



# Waste and recycling in Western Australia 2021–22

Data and trends report



#### **Waste Authority**

C/O Department of Water and Environmental Regulation  
Prime House, 8 Davidson Terrace  
Joondalup Western Australia 6027  
[www.wasteauthority.wa.gov.au](http://www.wasteauthority.wa.gov.au).

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# Introduction

This report presents data on, and trends in, waste recovery and disposal in Western Australia (WA) based on the 2021–22 financial year. The report also assesses the state’s progress against the targets set out in the Government of Western Australia’s *Waste Avoidance and Resource Recovery Strategy 2030* (waste strategy).

Under regulation 18C of the Waste Avoidance and Resource Recovery Regulations 2008 (WARR Regulations), liable persons are required to lodge annual returns containing waste and recycling data to the Department of Water and Environmental Regulation (the department). The data in this report was predominantly derived from annual returns lodged by 254 liable persons for the 2021–22 reporting period, including local governments, recyclers and non-metropolitan landfills. Other data sources are detailed in the methodology (Appendix A).

Only solid waste is required to be reported under the WARR Regulations. Most mining, agricultural and forestry wastes are excluded from this report.

This report is the third report in the series. The latest reports replace two long-running series of reports published by the Waste Authority prior to 2019–20: *Recycling activity in Western Australia* and *The census of Western Australian local government waste and recycling services*. In previous years, recyclers and local governments voluntarily supplied data for these reports. The reporting requirements under the WARR Regulations, introduced in 2019, provide for a more complete dataset compared with previous years under the voluntary reporting scheme.

Data published in the report is also dynamically presented in Power BI reports available on the Waste Authority’s [website](#).

# Waste and recycling in Western Australia

## 2021–22 at a glance

Among Perth and Peel local governments

8 provided a FOGO service

12 had committed to FOGO

13 had not yet committed to FOGO



## 6.7 million tonnes of waste generated



### Average kerbside recovery performance\*

Number of households



Recovery rates

15%

41%

54%

up to 45%

up to 66%

\*Adjusted for service roll out, does not include all service combinations

## Waste strategy targets

Materials recovered Energy recovered Landfilled

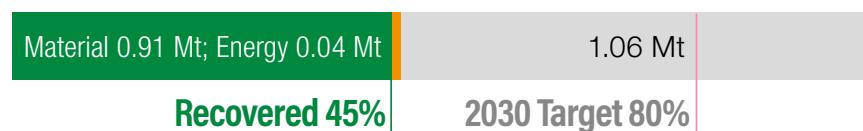
### Perth and Peel MSW



### Major regional centre MSW



### Commercial and industrial



### Construction and demolition



# Top 10 key findings

**1** A total of 6.7 million tonnes of waste was generated, which is an increase of 5 per cent from the previous year.

20-21 6.4 Mt	+5%
21-22 6.7 Mt	

**6** Sixty-seven per cent of all recovered materials were C&D type materials.

67% = C&D
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**2** Half of all waste generated came from construction and demolition (C&D) activities.

50% = C&D
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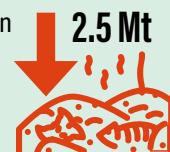
**7** Seventy-seven per cent of materials recovered were reprocessed in WA.

77% =
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**3** Municipal solid waste (MSW) generation per capita continued to decline steadily, with a reduction of 11 per cent from the previous year.

20-21 0.56 t /capita	-11%
21-22 0.49 t /capita	

**8** A total of 2.5 million tonnes of waste was disposed of to landfill.



**4** The overall material recovery rate increased to 62 per cent in 2021–22, from 60 per cent in 2020–21.

20-21 60%	+2%
21-22 62%	

**9** Local governments collected 1.49 million tonnes of waste from their residents.



**5** A total of 4.2 million tonnes of waste was recovered in 2021–22, which is an increase of 10 per cent from the previous year.

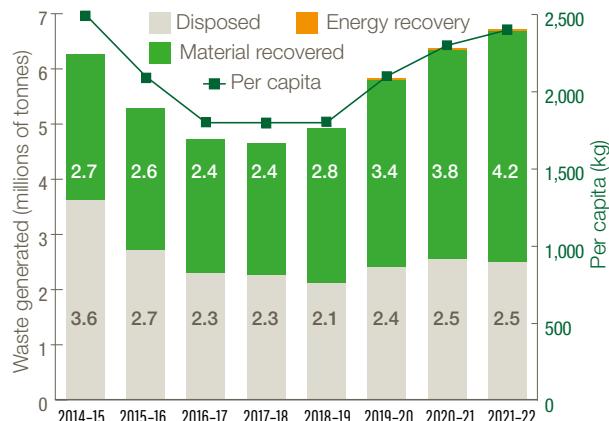
20-21 3.8 Mt	+10%
21-22 4.2 Mt	

**10** Local governments with FOGO recovered up to 66 per cent of their kerbside waste.



## Trends

Increases to the landfill levy from January 2015 caused a significant fall in the reported disposal of C&D waste. The introduction of mandatory reporting in 2019–20 resulted in an increase in the number of C&D recyclers reporting the recovery of C&D waste. The reported reduction in C&D generation between 2014–15 to 2017–18 is therefore more likely to represent a shift from disposal to recovery, with recovery rates poorly reflected in the data because of underreporting by recyclers (Figure 1).



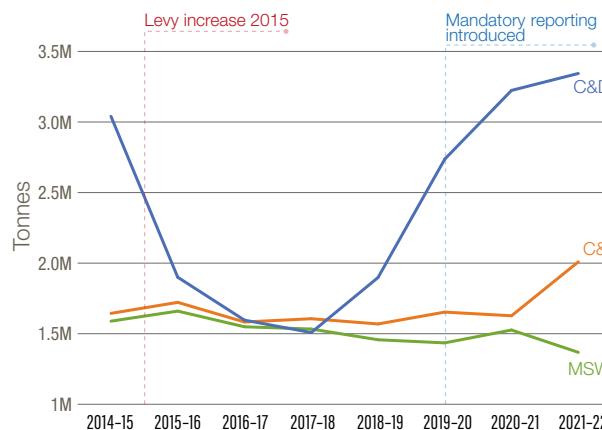
**Figure 1 Reported waste generation shown as materials recovered, disposed and recovered as energy.**

Note: prior to 2019–20 waste recovered as energy is shown as ‘recovered’.

Since 2019–20, waste stream composition has returned to longer term trends with around half of all waste generated coming from the C&D waste stream (Figure 2).

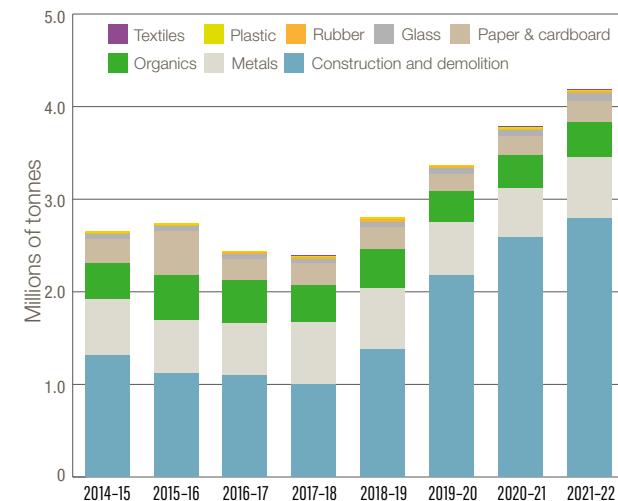
Waste generated in 2021–22 comprised:

- 3.3 million tonnes from the C&D waste stream (50 per cent)
- 2.0 million tonnes from the commercial and industrial (C&I) waste stream (30 per cent)
- 1.4 million tonnes from the municipal waste stream (MSW) (20 per cent).



**Figure 2 Waste generation by waste stream**

The quantity of materials recovered from the waste stream has increased from 2.7 million tonnes in 2014–15 to 4.2 million tonnes in 2021–22. Figure 3 below demonstrates that C&D materials were the largest recovered material type in 2021–22 and that the overall increase in material recovery since 2014–15 stems from an increase in the reported recovery of C&D materials. Reported recovered C&D materials include reprocessed C&D materials that are stockpiled.



**Figure 3 Waste recovery by material type**

# Performance against waste strategy targets



Sector	2014–15 baseline	2021–22	Targets		
			2025	2030	
Avoid targets	Overall	2,452 kg per capita	2,415 kg per capita	2%	10% reduction
	MSW	621 kg per capita	492 kg per capita	21%	5% reduction
	C&I	642 kg per capita	722 kg per capita	12%	5% reduction
	C&D	1,188 kg per capita	1,201 kg per capita	1%	15% reduction
Material recovery targets	Overall	42% recovery	62% recovery	2%  since 2020–21	70% recovery
	MSW (Perth and Peel)	39% recovery	36% recovery	4%  since 2020–21	67% recovery
	MSW (Major regional centres)	30% recovery	30% recovery	3%  since 2020–21	55% recovery
	C&I	53% recovery	45% recovery	5%  since 2020–21	75% recovery
	C&D	42% recovery	85% recovery	1%  since 2020–21	77% recovery
Protect target	Perth and Peel	Nil	8 local governments	+ 3  since 2020–21	All local governments in the Perth and Peel region provide consistent three-bin kerbside collection systems that include separation of FOGO from other waste categories by 2025
	Overall	49%* of Perth regions' waste disposed of to landfill <small>*Peel region data included as non-metropolitan source prior to 2018–19</small>	31% of Perth and Peel regions' waste disposed of to landfill	1%  since 2020–21	No more than 15% of Perth and Peel regions' waste is disposed of to landfill by 2030

Table 1 Performance against waste strategy targets for 2021–22

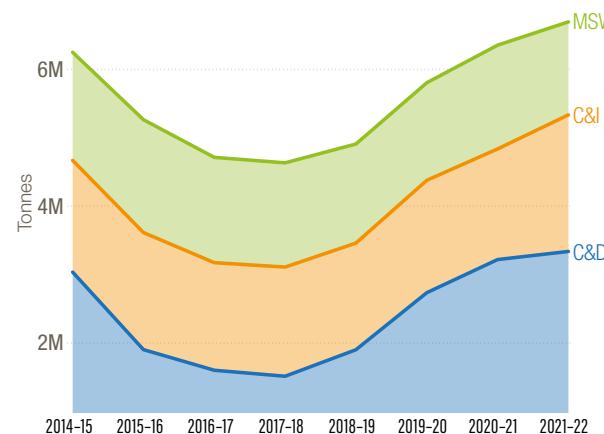


# Waste generation

In this report waste generation is the sum of waste disposal and recovery. Figure 1 (Page 9) shows the trend in reported waste generation between 2014–15 and 2021–22.

Waste generation was estimated as 6.7 million tonnes in 2021–22, an increase of 343,000 tonnes from the previous year. Waste generation comprised 4.2 million tonnes of material recovery, 2.5 million tonnes waste disposal to landfill and 0.04 million tonnes of waste recovered as energy.

Audits of 2021–22 annual returns identified potential underreporting of scrap metal recovery in earlier years. The inclusion of this material contributes to the increase in waste generation for 2021–22, particularly within the C&I sector.



**Figure 4** Waste generation composition by waste stream, with labels indicating percentage contribution

Material recovery from the construction and demolition waste stream also continued to increase, although at a decreased rate compared to the previous two reporting periods as shown in Figure 4.

