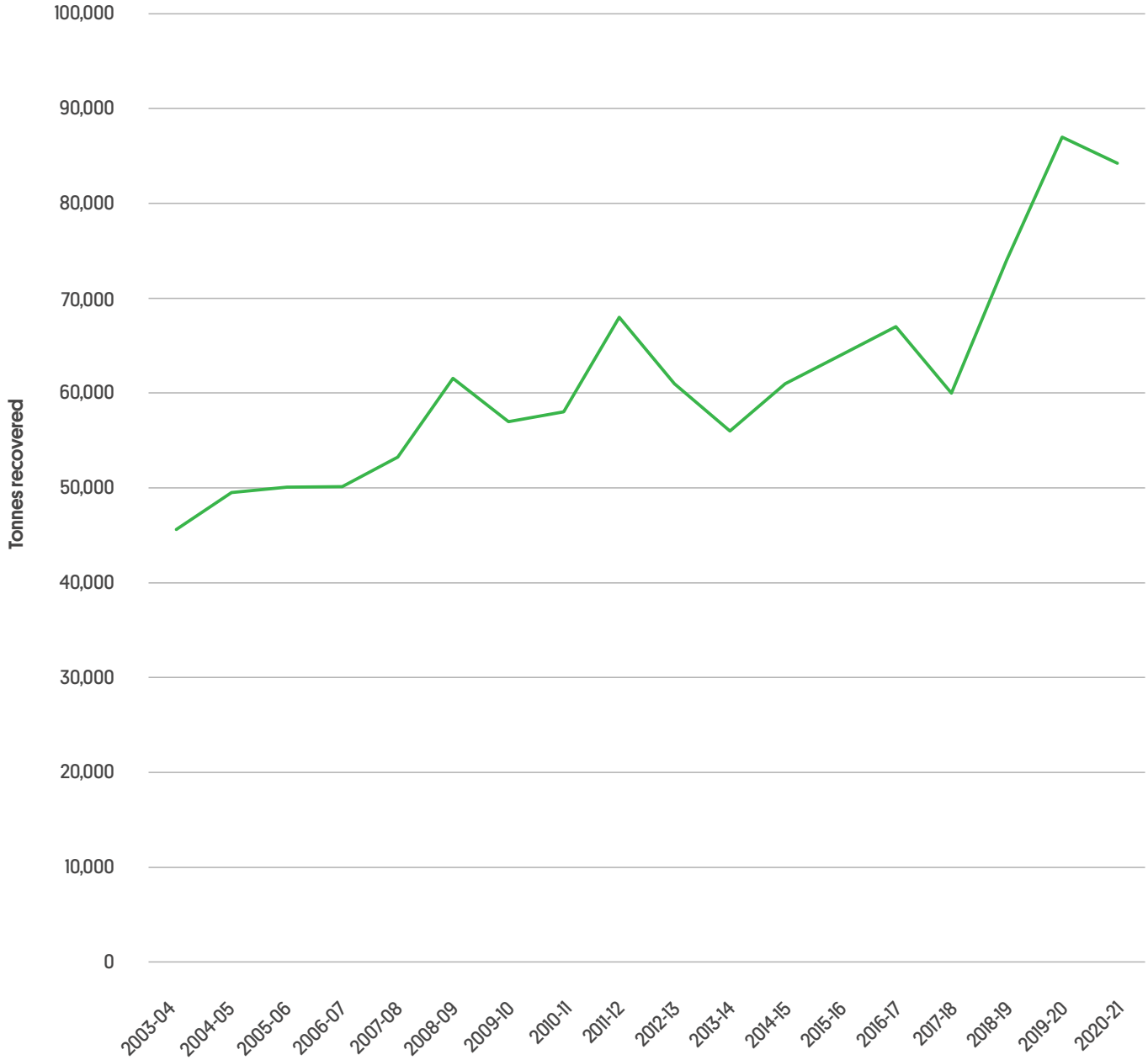
3.6 Glass

SA recovered about 84,000 t of glass in 2020-21. Recovered glass were mostly containers; 89% of overall volumes were from food and beverage containers, with the remaining 11% being other glass.

Table 21 Glass recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Glass from food and beverage containers	75			
Other glass, eg window and laminated	9.5			
Total	**84**	**44**	**370**	**80**

Figure 22 Glass recovered since 2003-04



Glass was mostly from the C&I stream (83%), followed by MSW. Most glass was from the metropolitan region (84%), and reprocessing was primarily undertaken locally (88%).

3.7 Other materials

The combined recovery of 'other materials' category, which includes fly ash, foundry sands, leather and textiles, and tyres and other rubber, was 29,000 t. SA has not recovered any fly ash since the closure of the Port Augusta Power Station.

Foundry sands and tyres and other rubber were entirely from C&I sources, while leather and textiles were made up entirely of MSW. About 81% of other materials was from metropolitan SA, and 19% from regional SA. Most other materials were reprocessed locally, including all foundry sands and leather and textiles. The destination for tyres and other rubber was 57% SA, 20% overseas and 23% interstate.

Table 22 Other materials recovered, SA 2020-21

Material type	Recovery ('000 t)	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Fly ash	0			
Foundry sands	8.2			
Leather and textiles	1.6			
Tyres and other rubber	19	20	1,220	1,000
Total	**29**			

Figure 23 Other materials recovered since 2003-04 – foundry sands, leather and textiles and tyres and other rubber

