GOVERNMENT OF WESTERN AUSTRALIA

WASTE AUTHORITY
WA...TOO GOOD TO WASTE

Waste and recycling in Western Australia 2022–23

Data and trends report

Waste Authority

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This document is available in alternative formats and languages on request to the Waste Authority.

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Introduction

This report presents data on, and trends in, waste recovery and disposal in Western Australia (WA) based on the 2022–23 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 257 liable persons for the 2022–23 reporting period, including local governments, recyclers and non-metropolitan landfills. Other data sources are detailed in the methodology (Appendix).

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 fourth report in the series.

Data published in the report is also dynamically presented in Power BI reports available on the Waste Authority's website and available for download on data.wa.gov.au.

Waste and recycling in Western Australia

2022–23 at a glance

7 million tonnes of waste generated

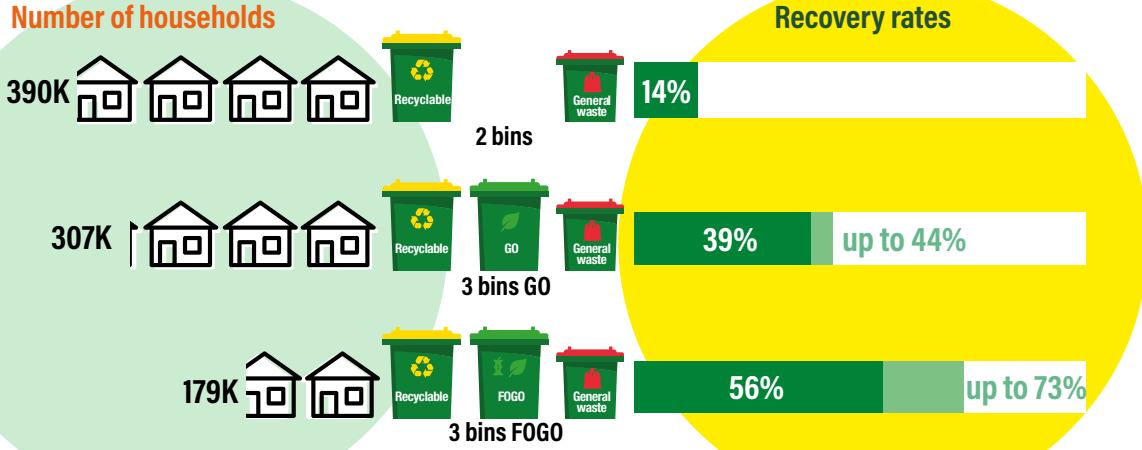
Among Perth and Peel local governments

10 provided a FOGO service

12 had committed to FOGO

11 had not yet committed to FOGO

Average kerbside recovery performance*



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

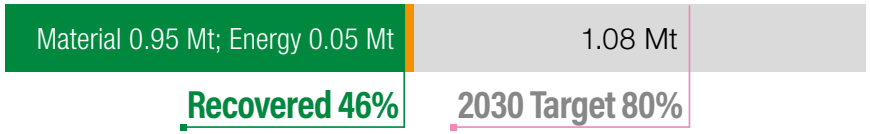
Waste strategy targets

Materials recovered | Energy recovered | Landfilled

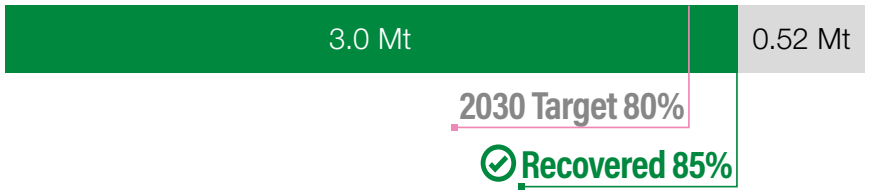
Perth and Peel MSW — Total 1.05 Mt

Major regional centre MSW — Total 0.13 Mt

Commercial and industrial — Total 2.07 Mt

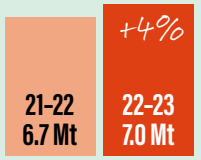


Construction and demolition — Total 3.52 Mt



Top 10 key findings

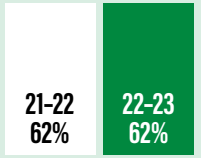
1 A total of 7.0 million tonnes of waste was generated, which is an increase of 4 per cent from the previous year.