Total reported waste generation per capita increased by 98 kilograms from 2020–21 to 2,415 kilograms in 2021–22. There has been an overall 2 per cent reduction in per capita waste generation since 2014–15.

In 2021–22, 50 per cent of waste was generated from the C&D waste stream. Since 2019–20, waste stream composition has returned to longer term trends seen prior to 2015–16, with around half of all waste generated arising from the C&D waste stream (Figure 4). An increase in C&I waste generation in 2021–22 can also be seen in Figure 4.

Total waste generation and generation per capita in 2021–22 for the MSW, C&I and C&D waste streams are presented in Table 2 and Table 3. Generation rates per capita were significantly higher in non-metropolitan regions for the C&I waste stream.

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion %	Tonnes	Proportion %	Tonnes	Proportion %
MSW	1,056,537	20	311,685	20	1,368,222	20
C&I	1,312,013	25	696,638	46	2,008,651	30
C&D	2,829,591	54	514,130	34	3,343,721	50
Total	5,198,140	100	1,522,453	100	6,720,594	100

**Table 2** Waste generation by waste stream (tonnes and per cent), 2021–22

Waste stream	Perth and Peel regions	Non-metropolitan regions	Western Australia
Population	2,228,346	554,809	2,783,155
MSW (per capita)	474	562	492
C&I (per capita)	589	1,256	722
C&D (per capita)	1,270	927	1,201
Total (per capita)	2,333	2,744	2,415

**Table 3** Waste generation, kilograms per capita by waste stream, 2021–22

Figure 5 shows the trends in generation per capita between 2014–15 and 2021–22 by waste stream and against the waste strategy ‘avoid’ targets.

Annual MSW generation per capita has decreased from 621 kilograms to 492 kilograms (21 per cent) since 2014–15, surpassing the 2030 target.

Annual C&I waste generation per capita has increased from 642 tonnes in 2014–15 to 722 tonnes (12 per cent). The waste strategy avoid 2025 target for C&I waste generation is 610 kilograms per capita.

Since 2014–15, C&I and MSW generation rates have mostly followed similar trends. Figure 5 shows an atypical divergence from 2020–21 to 2021–22. The increase in C&I generation is partly explained by increased scrap metal recovery, both from increased exports and improvements in reporting by metal recyclers. However, the reason behind a reported increase in C&I disposal and similar decrease in MSW disposal is less clear and may be because of the reallocation of waste streams by reporters.

Figure 5 shows that the reported annual C&D waste generation per capita fell rapidly after increases to the landfill levy in January 2015. As outlined earlier, this is likely to reflect underreporting of recovery. In 2021–22 C&D waste generation per capita (1,201 kilograms) was slightly higher than the per capita generation rates reported in 2014–15 (1,188 kilograms).

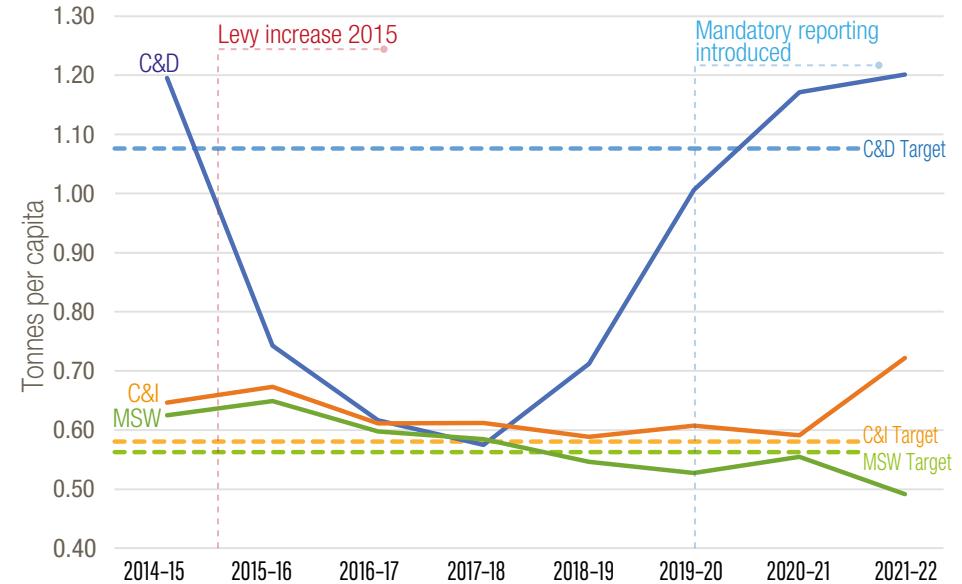
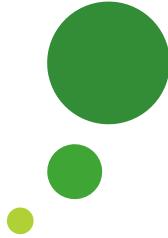


Figure 5 Waste generation per capita by waste stream and avoid targets

# Focus on reuse

Reuse is the recovery of materials without any reprocessing but possibly with some repair. Reuse is not captured in the annual returns lodged to the department by liable recyclers but is an important feature of the waste management hierarchy. The charitable sector is at the forefront of reuse in WA.



Iconic Western Australian disability employment and training social enterprise Good Sammy is a not-for-profit organisation that processes more than 6,000 tonnes of donated goods each year. The overwhelming majority of these donated goods are reused and given a second life as saleable items through Good Sammy's 26 op shops, online marketplace and exports. Sales revenue is invested back into Good Sammy's operations to help the organisation deliver its mission of providing employment opportunities for Western Australians with disability.

*Be a GREAT Sort by  
Gifting to charity!*



In 2021–22, Good Sammy sold more than 3,116 tonnes of pre-loved clothing, 163 tonnes of linen, 31 tonnes of hats and bags, 68 tonnes of shoes, 125 tonnes of furniture, 242 tonnes of crockery/kitchenware, 45 tonnes of toys and 96 tonnes of electronics.

Despite a decreasing market for secondhand books, CDs and DVDs, Good Sammy sold more than 80 tonnes of these items in 2021–22. The remainder was recycled as plastic or paper.

**Good Sammy employee Karen Price (left) at the organisation's recycling warehouse in Canning Vale (image provided by Good Sammy)**

Good Sammy also sends 115 tonnes of cardboard for recycling each year. This excludes all the cardboard the company reuses multiple times in its Canning Vale warehouse operations.

Good Sammy is the third largest charitable recycler in WA. Through its operations, Good Sammy's reuse activities positively and significantly impact the environment through reductions in energy and water use, as well as extending the useful life of goods by saving them from landfill.

(Text provided by Good Sammy)



# Disposal

An estimated 2.5 million tonnes of waste was disposed of to landfill in WA in 2021–22. There was a decrease of 52,000 tonnes of waste disposal compared to 2020–21. Although the overall one-year change was minor (2 per cent), there were more significant changes reported in MSW and C&I disposal. MSW disposal decreased by 19 per cent and there was an increase of a similar magnitude in C&I disposal (12 per cent). It seems likely that the flow of waste disposal from the MSW stream to the C&I waste stream may reflect a change in how the reporting landfills allocated waste streams in 2021–22 compared to previous years.

The waste strategy target is for no more than 15 per cent of the Perth and Peel regions' waste to be disposed to landfill by 2030. In 2021–22, 31 per cent – 1.6 million tonnes – of the regions' waste was landfilled.

Table 4 shows the waste disposed of to landfill by waste stream for 2021–22. Disposal trends are provided in Figure 6 (note that the Peel region was included in the non-metropolitan region category prior to 2019–20). Figure 6 highlights a significant decrease in the amount of C&D waste disposed of to landfill from 2014–15 onwards, which coincided with an increase in the waste levy for category 63 (inert) landfills (from \$12 to \$60 per cubic metre) in January 2015.

Significant  
decrease in the  
amount of C&D  
waste

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion %	Tonnes	Proportion %	Tonnes	Proportion %
MSW	677,518	42	239,061	27	916,579	37
C&I	639,500	40	420,853	48	1,060,353	43
C&D	285,136	18	226,970	26	512,106	21
Total	1,602,154	100	886,884	100	2,489,038	100

Table 4 Disposal to landfill by waste stream, 2021–22

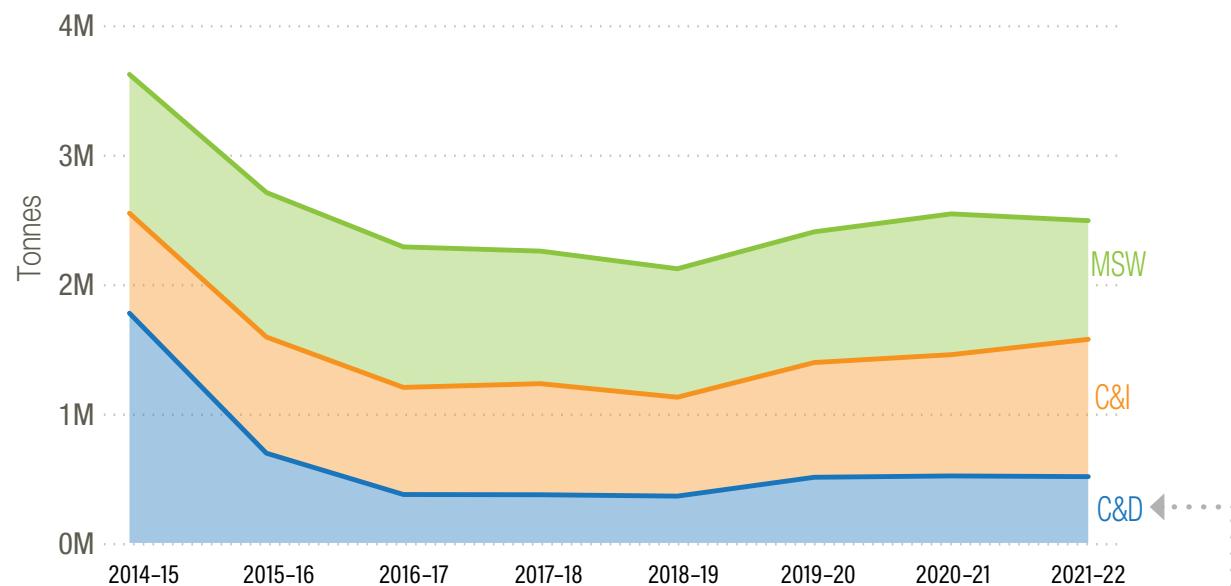


Figure 6 Annual disposal by waste stream

# Recovery

## Overall material recovery and trends

A total of 4.2 million tonnes of waste materials were recovered in 2021–22, which is an increase of 393,000 tonnes when compared to recovery in 2020–21. Data on material recovered by waste stream and category in 2021–22 is provided in Tables 5 and 6.

The reported total tonnes of materials recovered from the waste stream dramatically increased with the introduction of mandatory reporting in 2019–20. The reported total tonnes of material recovered each year has continued to increase over the past three reporting periods (see Figure 7). The most recent increase in reported overall material recovery from 2020–21 to 2021–22 was in part because of improvements in reporting by metal recyclers and increased exports, which increased scrap metal recovery. Material recovery from the C&D waste stream also continued to increase, although at a decreased rate compared to the previous two reporting periods. A large proportion of the increase in C&D recovery was reported by a facility located outside the Perth metropolitan area.