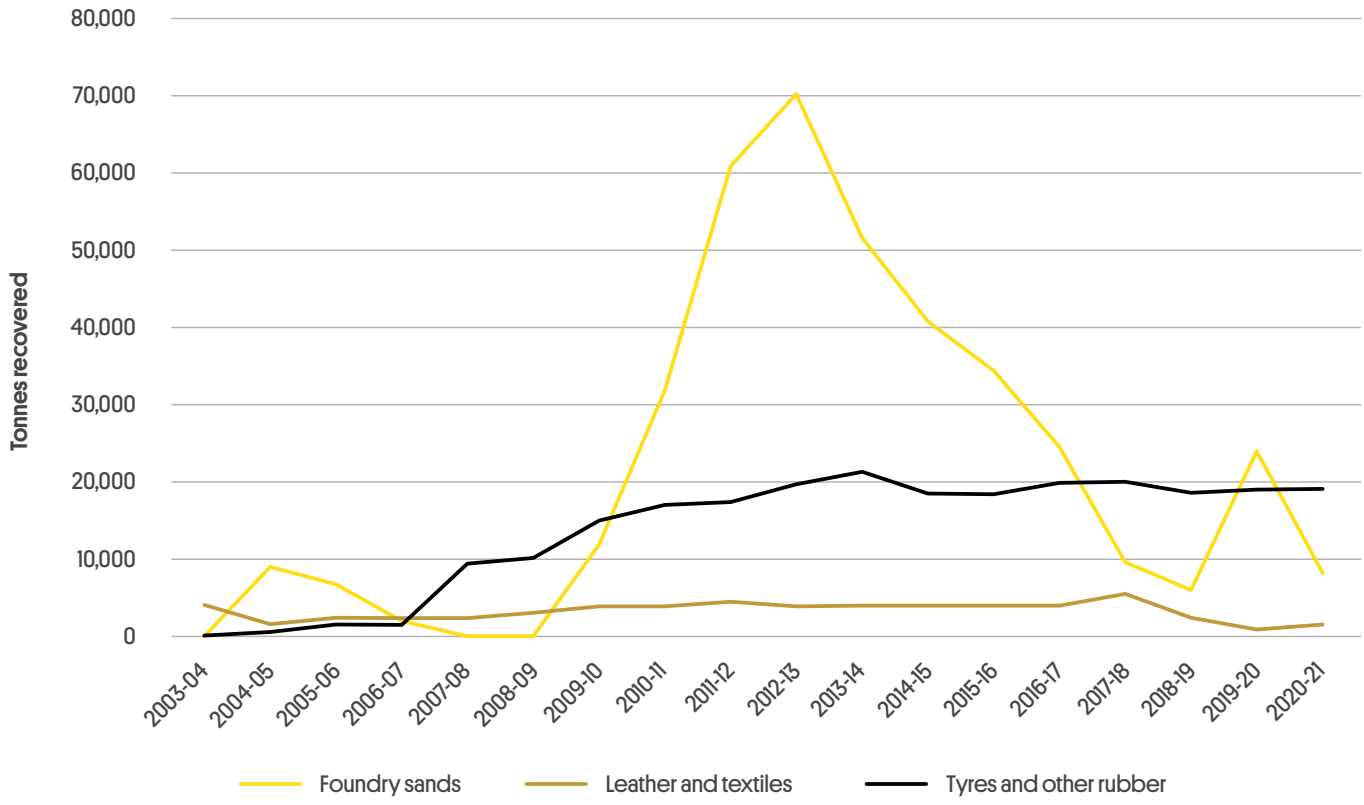
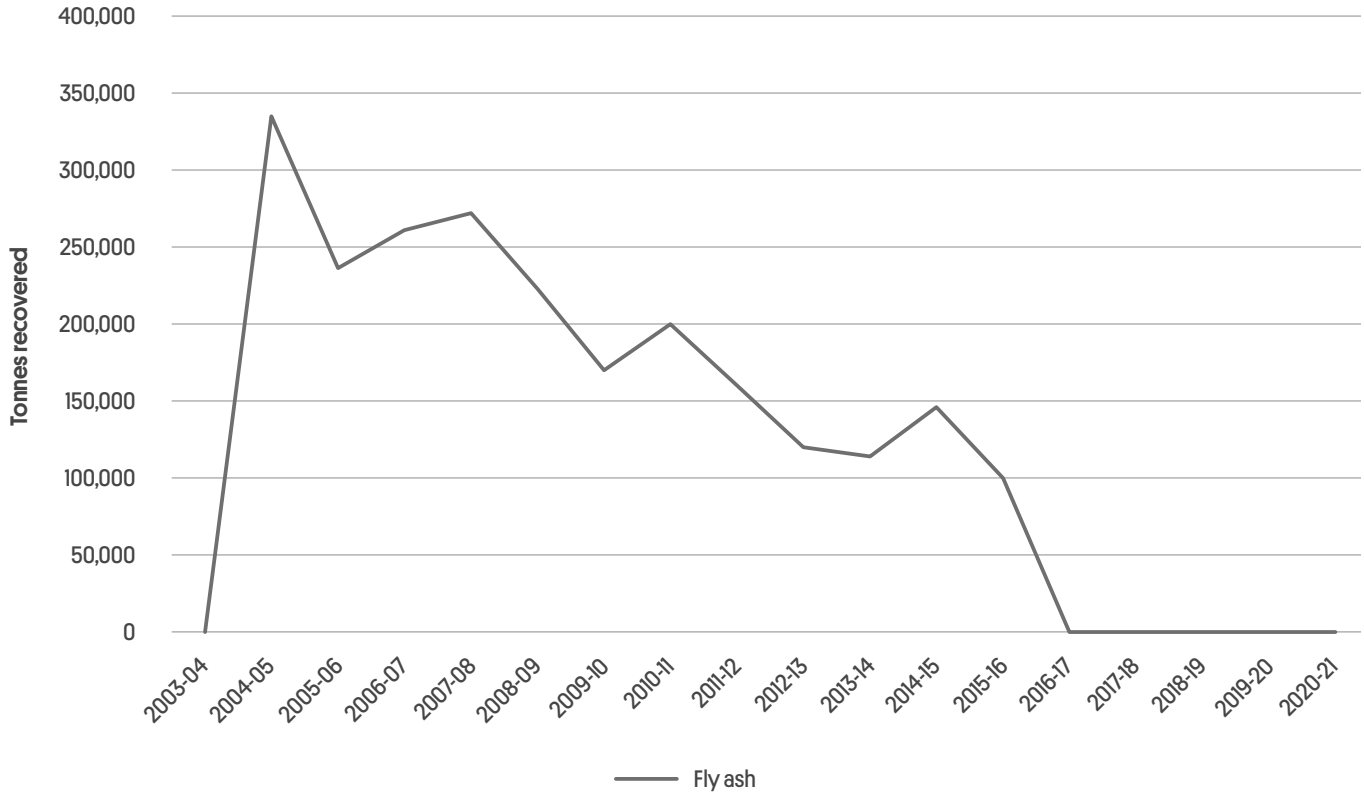