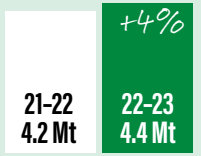
2 Half of all waste generated came from construction and demolition (C&D) activities.

3 Municipal solid waste (MSW) generation per capita was unchanged from the previous year after significant declines.

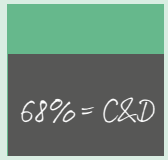
4 The overall material recovery rate remained unchanged at 62 per cent in 2022–23.



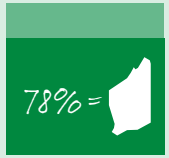
5 A total of 4.4 million tonnes of waste was recovered, an increase of 4 per cent from the previous year.



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



7 Seventy-eight per cent of materials recovered were reprocessed in WA.



8 A total of 2.6 million tonnes of waste was disposed of to landfill.

9 Local governments collected 1.5 million tonnes of waste from their residents.

10 Local governments with FOGO recovered up to 73 per cent of their kerbside waste.

Trends

In 2015, an increase in waste levy rates precipitated a significant decline in the tonnes of C&D waste sent to landfills without a corresponding rise in C&D recycling. Factors such as under-reporting by C&D recyclers, stockpiling of C&D materials and waste levy avoidance activities all contributed to a decline in C&D waste generation, a trend that was also reflected in overall waste generation.

This decline in reported waste generation was observed between 2014–15 and 2017–18, but since then waste generation has increased to 7 million tonnes in 2022–23 (Figure 1). Drivers behind the sustained increase in reported waste generation are likely to include the introduction of mandatory waste data reporting, population growth and investment in large-scale construction projects.

Since 2019–20, waste stream composition has returned to longer-term trends with about half of all waste generated coming from the C&D waste stream (Figure 2). Waste generated in 2022–23 comprised:

- 3.5 million tonnes (50 per cent) from the C&D waste stream
- 2.1 million tonnes (30 per cent) from the C&I waste stream
- 1.4 million tonnes (20 per cent) from the MSW waste stream.

The quantity of materials recovered increased from 2.7 million tonnes in 2014–15 to 4.4 million tonnes in 2022–23. Figure 3 shows that C&D materials were the largest recovered material type in 2022–23 and that the overall increase in material recovery since 2014–15 stems from an increase in the reported recovery of C&D materials.

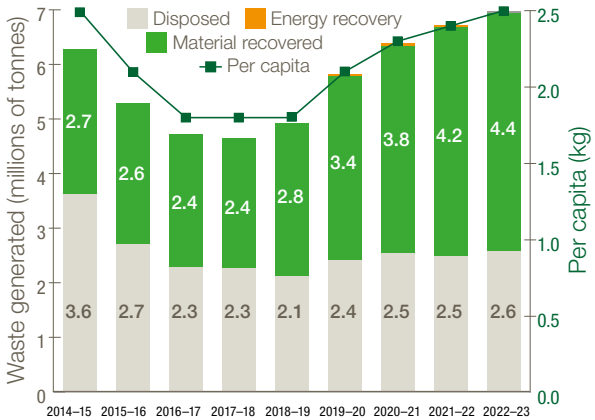


Figure 1 Reported waste generation shown as materials recovered, disposed and recovered as energy. Note: prior to 2019–20, waste recovered as energy is shown as 'material recovered'