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion %	Tonnes	Proportion %	Tonnes	Proportion %
MSW	378,018	11	72,560	12	450,578	11
C&I	637,724	18	269,283	43	907,008	22
C&D	2,544,113	71	287,160	46	2,831,273	68%
Total	3,559,855	100	629,003	100	4,188,859	100

Table 5 Material recovery by waste stream, 2021–22

Material category	2020–21	2021–22	Change
	Tonnes	Tonnes	Tonnes
C&D waste	2,588,915	2,793,867	204,952
Metals	531,183	657,811	126,628
Organics	357,612	380,915	23,303
Paper and cardboard	203,159	220,550	17,391
Glass	69,804	88,206	18,402
Rubber	10,285	23,852	13,567
Plastic	22,044	14,276	-7,769
Other		585	585
Hazardous waste	6,026	4,855	-1,171
Textiles	4,229	3,499	-730
Bulky Wastes	2,496	444	-2,052
Total	3,795,752	4,188,859	393,107

Table 6 Material recovery by category, 2020–21 and 2021–22

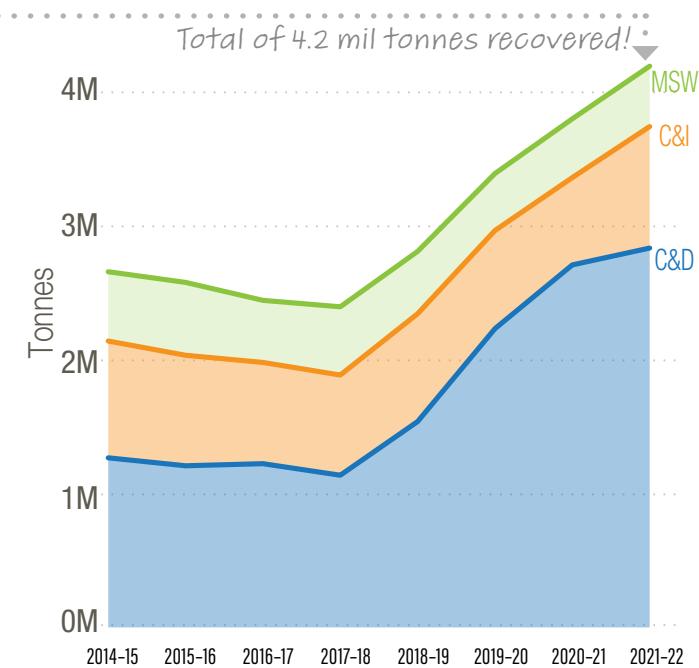


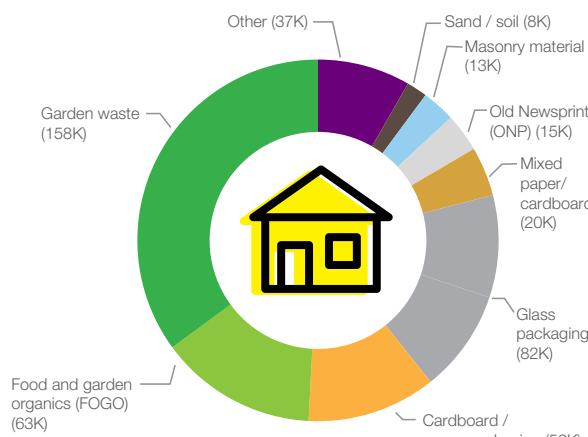
Figure 7 Material recovery (t) by waste stream from 2014–15

## MSW material recovery

In 2021–22, 451,000 tonnes of materials were recovered from the MSW stream (Figure 8). Organic waste (mostly garden waste) made up 50 per cent of the recovered materials, followed by paper and cardboard at 21 per cent. Glass (18 per cent) was the next most recovered material, by weight, from the MSW stream.

Organics recyclers reported that demand for their products was generally strong in 2021–22 but that demand was dependent on minimal contamination. Contamination of source materials was also commonly reported as a barrier to organics recovery.

The reported mass of materials recovered from the MSW stream has increased since 2019–20 but is still less than what was reported in 2014–15. Most of that decline (69 per cent) is associated with decreased reporting of C&D material types in the MSW stream (71,000 tonnes in 2014–15 compared to 25,000 tonnes in 2021–22).



**Figure 8 Materials recovered (t) from the MSW stream in 2021–22**

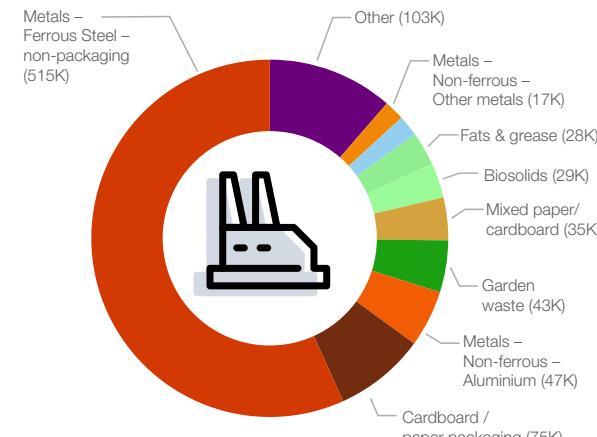
## C&I material recovery

In 2021–22, 907,000 tonnes of materials were recovered from the C&I waste stream (Figure 9). Metals comprised 64 per cent of the recovered materials. Paper and cardboard (14 per cent) and organics (14 per cent) were the next most common material types, by weight, recovered from the C&I waste stream.

Recovery in the C&I waste stream can be volatile because of the influence of the international market price for scrap metal, which accounts for most of material recovery within the C&I waste stream. There was a 176,000 tonne increase in the amount of recovered metals reported from the C&I waste stream from 2020–21 to 2021–22. This stems both from increased exports and improvements in reporting by metal recyclers.

Metal recyclers reported mixed market conditions in 2021–22, with constraints on container availability and increased shipping costs.

Improved recovery of paper and cardboard, organic waste, scrap plastics and rubber all present significant opportunities to increase recovery from the C&I waste stream in the future.



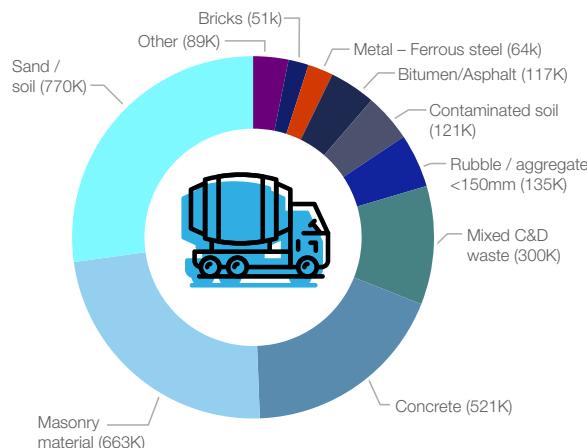
**Figure 9 Materials recovered (t) from the C&I waste stream in 2021–22**

## C&D material recovery

Material recovery in the C&D waste stream totalled 2.8 million tonnes in 2021–22 (Figure 10). Ninety-seven per cent (2.7 million tonnes) of this consisted of C&D materials. The largest recovered material types were sand/soil (770,000 tonnes), masonry materials (663,000 tonnes) and concrete (521,000 tonnes).

When mandatory reporting was introduced in 2019–20, there was a significant increase in the reported amount of annual C&D waste recovery because of an improvement in the capture of recyclers. Since then, the mass of C&D waste recovered has steadily increased.

Waste recyclers reported that the market for recycled C&D products continued to improve through 2021–22, although labour shortages and the cost of labour were commonly raised as barriers to increased recycling in 2021–22.



**Figure 10 Materials recovered (t) from the C&D stream in 2021–22**

## Material recovery facilities

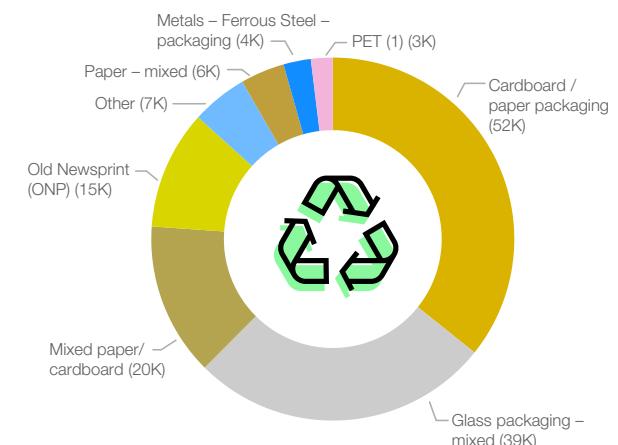
Materials recovery facilities (MRFs) typically receive comingled recycling collections from households or sort dry recyclables collected from commercial premises. In 2021–22, six MRFs lodged an annual return and reported receiving a total of 304,000 tonnes of mixed recyclables.

Of the six MRFs, three sorted recyclables primarily from the MSW stream and the others sorted waste primarily from the C&I waste stream.

The MRFs reported sorting and recovering 146,000 tonnes of recyclables from the MSW stream. Figure 11 shows the composition of the materials sorted and recovered from the MSW stream in 2021–22.

The MRFs also reported sorting and recovering 105,000 tonnes of recyclables from the C&I stream. The materials most commonly recovered by MRFs from the C&I waste stream were paper and cardboard (78 per cent) and glass packaging (11 per cent).

In 2021–22, MRFs reported 47,000 tonnes of recycling losses, or 16 per cent of all waste received.



**Figure 11 Composition of materials from the MSW stream recovered at MRFs in 2021–22**

## Destination

Table 7 shows the destination of material recovered from the waste stream in 2021–22. About 77 per cent (3.2 million tonnes) of recovered waste was reprocessed within the state and 20 per cent (0.85 million tonnes) was sent overseas for reprocessing. Relatively small quantities (0.1 million tonnes) were sent interstate for reprocessing.

Almost all (98 per cent) reprocessing of waste from the C&D waste stream occurred within WA, with recovered materials primarily used in construction-related activities. Recovery from the MSW stream also primarily (65 per cent) occurred in WA, with garden waste and FOGO materials used to produce compost and other soil enhancing products. In contrast, waste recovery from the C&I waste stream was dominated by scrap metal recovery and most (74 per cent) was exported from WA.

The destinations of recovered waste by material type are represented graphically in Figure 12.

Material recovery quantities, sources and destinations can be accessed from the [waste data portal](#) on the Waste Authority website.