Figure 24 Other materials recovered since 2003-04 – fly ash



4 E-waste

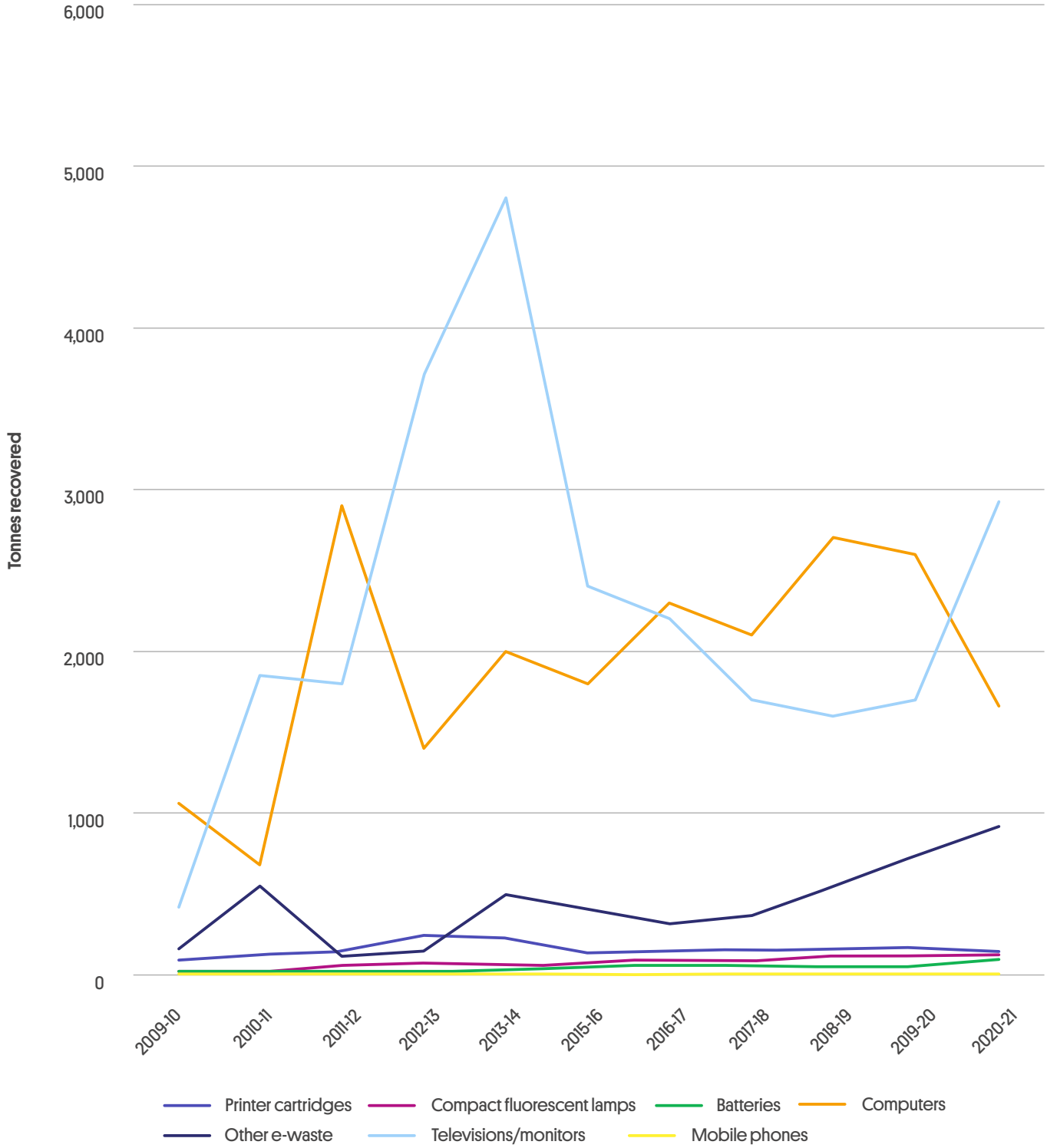
Electronic waste (e-waste) is anything with a plug or battery that is no longer wanted, and includes a wide range of items such as computers, televisions and white goods. E-waste recovery in SA totalled 5,900 t with an increase in televisions/monitors recovered.

Most e-waste came from municipal sources (89%), with the remainder from the C&I stream (11%). The destination for e-waste is mostly SA (66%), followed by overseas (30%), with a lesser proportion being sent interstate (5%).

Table 23 Reported tonnes of e-waste in SA, 2020-21 and 2019-20

E-waste type	2020-21 (tonnes)
Printer cartridges	150
Compact fluorescent lamps	120
Batteries	90
Computers	1,660
Televisions/monitors	2,930
Mobile phones	5.7
Other e-waste	920
Total	**5,900**

Figure 25 Reported e-waste recovered since 2009-10



5 Packaging

Australia has established targets for the management of packaging waste by 2025, as follows (Department of Agriculture, Water and the Environment 2022):

- 100% of packaging being reusable, recyclable or compostable by 2025
- 70% of plastic packaging being recycled or composted by 2025
- 50% of average recycled content included in packaging by 2025
- the phase out of problematic and unnecessary single-use plastic packaging by 2025.

SA recovered about 228,000 t of packaging materials in 2020 21, comprising about 42,000 t (18%) Container Deposit Legislation (CDL) materials and 186,000 t (82%) non-CDL materials.