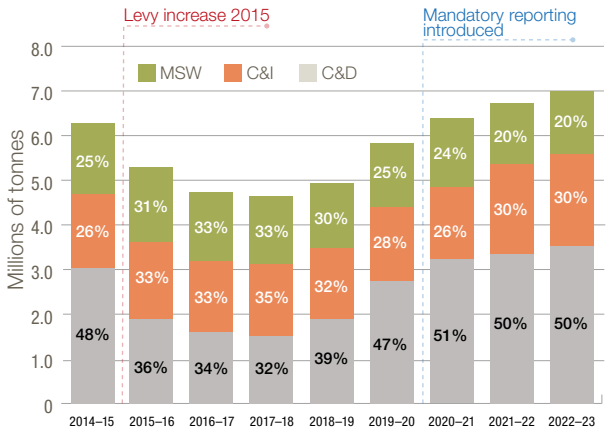


Figure 2 Waste generation by waste stream

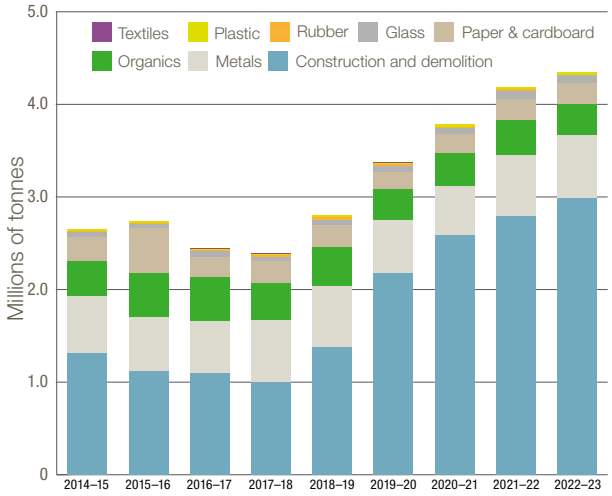


Figure 3 Material recovery by material type

The material recovery rate for solid waste in WA increased from 42 per cent in 2014–15 to 62 per cent in 2022–23 (Figure 4). This has been largely driven by the C&D waste sector response to significant increases in the waste levy.

Material recovery rates in the MSW and C&I waste streams have not shown any sustained improvements since 2014–15.