Waste stream	Final processing in Western Australia		Interstate		Exported		All recovered
	Tonnes	Destination %	Tonnes	Destination %	Tonnes	Destination %	
MSW	293,618	65	42,489	9	114,470	25	450,578
C&I	162,406	18	71,216	8	673,386	74	907,008
C&D	2,765,003	98	1,504	0	64,766	2	2,831,273
Total	3,221,027	77	115,209	3	852,622	20	4,188,859

Table 7 Destination of recovered materials by waste stream (tonnes)

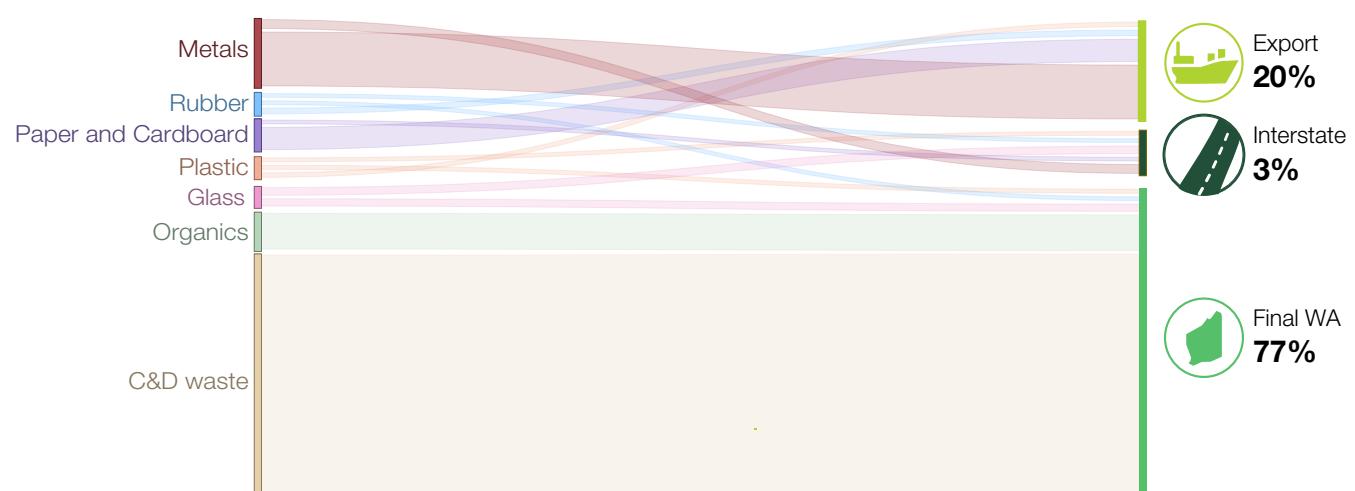


Figure 12 Waste recovery flows by processing destination and material category

## Regulated waste exports

Since 2021, exports of scrap glass, plastics and tyres have been regulated under the *Australian Recycling and Waste Reduction Act 2020*. Exports of paper and cardboard will be regulated under the Act from July 2024.

The regulations aim to ensure that exported waste is ready for use as a product, to prevent waste from being dumped overseas, reducing harm to the environment and human health. Concurrently, the Australian Government has partnered with state governments to invest in building capacity for local recycling.

MRFs reported in 2021–22 that market conditions for their recovered materials had weakened because of the export bans. As shown in Figure 13, there was a significant one-year decline in scrap plastic exports from 2020–21 to 2021–22. There were also declines in local reprocessing and scrap plastics sent for reprocessing interstate over the same period.

In WA, glass is typically either crushed locally or sent interstate for recovery, with little or no export. Exports of used tyres remained relatively steady over the past reporting period.

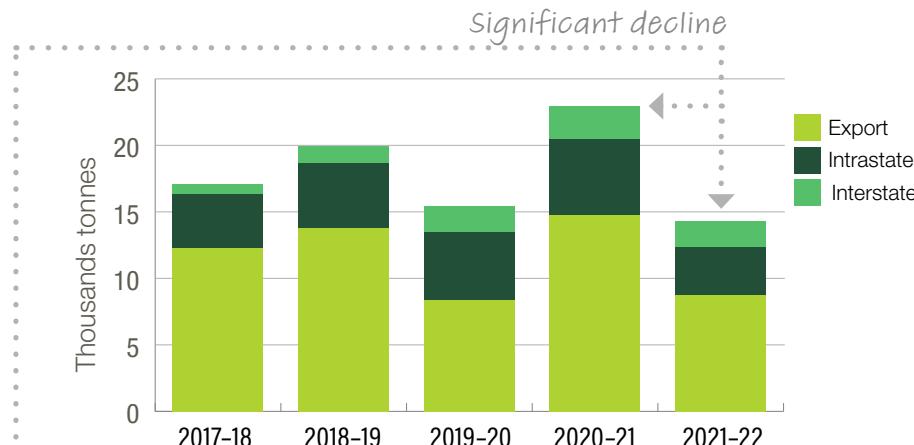


Figure 13 Destination of scrap plastics recovered in WA, 2017–18 to 2021–22

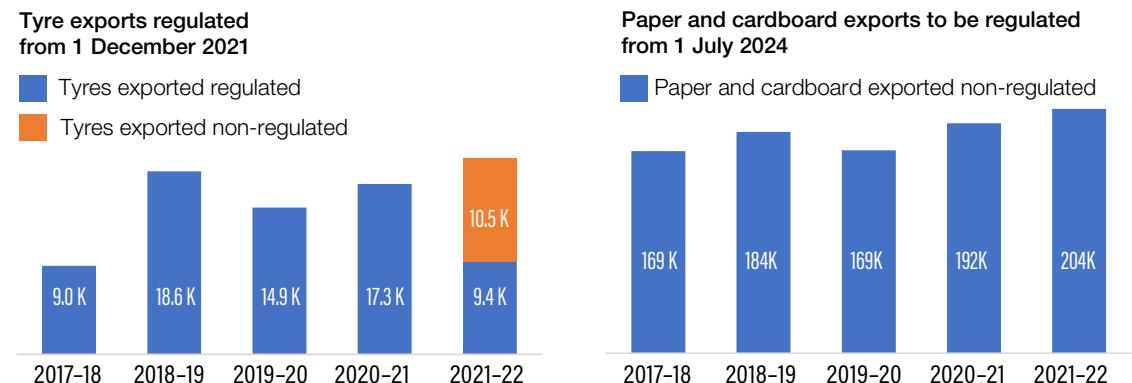


Figure 14 Tyre and paper and cardboard exports from WA, sourced from the Waste Export viewer, DCCEEW, 2023

## Energy recovery

About 43,000 tonnes of waste was recovered as energy in 2021–22. Almost all (97 per cent) of this was sourced from the C&I sector. About 60 per cent was recovered as tyre-derived fuel and most of the remainder was recovered as biogas.

There are two ‘waste to energy’ plants under construction in the Perth region. Once operational, these plants will significantly increase the amount of waste recovered as energy.

Waste to energy is not included as material recovery in the previous sections of this report (except Table 7). It is included in the calculation of waste generation.

Landfill gas capture has not been included in the estimate of energy recovery from waste.

Avoid, recover  
and protect! /



# Focus on e-waste

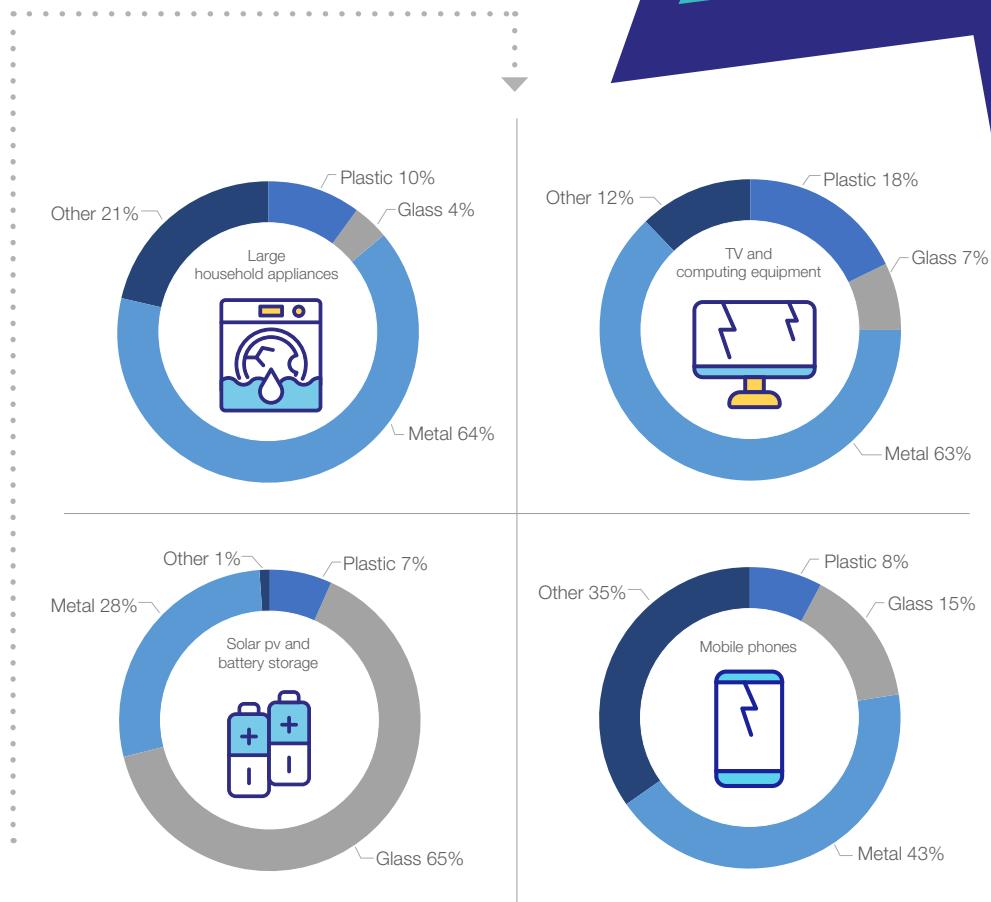
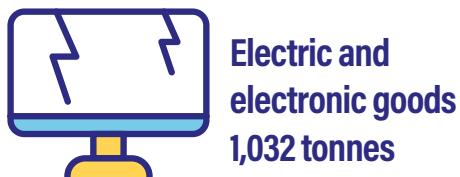
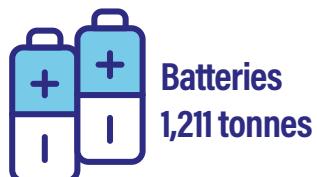
E-waste includes end-of-life electrical, electronic, and battery-powered items such as screens, lighting, appliances, batteries and photovoltaics (PV). In the past decade, e-waste generation has more than doubled each year and e-waste is currently one of the fastest-growing waste streams worldwide.

A recent report commissioned by the department investigated the flow of e-waste in WA. This report estimated about 69,000 tonnes of e-waste was generated in 2019–20 (excluding batteries and PV), with only 19,000 tonnes recovered. Nationally, it is estimated 20 kilograms of e-waste per capita was generated during that time. This was expected to rise to 23 kilograms per capita by 2023.

To improve the management and recycling of the e-waste produced in WA, the State Government is delivering a statewide ban on e-waste disposal to landfill by 2024. Data collected as part of the ban's implementation is anticipated to provide a clearer picture of e-waste collection and recycling activities in the state.

The waste data reporting regulations that underpin this report are focused on material recovery and are not designed to comprehensively capture the recovery of 'product' wastes such as e-waste. Rather, in this report, the recovery of e-waste will mostly be captured in the material recovery of metals, plastics and glass. Typical material compositions of some e-waste categories are shown right.

- WA local governments provide data on their e-waste collection services. In 2021–22 local governments reported they collected these specific e-waste types for recycling as below.



# Material recovery rate

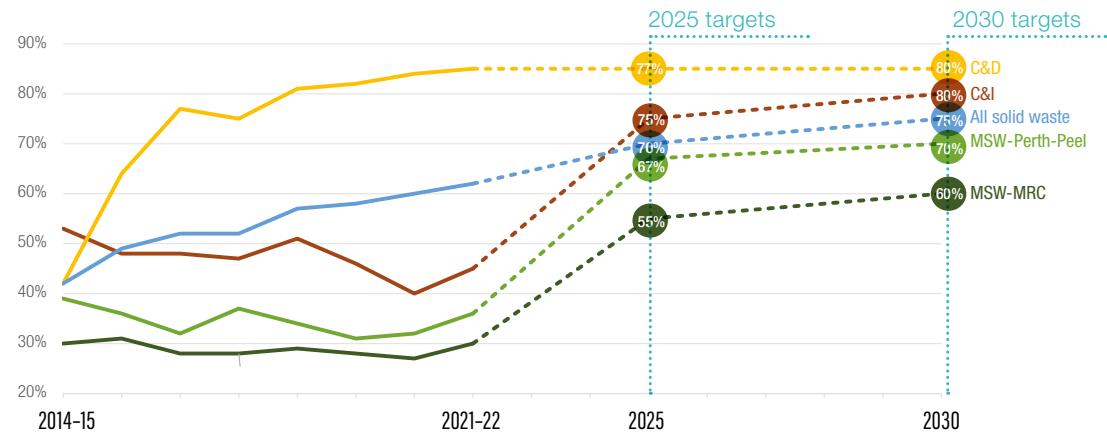
The material recovery rate for solid waste in WA in 2021–22 was 62 per cent, an increase of 2 per cent from 2020–21.