Table 24 Estimated packaging recovered in SA in 2020-21

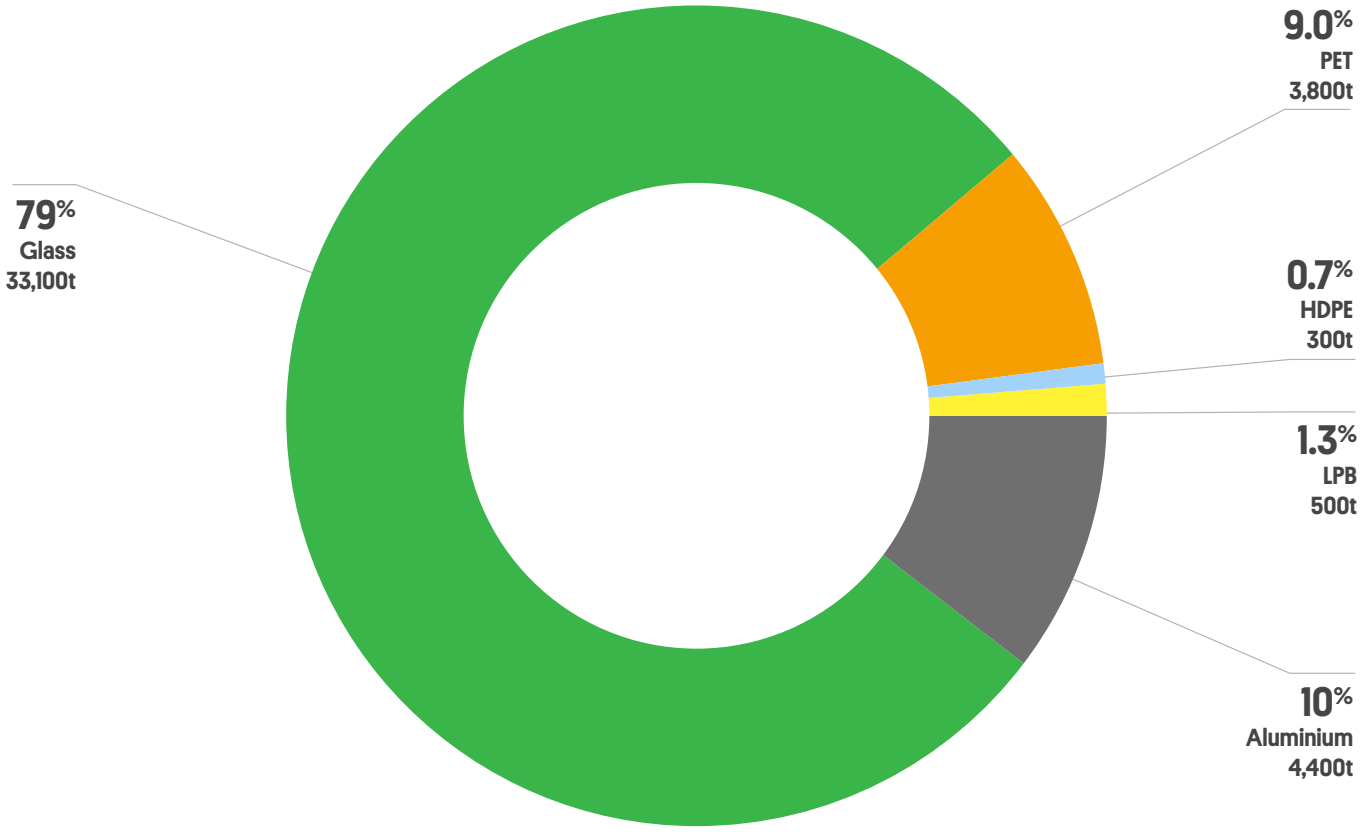
Packaging type	Recovered (kt)			Packaging as a proportion of total recovery
	CDL	Other	Total	
Steel cans	-	2.7	2.7	1%
Aluminium cans	4.4	0.1	4.4	36%
Cardboard packaging	-	124	124	90%
Liquid paperboard cartons	0.5	0.3	0.8	100%
PET packaging	3.8	5.1	8.9	100%
HDPE packaging	0.3	8.8	9.1	76%
PVC packaging	-	0.01	0.01	56%
LDPE packaging	-	4.4	4.4	97%
Polypropylene packaging	-	4.2	4.2	85%
Polystyrene packaging	-	0.3	0.3	68%
Other plastics packaging	-	0.8	0.8	47%
Glass bottles and jars	33	35	68	91%
Total	**42**	**186**	**228**	**-**

5.1 Container deposit legislation

SA has the longest working container deposit scheme in Australia, having introduced its CDL in 1977.

South Australians returned about 42,000 t of containers to CDL locations across the state, the bulk being glass containers (33,000 t, 79%).

Figure 26 Relative proportions of returned container deposit legislation materials, SA 2020-21



Return rates were high for glass and aluminium at over 80%, while plastics packaging and liquid paperboard exhibited more moderate return rates at 54% to 67%.

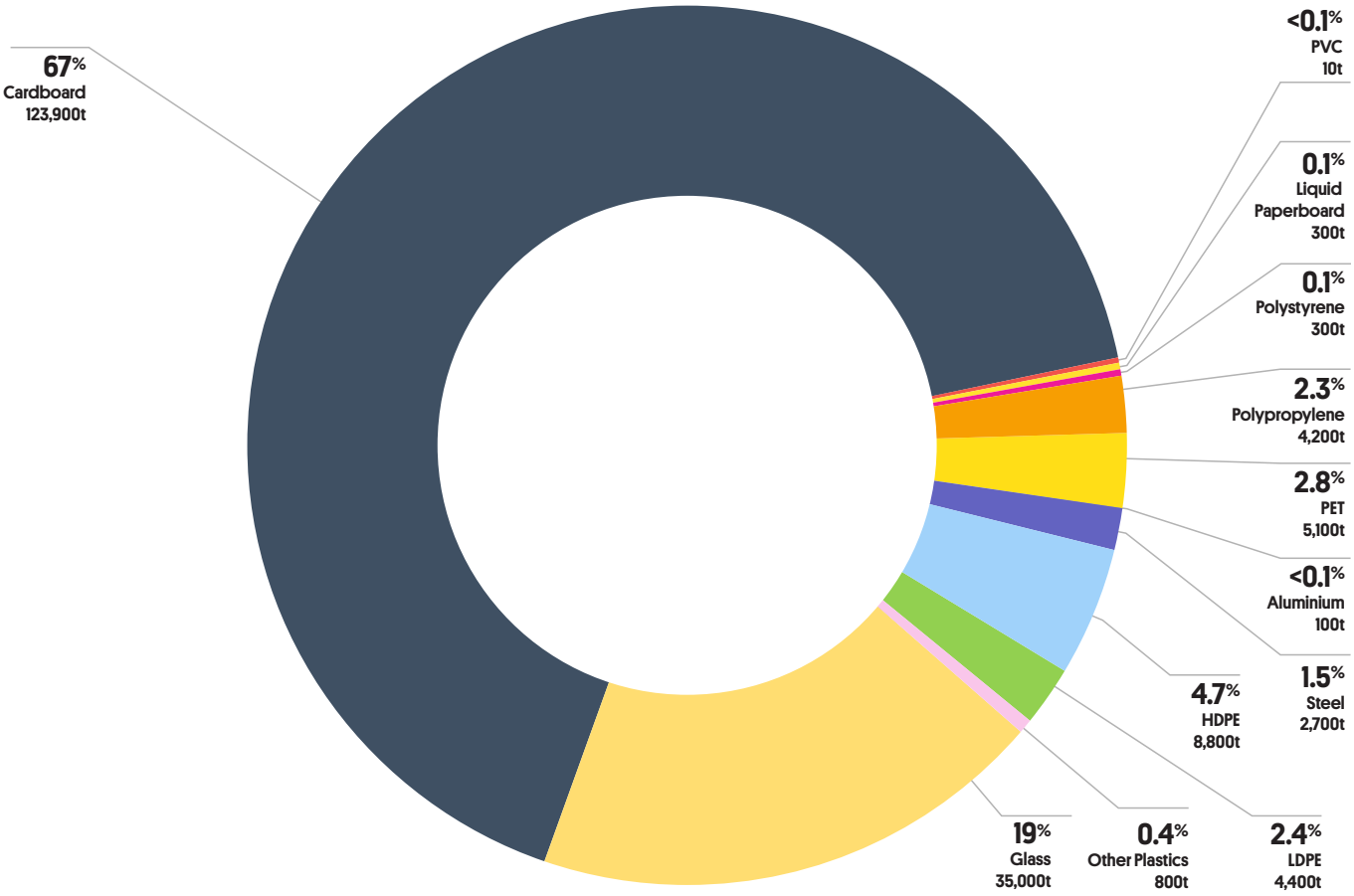
Table 25 Return rates for SA's container deposit legislation materials in 2020-21