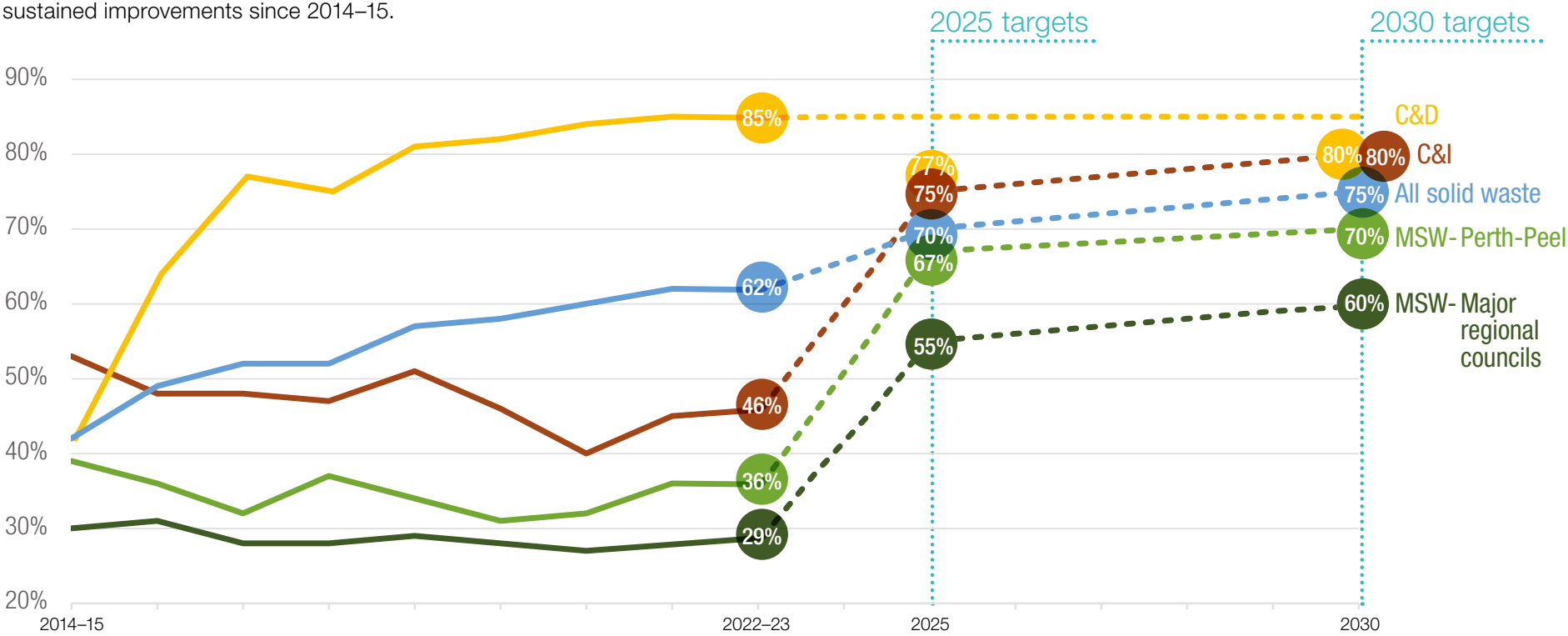


Figure 4 Material recovery rates against the waste strategy targets. Note: prior to 2019, material recovery rates included waste recovered as energy

Performance against waste strategy targets

	Sector	2014–15 baseline	2022–23		Targets	
					2025	2030
Avoid targets	Overall	2,452 kg per capita	2,474 kg per capita	**1%** ↑	10% reduction	20% reduction
	MSW	621 kg per capita	493 kg per capita	**21%** ↓	5% reduction	10% reduction
	C&I	642 kg per capita	734 kg per capita	**14%** ↑	5% reduction	10% reduction
	C&D	1,188 kg per capita	1,248 kg per capita	**5%** ↑	15% reduction	30% reduction
Material recovery targets	**Overall**	42% recovery	62% recovery	**No change** → since 2021–22	70% recovery	75% recovery
	MSW (Perth and Peel)	39% recovery	36% recovery	**No change** → since 2021–22	67% recovery	70% recovery
	MSW (Major regional centres)	30% recovery	29% recovery	**1%** ↓ since 2021–22	55% recovery	60% recovery
	C&I	53% recovery	46% recovery	**1%** ↑ since 2021–22	75% recovery	80% recovery
	C&D	42% recovery	85% recovery	**No change** → since 2021–22	77% recovery	80% recovery
	Perth and Peel	Nil	10 local governments (11 as at June 2024)	**+ 1** ↑ since 2021–22	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	
Protect target	**Overall**	**49%* of Perth regions' waste disposed of to landfill** *Peel region data included as non-metropolitan source prior to 2018–19	30% of Perth and Peel regions' waste disposed of to landfill	**1%** ↓ since 2021–22		No more than 15% of Perth and Peel regions' waste is disposed of to landfill – by 2030

Table 1 Performance against waste strategy targets

Waste generation

In this report, waste generation is the sum of waste disposal and recovery. Figure 1 shows the trend in reported waste generation between 2014–15 and 2022–23.

Waste generation was estimated as 7.0 million tonnes in 2022–23, an increase of 257,000 tonnes from the previous year. Waste generation comprised 4.4 million tonnes of material recovery, 2.6 million tonnes waste disposal to landfill and 0.05 million tonnes of waste recovered as energy.

An increase of 169,000 tonnes in the recovery of materials from the C&D waste stream was the largest contributing factor to the one-year increase in waste generation. There were also smaller increases in waste arising from the C&I (56,000 tonnes) and MSW (24,000 tonnes) waste streams.

Total waste generation and per capita generation in 2022–23 for each of the waste streams are presented in Tables 2 and 3. Overall, MSW and C&I waste generation rates per capita were significantly higher outside the Perth and Peel regions.

Total reported waste generation per capita increased from 2,415 kg in 2021–22 to 2,475 kg in 2022–23. There has been an overall 1 per cent increase in per capita waste generation since 2014–15.

Waste generation per capita is used to measure progress towards the avoid targets in the waste strategy. Figure 5 shows trends in per capita waste generation by waste stream against the corresponding avoid targets. Per capita generation for MSW has steadily declined since 2014–15 and the 2030 MSW avoid target has been met. Conversely, C&I and C&D per capita waste generation have increased compared to the baseline rates (2014–15). The 2030 avoid targets for these waste streams are unlikely to be met without significant interventions.