Figure 15 shows the trends in material recovery rates since 2014–15 against the 2025 and 2030 recovery targets in the waste strategy. There has been a rise in recovery rates for the overall waste stream and for the C&D waste stream. Until 2018–19, these increases were driven by falling reported C&D waste disposal amounts rather than reported increases in material recovery. The introduction of mandatory reporting in 2019–20 saw a significant increase in reported material recovery from the C&D waste stream and associated recovery rates.

The material recovery rate for the C&D waste stream has exceeded the 2030 target for the past three reporting periods. However, this is most likely influenced by stockpiles of unprocessed waste (as discussed in the stockpiles section of this report).

Material recovery rates in the MSW and C&I waste streams have not shown any sustained improvements since 2014–15. Improvement in material recovery rates in these sectors is required to meet waste strategy targets. The waste strategy's goal to transition all local governments in the Perth and Peel regions to three-bin FOGO systems by 2025 is designed to meet the 2025 Perth and Peel MSW recovery target. For example, local governments with well-established three-bin FOGO systems achieved overall recovery rates of up to 66 per cent in 2021–22.

The MSW material recovery rate for major regional centres has not shown any sustained improvement since 2014–15. Two major regional centres – the City of Bunbury and the City of Albany – have introduced FOGO systems and reported that their kerbside systems achieved the 2025 target recovery rate of 55 per cent in 2021–22.



**Figure 15 Material recovery rates against the waste strategy targets.**

Note: prior to 2019–20, material recovery rates included waste recovered as energy

# Stockpiled waste

Recyclers reported 2.19 million tonnes of waste was stockpiled as at 30 June 2022 (Table 8). Most of this (91 per cent) was C&D waste. The quantity of waste stockpiled at liable persons' facilities has increased by 310,000 tonnes since reporting commenced in 2019–20 (Figure 16). Over the most recent reporting period, reprocessed stockpiles at liable persons' facilities decreased by 92,000 tonnes, while 161,000 tonnes of waste was added to unprocessed stockpiles.

Materials in unprocessed stockpiles are not included in waste generation calculations until they are either processed or disposed. As mentioned in previous sections, these stockpiles may be influencing the C&D waste stream's reported material recovery rate.

Material category	General and organic recyclers		MRF (t)	Total (t)
	Reprocessed (t)	Unprocessed (t)		
C&D waste	848,060	1,145,156		1,993,216
Metals	71,800	14,744	322	86,866
Organics	72,992	12,260		85,252
Glass	4,916	2,637	242	7,795
Rubber	743	6,669		7,412
Other	5,230	700	1,261	5,930
Paper and cardboard	133	254		1,648
Plastic	45	22	301	368
Bulky Wastes	254	97		351
Total	1,004,173	1,182,539	2,126	2,188,838

Table 8 Stockpiled waste at liable persons' facilities as of 30 June 2022

Figure 17 provides a breakdown of the stockpiled C&D material types. The most common stockpiled material is 'mixed C&D waste', with 793,000 tonnes of mixed C&D waste waiting to be processed at 30 June 2022. Large quantities of reprocessed sand/soil are also stockpiled. Although there is generally a strong demand for recycled C&D waste products, recyclers have reported that the market for sand/soil can be slow because of buyer hesitancy about the recycled product.

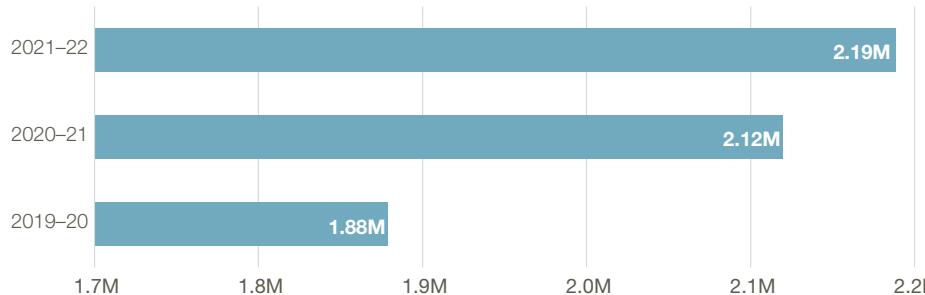


Figure 16 Tonnes of stockpiled C&D materials at 30 June 2022

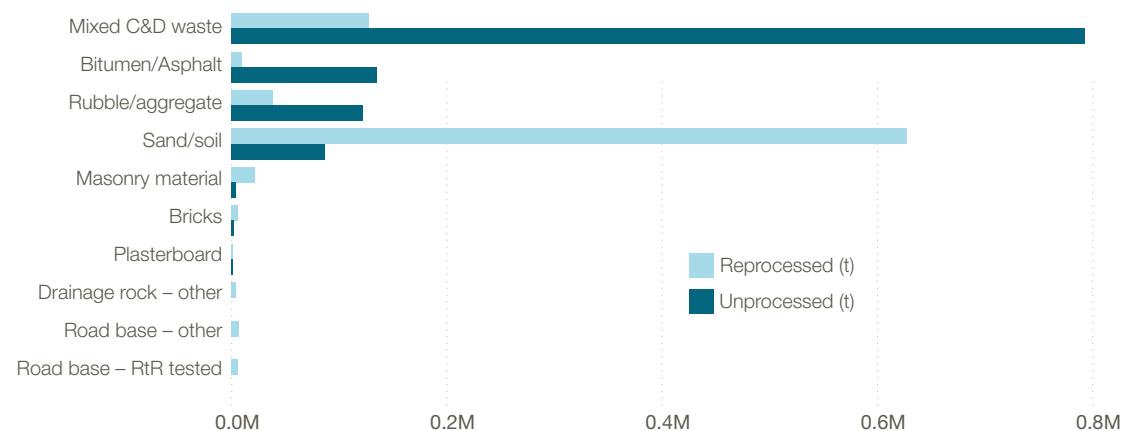


Figure 17 Tonnes of stockpiled materials at the end of each reporting period

# Domestic waste

## Domestic waste and MSW

Domestic waste makes up most of the municipal waste stream. Local governments are the key providers of services to collect and recover domestic waste. In 2021–22, 144 local governments and regional councils in WA reported to the department on the waste services they provided to their residents and the quantities of waste they collected and recovered.

- These are the local governments with the highest overall recovery rates!

Local government	Collected (t)	Recovered (t)	Overall recovery %	Kerbside collection systems
City of Melville	46,691	30,656	66	Three bins – FOGO
City of Albany	19,898	13,029	65	Three bins – FOGO
Town of Bassendean	7,276	4,517	62	Three bins – FOGO
Town of East Fremantle	3,611	2,232	62	Three bins – FOGO
Town of Cambridge	16,449	9,176	56	Three bins – GO <sup>1</sup>

Table 9 Top five performing local governments by overall domestic waste recovery rates (includes all waste services; i.e. kerbside, vergeside and drop off)

<sup>1</sup> GO = Garden organics only

## Domestic waste collected and recovered

Local governments reported that providing waste and recycling services to their residents cost them \$382 million in 2021–22.

In 2021–22, local governments collected 1.49 million tonnes of domestic waste from their residents and reported a 34 per cent material recovery rate. Overall, material recovery was higher in the Perth and Peel regions (37 per cent) compared with other regions in the state (26 per cent).

Four local governments that provided their residents with kerbside FOGO collections achieved recovery rates greater than 60 per cent in 2021–22. The local governments with the highest overall recovery rates are shown in Table 9.

The amount of domestic waste collected by local governments in WA has remained relatively stable since 2014–15, with a relatively steady but small decline in the amount of domestic waste collected per capita (Figure 18).

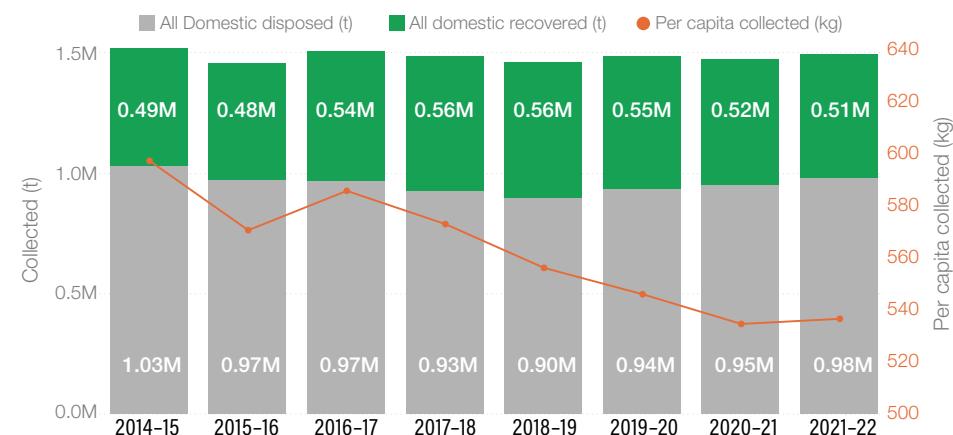


Figure 18 Total domestic waste collected (shown by recovered or disposed fate) and per capita domestic waste collected in WA since 2014–15

Figure 19 shows that most domestic waste was collected through kerbside services (67 per cent), followed by waste that residents dropped off to specialist collection facilities provided by local governments (25 per cent). Smaller quantities were collected from bulk garden and bulky waste verge services (8 per cent), public place bins and special events services (1 per cent).

## Containers for Change

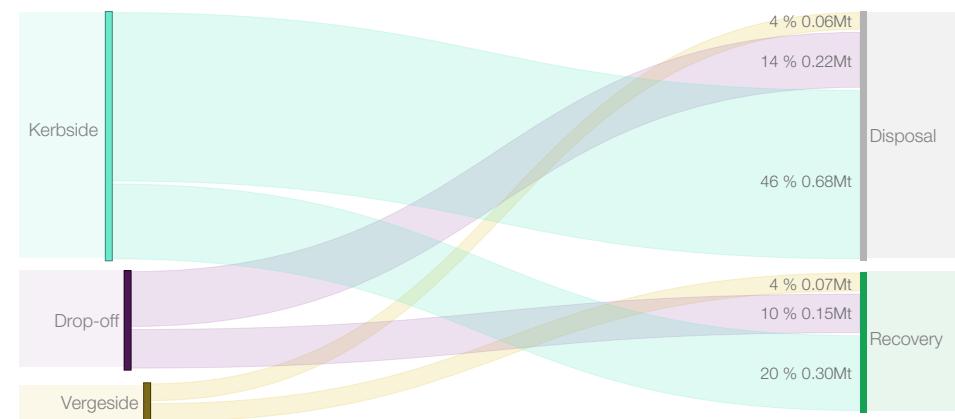
Under WA's Containers for Change container deposit scheme (CDS), eligible drink containers can be taken to refund points for a 10-cent refund per container. In 2021–22, 50,000 tonnes of eligible containers were collected at refund points for recycling.