Packaging material	Recovered (kt)	Return rate
Glass	33	81%
Aluminium	4.4	82%
PET	3.8	67%
Liquid paperboard	0.5	54%
HDPE	0.3	65%

5.2 Other packaging materials

Non-CDL recovered packaging material during 2020-21 included cardboard (67%), and glass bottles and jars (19%).

Figure 27 Relative proportions of other (non-CDL) packaging materials, SA 2020-21




Lactose Free
kids

6 Resource recovery value

The total value of recovery in SA in 2020-21 is estimated at about $478 million largely due recovered iron and steel, which increased in both tonnage and value.

Table 26 Estimated resource value for recovered materials in SA in 2020-21

Material category or type	Recovered (kt)	Estimated on-sale price ($/tonne)	Estimated value ($ millions)
Masonry	1,666	$23	$38.8
Metals – iron and steel	327	$591	$193.5
Metals – non-ferrous including aluminium	24	$1,245	$29.4
Organics – meat rendering[9]	89	$1,500	$134.2
Organics – garden, food and timber	495	$20	$9.9
Cardboard and paper	182	$224	$40.6
Plastics	32	$420	$13.6
Glass	84	$83	$7.0
Other materials	29	$191	$5.5
Separately reported materials and clean fill	729	$7	$5.4
Total	**3,657**	-	**$477.8**

9 Note that the meat rendering tonnage is reduced due to mass loss during processing, resulting in lower volumes that can be sold. Tonnes of resource recovered waste grease and fat, waste sludge and biosolids, and miscellaneous organics were not included in the total.

Figure 28 Estimated market value of resource recovered materials, SA 2020-21

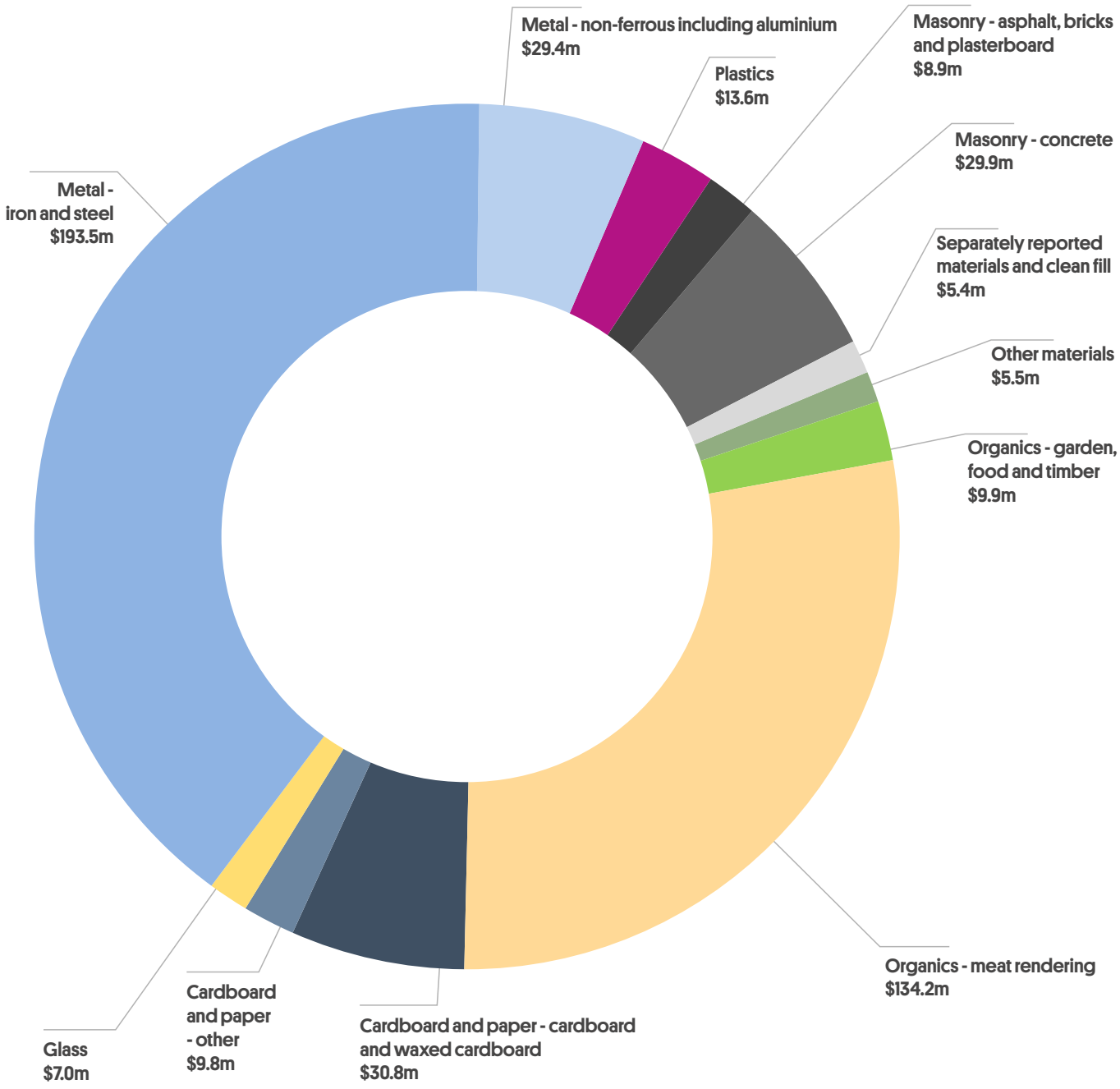


Figure 29 Estimated market value of resource recovered material in SA during 2020-21

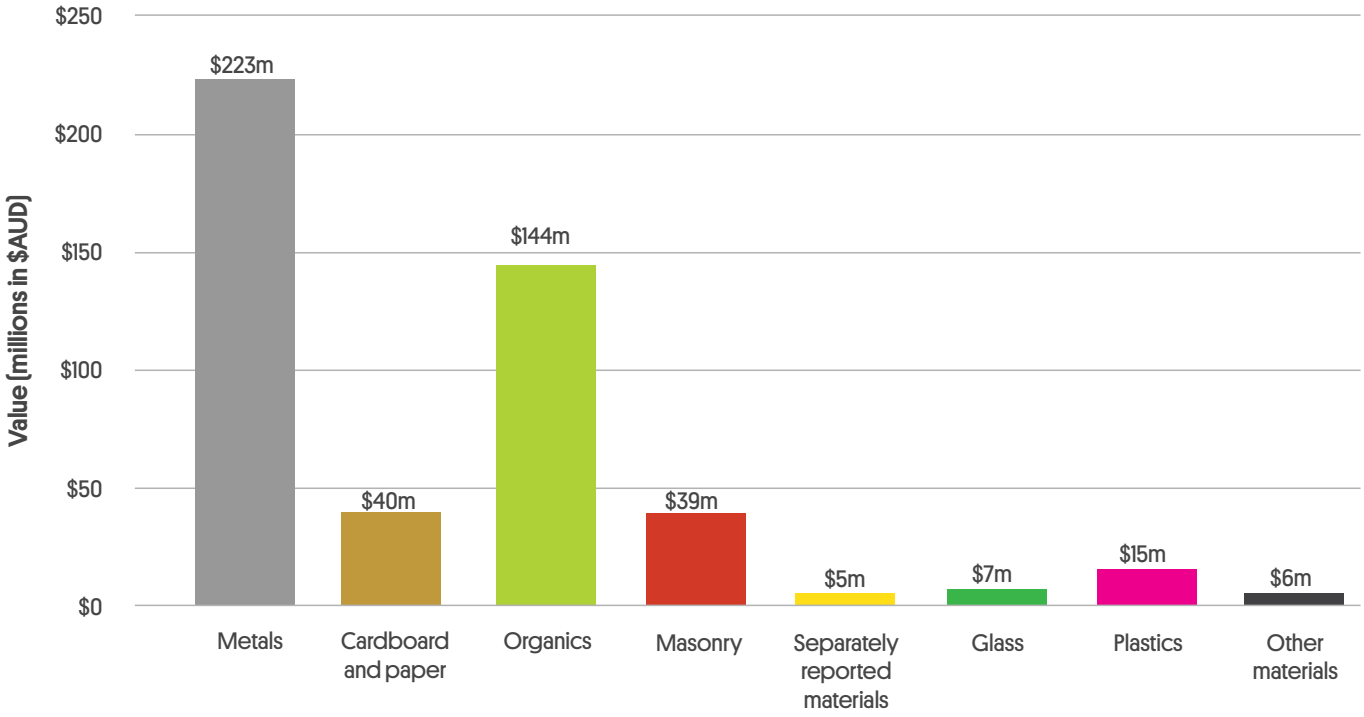
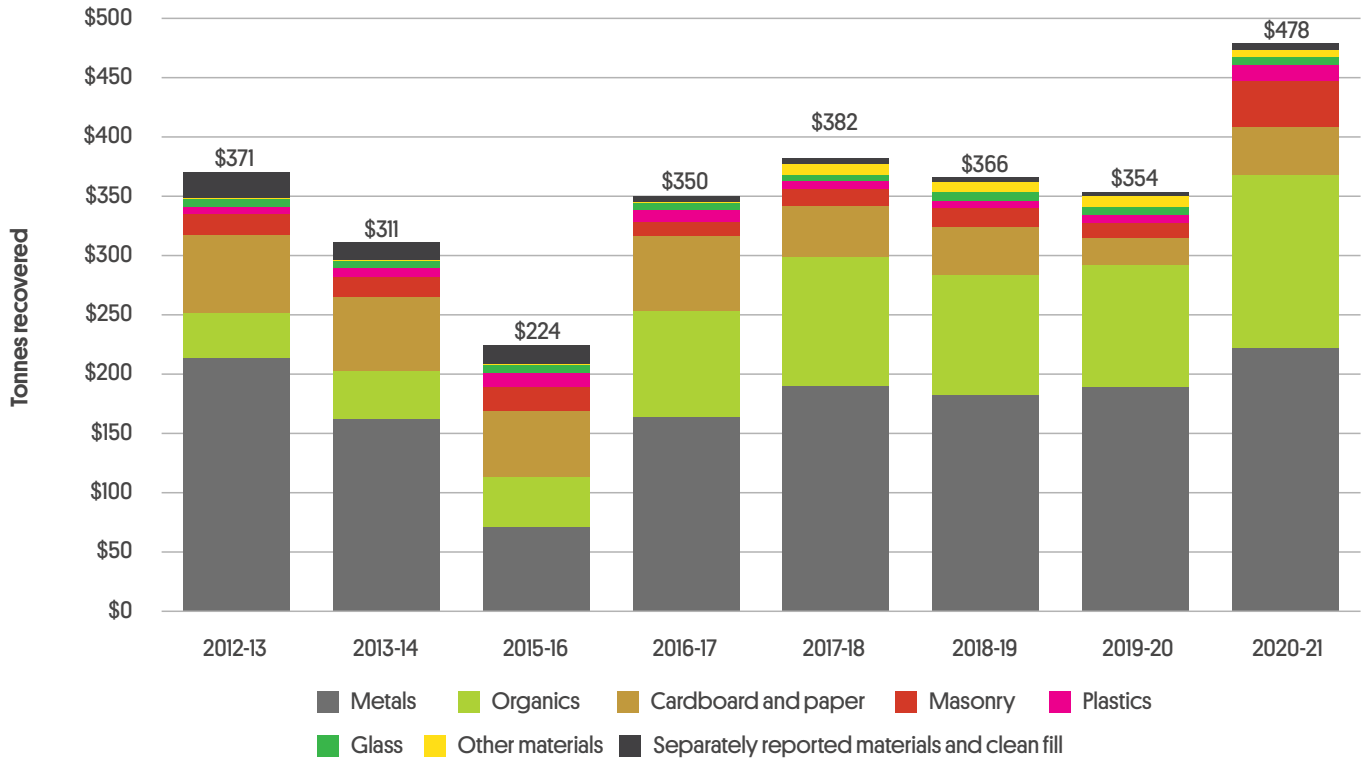