Only a small proportion of these tonnes were collected at refund points operated by local governments. The removal of eligible containers from kerbside collections has a downward impact on the overall domestic recovery rate in this report. In 2021–22, the magnitude of that impact is estimated as one percentage point. That is, if CDS containers were collected from the kerbside at the same rate they were collected prior to the CDS, the 2021–22 domestic recovery rate would increase to approximately 35 per cent.

CDS tonnes will still be captured in the overall recovery data reported in early sections of this report.

## Regional sources of domestic waste

Local governments in the Perth and Peel regions collected 73 per cent of all domestic waste. The recovery of waste per capita was similar across the regions, but disposal to landfill per capita was 87 per cent higher outside the Perth and Peel regions (Table 10).



**Figure 19 Waste collected and fate by service category.** Labels show tonnes of flow and proportion (%) of total collected domestic waste. Waste collected from public places and special events is not shown.

Waste stream	Perth and Peel regions	Non-metropolitan regions	Western Australia
Domestic waste (kg) recovered per capita	184	190	185
Domestic waste (kg) landfilled per capita	308	529	350
Recovery rate	37%	26%	34%

**Table 10 Sources and fates of domestic waste collected by local governments in 2021–22**

## Kerbside services

Local governments collected 981,000 tonnes of domestic waste through kerbside services in 2021–22 and recovered 298,000 tonnes (30 per cent) of materials from the stream. Kerbside waste collections provide the largest potential for future increases in material recovery (see Figure 19).

In 2021–22, 98 per cent of the population had at least one kerbside waste service, and 94 per cent were provided with a comingled recycling service (yellow-lid bin). Fifteen per cent of the population was provided with a FOGO bin and 30 per cent with a garden organics (GO) bin.

Figure 20 shows the waste recovery and disposal for each type of kerbside service provided by local governments in 2021–22. Reporting showed 63 per cent, or 615,000 tonnes, of the domestic waste collected from kerbsides

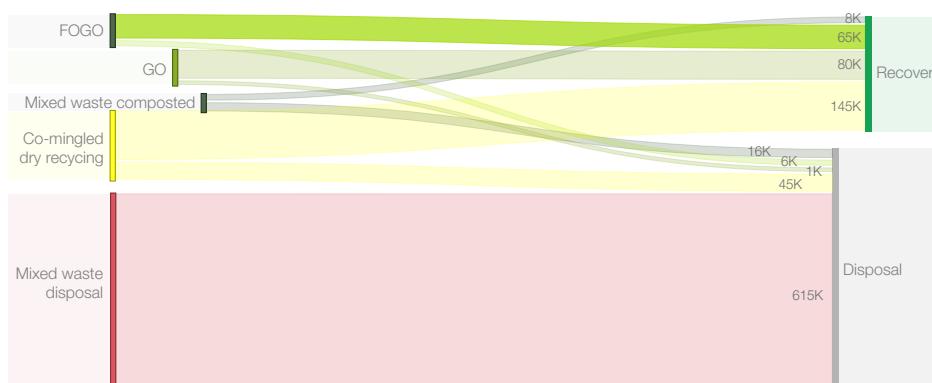


Figure 20 Kerbside services, recovery and disposal, with flow tonnes and recovery rates (%)

was transported directly to landfill (red-topped bin), showing an opportunity for further recovery of resources from this service category.

The best performing kerbside system for material recovery in 2021–22 was the three-bin system that enabled recovery of FOGO materials. Three-bin FOGO systems had an average recovery rate of 54 per cent, compared with only 15 per cent for two-bin systems without organics composting. • • • • •

Figure 21 shows the mean and range of reported recovery rates of kerbside systems in 2021–22.

Further information about local government services for domestic waste collection is provided in Appendix B. Performance data for individual local governments can also be accessed from the waste data portal on the Waste Authority [website](#).

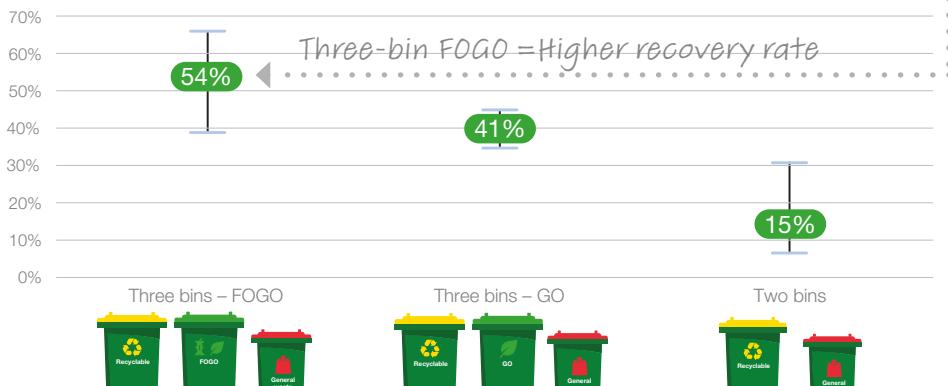


Figure 21 Mean, maximum and minimum recovery rates for kerbside systems in 2021–22

## Local government waste plans

### Materials recovered from the kerbside

In 2021–22, the largest quantity of waste recovered from kerbside services by material type was 126,000 tonnes of garden organics. The second largest quantity of waste recovered by material type was 88,000 tonnes of paper and cardboard. Materials commonly recovered from kerbside services are shown in Figure 22.

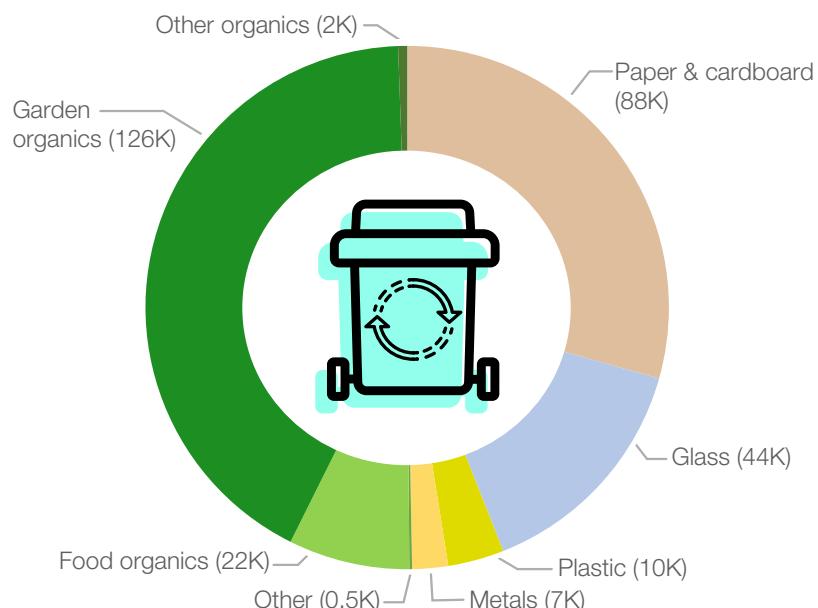


Figure 22 Composition of materials recovered from kerbside services in 2021–22 (tonnes)

Local governments in the Perth and Peel regions and major regional centres of WA (Cities of Albany, Busselton, Bunbury, Greater Geraldton and Kalgoorlie-Boulder; and Bunbury-Harvey Regional Council) submitted their first waste plan annual reports to the department in 2022. The reports set out the progress that each local government has made in implementing their waste plans during the 2021–22 financial year. The information in waste plan annual reports is used to assess whether local governments are delivering their waste services consistent with the waste strategy and making progress towards waste strategy targets.

The waste strategy includes a target for all local governments in the Perth and Peel regions to provide consistent three-bin kerbside collection systems that include separation of FOGO from other waste materials by 2025. In their 2021–22 waste plan annual reports:

- Eight local governments in the Perth and Peel region (and two local governments from major regional centres) reported completing the delivery of FOGO services to their residents.
- Twelve local governments in the Perth and Peel region (and one local government from a major regional centre) have committed to providing a FOGO service by 2025.
- Thirteen local governments in the Perth and Peel region (and two local governments from major regional centres) have not yet committed to implementing FOGO but are assessing the feasibility of providing a FOGO service by 2025.

Figure 23 shows the FOGO status of the local governments in the Perth and Peel region.

The waste strategy recognises that energy recovery via waste to energy technologies is a preferable alternative to waste disposal to landfill. Consistent with circular economy principles, to maximise recovery, only residual waste that remains after better practice source separation approaches (such as FOGO) have been implemented should be used for energy recovery.

Modelling recently commissioned by the Waste Authority found that high performing three-bin FOGO kerbside services can achieve material recovery rates of about 75 per cent, or 79 per cent if waste to energy is used to process the genuine residual waste that remains unrecovered. The strategy includes an energy recovery target that energy is to only be recovered from residual waste from 2020.

In their 2021–22 waste plan annual reports:

- Eleven local governments reported that they have waste to energy contracts in place and expect to recover energy from residual waste, via waste to energy processes, consistent with the waste strategy target.
- Twelve local governments reported that they have waste to energy contracts in place; however, their ability to deliver these consistent with the waste strategy will depend on the outcome of their FOGO feasibility assessments and their ability to implement FOGO by 2025. Discussions with these local governments on how they might achieve consistency with the waste strategy are ongoing.
- Three local governments reported that they were investigating the feasibility of implementing energy recovery via waste to energy processes.
- Twelve local governments have reported that they do not have current waste to energy commitments.



Figure 23 FOGO status of the local governments in the Perth and Peel region

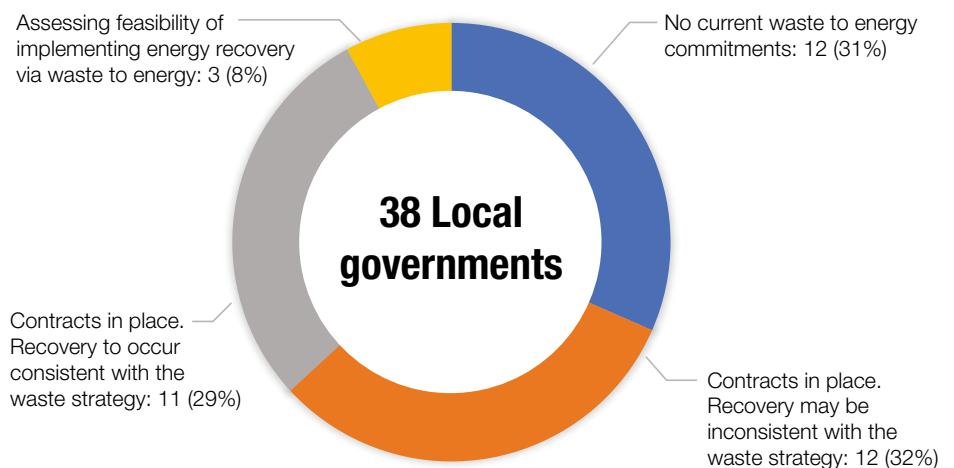


Figure 24 Waste to energy commitments reported in 2021–22 waste plan reports

## Information reported by local governments in 2021–22 waste plan annual reports

The most commonly implemented actions reported related to education and communications, infrastructure, the delivery of waste services, data and litter and illegal dumping. Table 11 identifies the number of local governments implementing actions in these categories and provides examples of the most common types of actions implemented.

Action categories	Local governments implementing relevant actions (number and proportion of all local governments)	Examples of actions implemented
Education and communication	39 (90%)	<ul style="list-style-type: none"><li>• Developing and implementing education and engagement strategies and tools</li><li>• Conducting workshops with residents</li><li>• Delivering schools waste education programs</li><li>• Appointing waste education staff</li><li>• Implementing the WasteSorted toolkit</li></ul>
Data	35 (81%)	<ul style="list-style-type: none"><li>• Conducting waste and data audits</li><li>• Implementing improved data collection and management systems and procedures</li><li>• Improving waste separation data for commercial and domestic waste collections</li><li>• Tracking waste generation rates and progress towards waste strategy recovery targets</li></ul>
Litter and illegal dumping data	26 (60%)	<ul style="list-style-type: none"><li>• Strategy development and implementation</li><li>• Implementing behaviour change measures</li><li>• Exploring and implementing technology solutions</li></ul>
Waste services	25 (58%)	<ul style="list-style-type: none"><li>• Reviewing and improving bulk waste, drop-off and vergeside services</li><li>• Optimising waste services contracts</li><li>• Improving hazardous waste collection services</li></ul>
Infrastructure	11 (25%)	<ul style="list-style-type: none"><li>• Reviewing/upgrading waste infrastructure, facilities and technology</li><li>• Installing reuse shops at waste facilities</li><li>• Implementing community recycling hubs and improved public collection bins</li><li>• Providing better infrastructure for collecting hazardous waste and recyclable materials</li></ul>

Table 11 Common actions implemented by local governments, reported in 2021–22 waste plan reports

# Glossary

Term	Definition
C&I	Commercial and industrial waste. Waste that is produced by institutions and businesses, including offices, schools, restaurants, retail and wholesale businesses and industries such as manufacturing. Also includes waste from primary and secondary production, such as mining and minerals processing.
C&D	Construction and demolition waste. Waste produced by demolition and building activities, including road and rail construction and maintenance, and excavation of land associated with construction activities.
Department	The Department of Water and Environmental Regulation.
Disposal	All waste buried in landfill or incinerated without energy capture. This includes waste material used as daily cover at landfills and waste exempt from the waste levy where that waste is used onsite. For the purposes of reporting, this is reported as a wet weight.
Domestic waste	Waste collected by local governments from households.
Drop off services	These are waste collection facilities where residents can bring their waste or recyclables for disposal or recovery. They are often located at a landfill or transfer station.
Energy recovery	Processes through which wastes are collected, sorted and processed to recover the energy embodied in waste. For the purposes of reporting, this is reported as a wet weight.
FOGO	Food organics and garden organics.
GO	Garden organics.

Term	Definition
Kerbside services	A regular (typically weekly or fortnightly), containerised (for example, wheelie bin) collection service that collects waste from a resident's kerbside.
Liable persons	Liable persons are defined under regulation 18B of the WARR Regulations and are required to submit an annual return under regulation 18C of the WARR Regulations.
Local government	A local government defined under section 1.4 of the <i>Local Government Act 1995</i> . For the purposes of waste reporting, the local government provides waste services and includes regional local governments.
Material recovery	The materials extracted from processing waste (does not include recovered energy). Also commonly referred to as recycling.
Material recovery rate	The percentage of material recovery divided by waste generation.
MRF	Materials recovery facility. A facility that sorts, aggregates and bales mixed recovered materials (comprising mainly packaging) prior to reprocessing.
MSW	Municipal solid waste. Solid waste generated from domestic (residential) premises and local government activities.
Organic waste	Waste that is derived from biotic processes. Includes food, garden organics, wood and biosolids. Typically excludes paper and cardboard, textiles, rubber, leather and nappies, but may include them under some circumstances.
Peel region	The Peel region is the area defined by the Peel Region Scheme (May 2013). It encompasses the City of Mandurah and the shires of Murray and Waroona.
Perth metropolitan region	The Perth region, or Perth metropolitan region, is the area defined by the Metropolitan Region Scheme (June 2014).

Term	Definition
Recycling	<p>When solid wastes are collected, sorted, processed (including through composting), and converted into a final product or into raw materials to be used in the production of new products. For data reporting purposes, recycling:</p> <ul style="list-style-type: none"> <li>• excludes materials in stockpiles of unprocessed waste materials</li> <li>• includes all materials processed for recycling, whether they are quickly sold or used, or stockpiled for later sale or use</li> <li>• excludes residuals that are sent to landfill or otherwise disposed of.</li> </ul>
Regional council	A regional local government established under section 3.61 of the Local Government Act.
Regional local government	See regional council.
Reportable waste	Waste that is considered solid matter under regulation 18A of the WARR Regulations.
Reprocessing	Secondary processing of waste (generally size reduction) to make raw materials to be used in the production of new products or direct use.
Recovery rate	The percentage of recovery divided by the weight of waste generated.
Scrap	A generic term for unprocessed recyclable waste materials.
Stockpiled	Waste or waste products temporarily stored for future sale, resource recovery or disposal.
Vergeside service	Bulk waste services that are infrequent (typically every 4–6 months or on demand), where material is collected from residential vergesides. Can be non containerised or via a skip bin provided by the local government.

Term	Definition
WA	Western Australia.
WARR Regulations	Waste Avoidance and Resource Recovery Regulations 2008.
Waste generated/generation	The sum of waste recovered plus waste disposed.
Waste strategy	Waste Avoidance and Resource Recovery Strategy 2030.
Waste plans	All local governments and regional councils in the Perth and Peel regions and major regional centres (Cities of Albany, Busselton, Bunbury, Greater Geraldton and Kalgoorlie Boulder; and Bunbury Harvey Regional Council) that provide waste services are required to prepare a waste plan, under the <i>Waste Avoidance and Resource Recovery Act 2007</i> (WARR Act), outlining how waste services will be managed to achieve consistency with the waste strategy and protect public health and the environment.
Residual waste	Waste that remains after the application of a better practice source separation process and recycling system, consistent with the waste hierarchy as described in section 5 of the WARR Act. Where better practice guidance is not available, an entity's material recovery performance will need to meet or exceed the relevant stream target (depending on its source – MSW, C&I or C&D) for the remaining non recovered materials to be considered residual waste under the waste strategy.
Recovery	The process of extracting materials or energy from a waste stream through reprocessing, recycling or recovering energy from waste. For the purposes of reporting, this is reported as a wet weight.

# References

- Australian Bureau of Statistics (2021), Regional population, ABS Website, accessed 23 February 2023.
- Blue Environment 2023, [\*National Waste Report 2022\*](#), The Department of Climate Change, Energy, the Environment and Water.
- Blue Environment 2023, "Australian plastic flows and fates 2021–22 – Western Australia" (unpublished). Prepared for the Department of Water and Environmental Regulation.
- Bontinck PA, Bricout J, Grant T and Legoe G (2021) Eproduct stewardship in Australia: Evidence report. Prepared for the Commonwealth Department of Agriculture, Water and the Environment.
- Department of Climate Change, Energy, the Environment and Water, [\*Waste Export Data Viewer DCCEEW\*](#), accessed 8 March 2023.
- Department of Water and Environmental Regulation 2021, [\*Waste and recycling in Western Australia 2019–20\*](#).
- Department of Water and Environmental Regulation 2022, [\*Waste and recycling in Western Australia 2020–21\*](#).
- WA Return Recycle Renew, 2021, Quarterly Report (1 July – 30 September 2022 & 1 October – 31 December 2022), [warrl.com.au/reportingagreements/](http://warrl.com.au/reportingagreements/)
- WA Return Recycle Renew, 2022, Quarterly Report (1 January – 31 March 2022 & 1 April – 30 June 2022), [warrl.com.au/reportingagreements/](http://warrl.com.au/reportingagreements/)
- Waste Authority 2018, [\*Waste avoidance and resource recovery strategy 2030\*](#).

A total of 4.2 million tonnes of waste was recovered in 2021–22, which is an increase of 10 per cent from the previous year.



# Appendix A: Methodology

## Data sources

### Waste Avoidance and Resource Recovery Regulations r.18C: annual returns

Regulation 18C of the Waste Avoidance and Resource Recovery Regulations 2008 (WARR Regulations) requires liable persons to report certain waste and recycling data annually to the Department of Water and Environmental Regulation (the department) in accordance with approved procedures. The annual returns are lodged through an online portal. Ninety-six liable recyclers, 14 liable landfills, 139 local governments and five regional councils lodged an 18C return for the 2021–22 reporting period.

The approved procedures for liable persons are available from the department's [website](#).

### Waste levy data

Data collected by the department through administering the waste levy was used to estimate the disposal of waste generated in the Perth metropolitan region. This data included waste levy quarterly returns, waste levy exemptions and other supporting landfill records.

### Waste exports

Waste export data is used to supplement recycling data for the metals, paper and cardboard and textiles material categories. The export data was obtained from the Department of Climate Change, Energy, the Environment and Water's [Waste Export Data Viewer](#), extracted on 30 January 2023.

### Plastic recycling

Plastic recycling data was obtained both directly from recyclers and supplemented with draft data collected for the *Australian plastic flows and fates 2021–22 – Western Australia* report, which is prepared for the department by Blue Environment. The draft plastic data is subject to change; the final data may be incorporated into other data products.

### Garden waste

Organic waste is commonly collected, mulched and composted by different recyclers, with the processed materials becoming different ‘products’ at various points of the cycle. Previous audits have identified additional quantities of recovered garden waste not reported in 18C annual returns. These quantities were collected through a voluntary survey and incorporated into the data presented in this report.

### Population

Population data for 2014–15 to 2020–21 was sourced from the Australian Bureau of Statistics as Regional Population (Estimated Resident Population). Population for 2021–22 was estimated using a linear projection. The number of domestic premises was sourced from Australian Bureau of Statistics as occupied private dwellings. Linear projections were used to estimate intercensal years and forecast future dwellings.

## Waste material categories

All liable persons under the WARR Regulations reported recycling and landfill data against the waste material categories and types specified in the approved procedures. These categories and types have been consolidated in some figures and tables in the report to improve presentation.

## Estimates made for material disposal

The quantity of waste disposed of to landfill by material type was estimated using composition data from the [National Waste Report 2022](#) (Blue Environment 2023), which was applied to reported and estimated disposal data.

## Estimates made for waste disposal outside the Perth metropolitan area

The quantity of waste disposed of to landfill outside of the Perth metropolitan area was estimated by calculating per capita waste stream disposal rates for assumed catchment areas for liable non-metropolitan landfills and then applying those rates across the entire regional population.

## Estimates made for some local governments

Under the WARR Regulations' approved procedures for liable persons, there are special provisions for non-metropolitan local governments with populations of less than 1,500. Under these special provisions, the department estimated the quantity of waste collected, recovered and disposed of for at least one waste service for 44 local governments.

The estimates were based on the defaults in the approved procedures, and averages calculated from data obtained from the local government waste and recycling census which ran prior to 2019–20. The waste and recycling census reports are available for download from the Waste Authority's [website](#).

## Exported recyclables

All recyclable materials exported were assumed 100 per cent recovered. These quantities may include contaminants subsequently removed at the destination facility.

## Waste generation and recovery rate calculation

Waste generation has been calculated as the sum of disposed waste and recovered waste. No other waste fates, such as long-term storage, have been included.

The recovery rate has been calculated as recovered waste divided by waste generation.