Figure 30 Estimated market value of resource recovered materials in SA, 2012 13 to 2020-21[10]



10 Historical values have been adjusted to account for inflation.

7 Environmental benefits of recycling

The production and consumption of materials requires the use of energy and water and emits greenhouse gases. When recoverable material is landfilled, the resource and the energy 'embodied' within it (that is, the energy used to make it) is wasted. Materials prone to biological decay (i.e. organics) generate and release the potent greenhouse gas methane when they are landfilled. Resource recovery in SA in 2020-21 achieved the following estimated environmental benefits:

Table 27 Estimated environmental benefits of recycling in SA in 2020-21

Material type	Recovered kt	Emissions saved kt CO_2-e	Energy saved TJ LHV	Water saved ML
Total	4,201	1,140	14,500	7,920

7.1 Greenhouse gas emission savings

Through recycling its materials in 2020-21, SA saved about:

1.14 million tonnes

of carbon dioxide equivalent (CO_2-e)

Emission savings due to recycling in 2020-21 are approximately equivalent to:

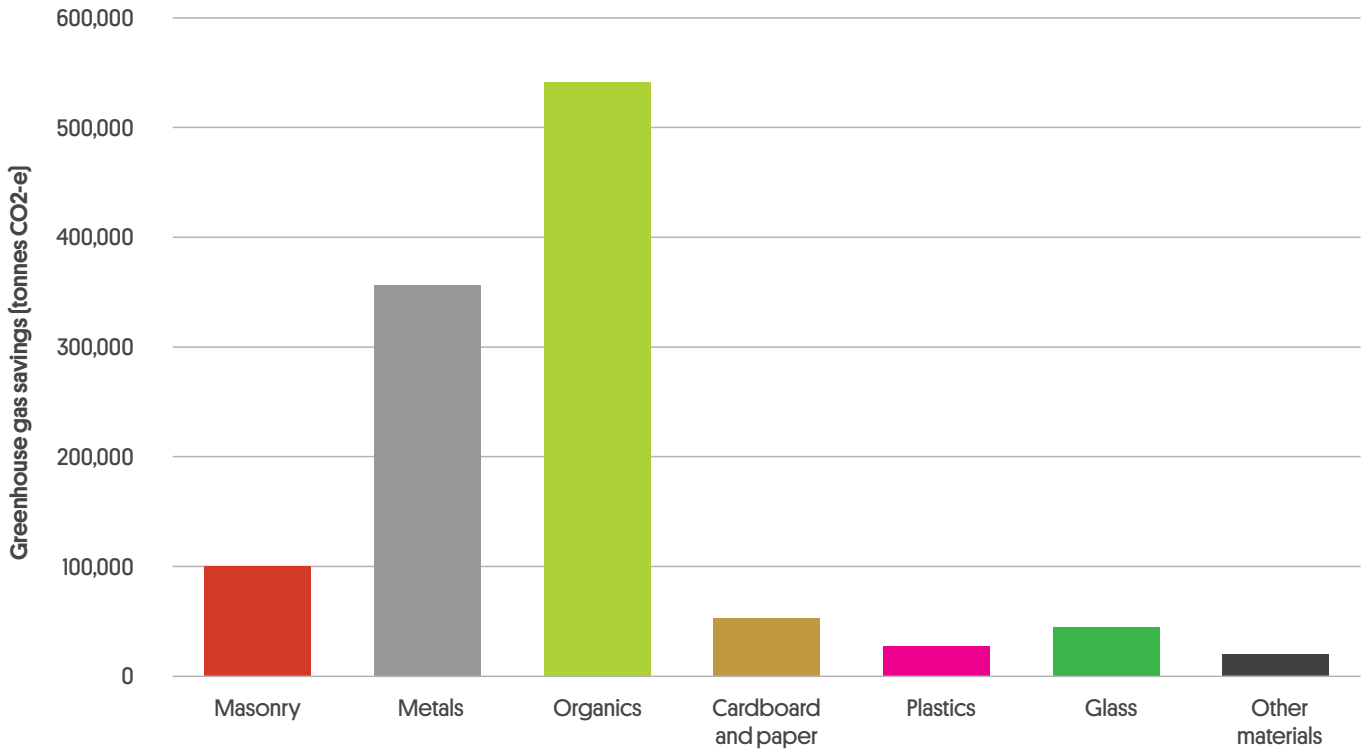
the CO_2 absorbed by

1.7 million trees

229,000 cars

off the road in one year

Figure 31 Estimated greenhouse gas emissions savings due to recycling, SA, 2020-21



7.2 Energy savings

Through recycling its materials in 2020-21, SA saved about:

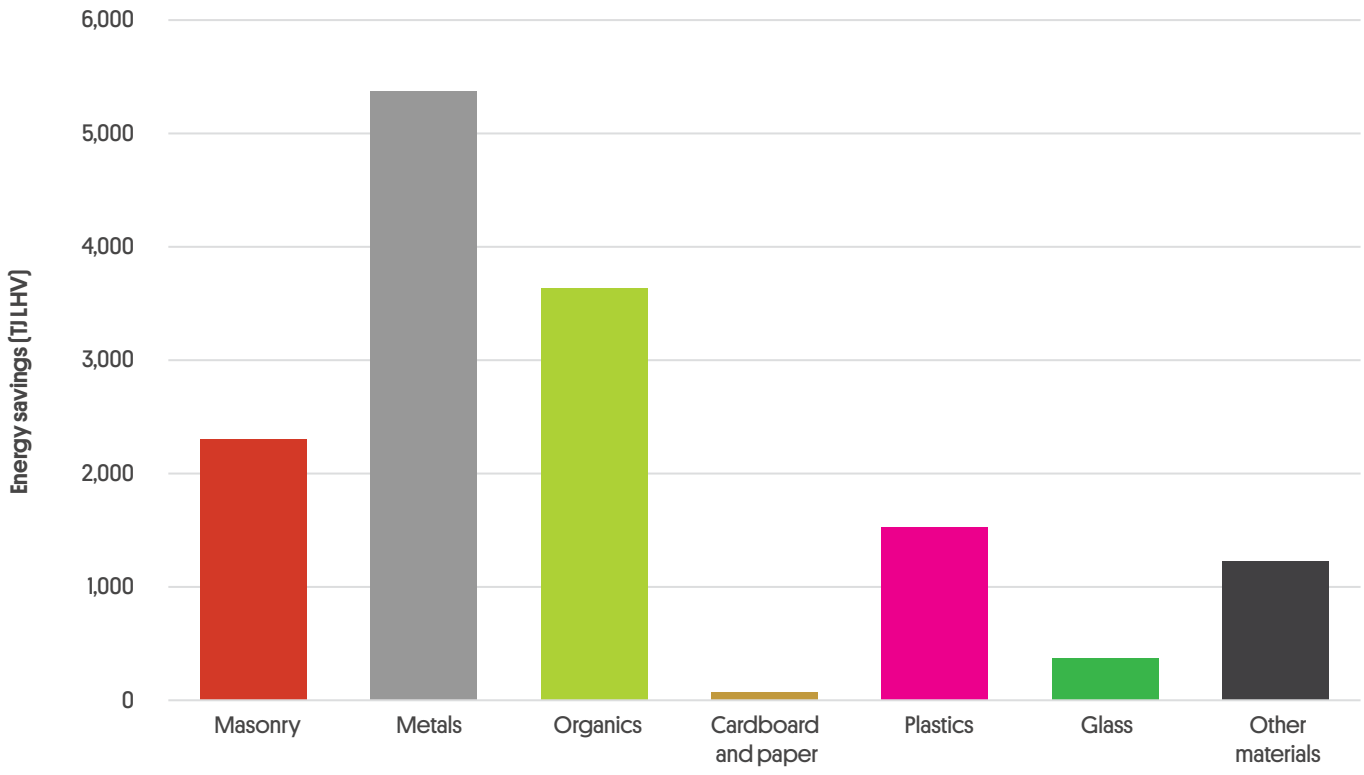
14,500 Terajoules
of carbon dioxide equivalent (CO_2-e)

Energy savings due to recycling in 2020-21 are approximately equivalent to:

Energy use from
284k households
in one year

The energy supplied by
2.4m barrels of oil

Figure 32 Estimated energy savings due to recycling, SA, 2020-21



7.3 Water savings

Through recycling its materials in 2020-21, SA saved about:

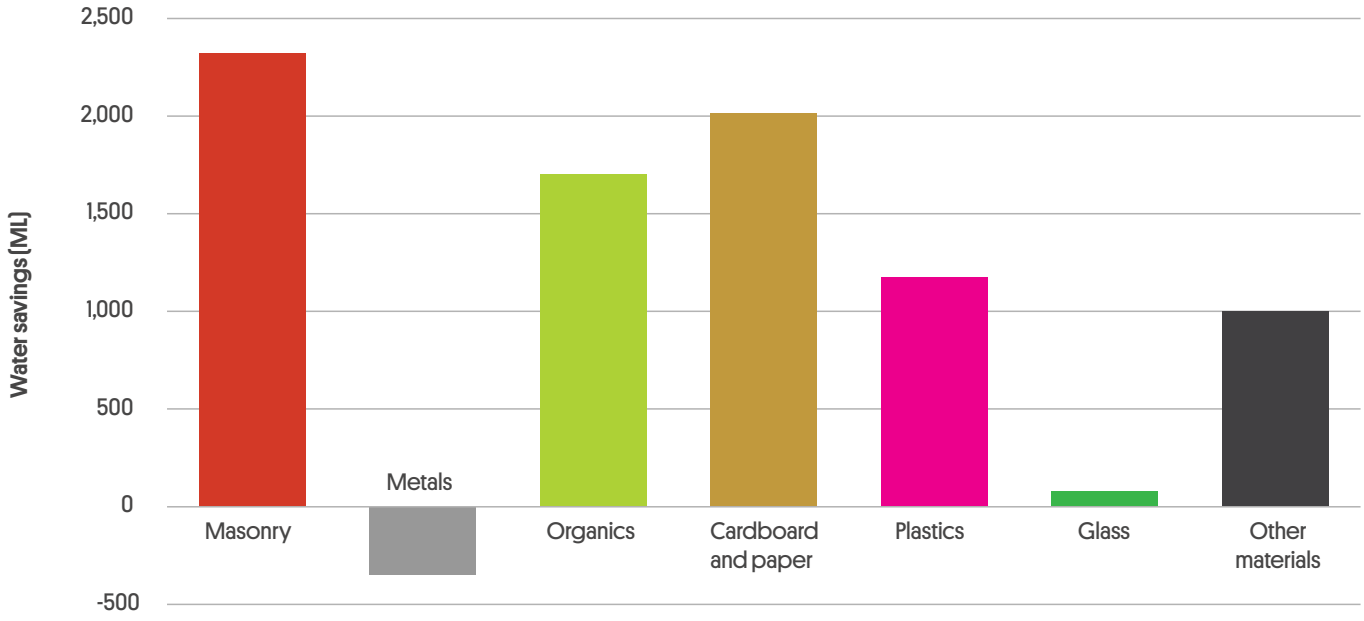
7,920 megalitres of water

Water savings due to recycling in 2020-21 are approximately equivalent to:

water use from **48k households** in one year

The water contained in **3,200 Olympic sized swimming pools**

Figure 33 Estimated water savings due to recycling, SA, 2020-21



Although metals recycling provides significant environmental benefits in terms of greenhouse gas emissions and energy savings, it is understood to be a net water cost compared to its virgin equivalent.

Acknowledgements

Green Industries SA would like to recognise and thank the following participants of the Circular Economy Resource Recovery Survey 2020-21 and the SA Organics Industry Survey 2020-21. The list below does not include all organisations that participated in the surveys but those that agreed to be recognised.

AAIMG

Adelaide Hills Region Waste Management Authority

Alexandrina Council

APR Manufacturing Group

Australia and New Zealand Recycling Platform

Australian Mobile Telecommunications Association

Boral Resources

Ceduna Recycling

Clare Valley Waste

Downer EDI

Ecoplas Australia

Electronic Recycling Australia

Foodbank

Hallett Resources

Intercast and Forge

J Mathews Pty Ltd

JA Braun Investments Pty Ltd

JBS

Jeffries

Kangaroo Island Council

Mobius Farms

Northern Adelaide Waste Management Authority

Normetals

OneFortyOne Wood Products

Opal

OzHarvest

Peats Group

PC and JL Giles

Renewal SA

ResourceCo

SA Composters

SA Water

Sims Metal

Southern Region Waste Resource Authority

Statewide Recycling

Tarac Technologies

YCA Recycling

Government
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