Material recovery does not include waste reported as recovered as energy.

# Data quality

## Measurement

Liable recyclers are required to report how they measured the quantity of reportable waste. In 2021–22, 30 per cent of reported recovered waste was weighed, 69 per cent was assessed by volume and the remainder was estimated using alternative methodologies.

The quantity of disposed waste arising from the Perth metropolitan region was estimated from records submitted with landfill levy returns. Ninety-eight per cent of this reported waste was weighed.

The quantity of disposed waste arising from the Peel region was determined from liable non-metropolitan landfills. Ninety-six per cent of waste reported by liable non-metropolitan landfills was weighed. Waste disposal outside the Perth and Peel regions was estimated on a per capita basis and is subject to a higher degree of uncertainty than directly reported disposal and recovery.

## Audits

All annual returns were reviewed by department officers for completeness and consistency. Audits of eight liable recycler 2021–22 annual returns were also completed. The audit findings were incorporated into this report.



## Comparability to previous reports

Data collected under regulation 18C of the WARR Regulations is presented in this report alongside data voluntarily reported to the department prior to 2019–20. The introduction of mandatory reporting resulted in additional reporters and any increases in tonnes of recovery may represent activity that was ongoing but not reported prior to mandatory reporting.

Waste disposal includes some waste that is disposed of to landfill but exempt from the waste levy. Metropolitan disposal shown in this report from 2019–20 onwards includes some waste disposal that was exempt from the levy which may not have been captured in previous years.

While the number of reporting local governments has increased with mandatory reporting, the populations of non-reporting local governments under the voluntary surveys were typically small. Consequently the domestic waste data presented in this report is considered comparable to data contained in *The census of Western Australian local government waste and recycling services* series of reports.

## Waste stream reporting

Under the approved procedures, liable recyclers and non-metropolitan landfills are required to record the source waste stream of waste received. Liable persons are directed to record the waste stream from which the waste generated where possible. In practice, the waste stream in which waste is collected is often recorded.

## Stockpiles

Tonnes of stockpiled waste presented in this report only include waste stored at liable persons' premises. No attempt has been made to estimate the quantity of waste stored elsewhere.

# Appendix B: Waste and recycling services provided by local governments to residents

Kerbside services	Region	Collected (t)	Recovered (t)	Recovery rate (%)	Residents provided with service (%)
Mixed waste collected and transported to landfill directly or via a transfer station	Western Australia	614,673	32	0	98
	Non-metropolitan (other) region	141,585	32	0	93
	Peel region	35,379	0	0	98
	Perth metropolitan region	437,709	0	0	100
Comingled dry recycling	Western Australia	190,195	145,198	76	94
	Non-metropolitan (other) region	31,533	24,131	77	72
	Peel region	8,104	6,113	75	98
	Perth metropolitan region	150,558	114,954	76	100
Garden organics only	Western Australia	80,843	79,960	99	30
	Non-metropolitan (other) region	130	0	0	0
	Peel region	0	0	N/A	0
	Perth metropolitan region	80,713	79,960	99	39
Combined food organics and garden organics	Western Australia	71,392	65,1290	91	15
	Non-metropolitan (other) region	26,382	25,650	97	28
	Peel region	0	0	N/A	0
	Perth metropolitan region	45,010	39,479	88	13
Mixed waste collected and processed in a composting facility	Western Australia	24,114	7,970	33	25
	Non-metropolitan (other) region	0	0	N/A	0
	Peel region	0	0	N/A	0
	Perth metropolitan region	24,114	7,970	33	33

Vergeside services	Region	Collected (t)	Recovered (t)	Recovery rate (%)	Percentage of population provided with a service
Domestic green waste vergeside collection services	Western Australia	47,726	47,249	99	82
	Non-metropolitan (other) region	3,037	2,563	84	28
	Peel region	3,276	3,276	100	95
	Perth metropolitan region	41,413	41,410	100	96
Domestic hard waste vergeside collection services	Western Australia	75,040	15,659	21	83
	Non-metropolitan (other) region	4,440	599	13	29
	Peel region	3,656	827	23	98
	Perth metropolitan region	66,944	14,233	21	96
Specific product vergeside collection (e.g. white goods, mattresses, e-waste)	Western Australia	3,081	2,694	87	41
	Non-metropolitan (other) region	228	130	57	2
	Peel region	78	78	100	3
	Perth metropolitan region	2,774	2,485	90	53

Public place and special events services	Region	Collected (t)	Recovered (t)	Recovery rate (%)
Waste (garbage)	Western Australia	20,354	428	2
	Non-metropolitan (other) region	7,055	24	0
	Peel region	1,454	0	N/A
	Perth metropolitan region	11,845	404	3
Recycling	Western Australia	624	528	85
	Non-metropolitan (other) region	192	148	77
	Peel region	0	0	N/A
	Perth metropolitan region	432	380	88

Dropoff services	Region	Collected (t)	Recovered (t)	Recovery rate (%)
Mixed waste drop-off facilities	Western Australia	198,857	17,005	9
	Non-metropolitan (other) region	116,180	1,345	1
	Peel region	9,829		
	Perth metropolitan region	72,848	15,660	21
Dry recyclables drop-off (includes paper/ cardboard, packaging containers)	Western Australia	6,906	6,552	95
	Non-metropolitan (other) region	2,905	2,551	88
	Peel region	402	402	100
	Perth metropolitan region	3,599	3,599	100
Green waste drop-off	Western Australia	83,481	74,499	89
	Non-metropolitan (other) region	33,300	24,674	74
	Peel region	5,592	5,236	94
	Perth metropolitan region	44,589	44,589	100
Hard waste or bulk rubbish drop-off	Western Australia	57,087	33,222	58
	Non-metropolitan (other) region	24,651	17,520	71
	Peel region	3,761	3,598	96
	Perth metropolitan region	28,674	12,104	42
Container deposit depot	Western Australia	2,973	2,973	100
	Non-metropolitan (other) region	1,239	1,239	100
	Peel region	0	0	N/A
	Perth metropolitan region	1,733	1,733	100
Waste recovered for sale at a tip shop	Western Australia	6,201	6,120	99
	Non-metropolitan (other) region	985	914	93
	Peel region	0	0	N/A
	Perth metropolitan region	5,216	5,206	100
Other	Western Australia	10,525	9,109	87
	Non-metropolitan (other) region	4,775	3,361	70
	Peel region	11	11	100
	Perth metropolitan region	5,739	5,737	100

# Appendix C: Waste recovery, disposal, generation in tonnes by year, waste stream and region

	Sum of Tonnes	Recovered				Energy recovery				Disposed				Generated			
		C&D	C&I	MSW	Total	C&D	C&I	MSW	Total	C&D	C&I	MSW	Total	C&D	C&I	MSW	Total
<b>2017–18</b>	Western Australia	1,135,900	747,700	509,300	2,393,000					372,300	857,800	1,023,800	2,253,800	1,508,201	1,605,498	1,533,077	4,646,800
	Non-metropolitan	171,700	254,200	104,100	530,100					243,200	416,200	331,900	991,300	414,900	670,400	436,100	1,521,400
	Perth metropolitan	964,200	493,500	405,200	1,862,900					129,100	441,600	691,800	1,262,500	1,093,300	935,100	1,097,000	3,125,400
<b>2018–19</b>	Western Australia	1,536,600	804,900	465,100	2,806,500					361,700	763,700	992,000	2,117,500	1,898,301	1,568,540	1,457,103	4,923,900
	Non-metropolitan	203,952	277,342	106,726	588,000					231,022	352,167	304,978	888,200	434,975	629,510	411,705	1,476,200
	Perth metropolitan	1,332,600	527,500	358,300	2,218,500					130,700	411,500	687,100	1,229,300	1,463,300	939,000	1,045,400	3,447,800
<b>2019–20</b>	Western Australia	2,229,861	732,490	425,342	3,387,693		34,198	350	34,548	507,259	886,135	1,009,376	2,402,770	2,737,120	1,652,823	1,435,068	5,825,011
	Non-metropolitan	190,799	253,724	78,788	523,312		6,172	62	6,234	190,247	405,033	254,845	850,125	381,046	664,929	333,696	1,379,672
	Perth and Peel	2,039,062	478,766	346,554	2,864,381		28,026	287	28,313	317,012	481,102	754,531	1,552,645	2,356,074	987,894	1,101,372	4,445,340
<b>2020–21</b>	Western Australia	2,705,596	651,683	438,474	3,795,753	1,172	39,177	212	40,561	517,618	936,378	1,087,372	2,541,368	3,224,386	1,627,238	1,526,058	6,377,682
	Non-metropolitan	124,827	204,073	82,638	411,538		5,886	59	5,945	210,526	416,609	334,871	962,006	335,353	626,568	417,568	1,379,489
	Perth and Peel	2,580,769	447,610	355,836	3,384,215	1,172	33,291	153	34,616	307,092	519,769	752,501	1,579,362	2,889,033	1,000,670	1,108,490	4,998,193
<b>2021–22</b>	Western Australia	2,831,273	907,008	450,578	4,188,859	342	41,290	1,065	42,697	512,106	1,060,353	916,579	2,489,038	3,343,721	2,008,651	1,368,222	6,720,594
	Non-metropolitan	287,160	269,283	72,560	629,003		6,502	64	6,566	226,970	420,853	239,061	886,884	514,130	696,638	311,685	1,522,453
	Perth and Peel	2,544,113	637,724	378,018	3,559,855	342	34,788	1,001	36,131	285,136	639,500	677,518	1,602,154	2,829,591	1,312,013	1,056,537	5,198,140

# Appendix D: 2021–22 local government data for the National Environment Protection (Used Packaging Materials) Measure 2011

This appendix presents additional data not in the main report to meet the requirement of National Environment Protection (Used Packaging Materials) Measure 2011 that certain local government recycling data must be published as part of the National Environment Protection Council's annual reporting requirements.

## Kerbside recycling services

Some local governments provide multiple bin sizes to residents. Only the most commonly provided bin sizes are reported below.

Service	Bin capacity (L)	Frequency	Local governments
Co-mingled dry recyclables	240	weekly	4
	240	fortnightly	93
	240	other	1
	360	fortnightly	2

## Other recycling services

Seventy-five local governments, including three regional councils, reported providing dropoff recycling services for dry recyclables to their residents. In addition, nine local governments, including one regional council also provided container deposit depots (refund points).

## Premises with kerbside recycling services

Residential: 927,000

Commercial: 29,000

(includes separated and 'mixed recycling' service types)

## Median fee per premises charged by councils for recycling services

Residential: \$107 (based on 21 responses)

Commercial: \$153 (based on 33 responses)

## Median per premises cost to councils for comingled recycling services

Residential: \$77 (estimated from 27 responses)

Commercial: \$157 (estimated from 35 responses)



## Resident participation rate in kerbside recycling services

Eighty-four per cent

### Recovery of dry recyclables dropped off by residents at facilities run by local governments

Material type	Recovered (t)
Paper and cardboard	5,749
Glass	3,068
Plastics	391
Metals – packaging	347
<b>Total</b>	<b>9,555</b>



## Waste Authority

c/o Department of Water and Environmental Regulation  
Level 7 Prime House, 8 Davidson Terrace Joondalup WA 6027

[info@wasteauthority.wa.gov.au](mailto:info@wasteauthority.wa.gov.au)

[wasteauthority.wa.gov.au](http://wasteauthority.wa.gov.au)

(08) 6364 6965