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion %	Tonnes	Proportion %	Tonnes	Proportion %
MSW	1,053,070	20	339,233	20	1,392,303	20
C&I	1,359,830	26	709,888	42	2,069,718	30
C&D	2,866,466	54	654,416	38	3,520,882	50
Total	5,279,366	100	1,703,537	100	6,982,903	100

Table 2 Waste generation by waste stream (tonnes and per cent), 2022–23

Waste stream	Perth and Peel regions	Non-metropolitan regions	Western Australia
Population	2,261,000	560,000	2,821,000
MSW (per capita)	466	606	493
C&I (per capita)	601	1,267	734
C&D (per capita)	1,268	1,168	1,248
Total (per capita)	2,335	3,041	2,475

Table 3 Waste generation, kilograms per capita by waste stream, 2022–23

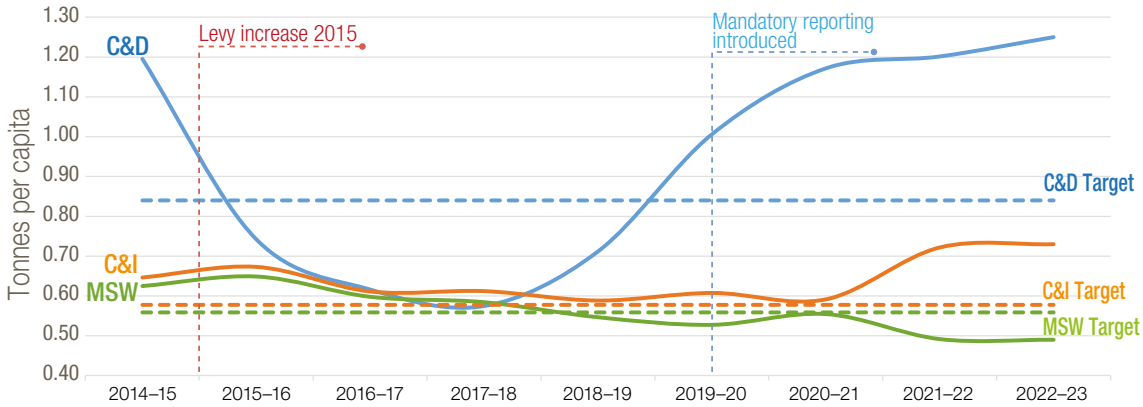


Figure 5 Waste generation per capita by waste stream and avoid targets

Disposal of waste

An estimated 2.6 million tonnes of waste were sent to landfill in WA in 2022–23. Sixty-two per cent of this waste was generated from the Perth and Peel regions, with the remaining 38 per cent generated from outside these regions.

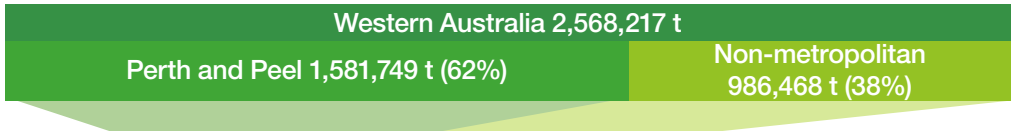
There was a small (3 per cent) one-year increase in the total amount of waste sent to landfill. However, disposal of waste generated in the Perth and Peel regions decreased (1 per cent) during this period. It should be noted that the estimated tonnes of waste disposed outside the Perth and Peel regions is subject to a higher degree of uncertainty than the other waste and recycling components included in this report (see methodology for more information on how these figures are estimated).

Following an increase in the waste levy for category 63 (inert) landfills (from $12 to $60 per cubic metre) in January 2015, C&D waste disposal declined. Since the waste levy increase, typically the C&I and MSW waste streams combined have accounted for about 80 per cent of waste disposal, with the remaining 20 per cent from the C&D waste stream (Figure 6 and Table 4).

Waste disposal sometimes includes waste used in beneficial ways at landfills, such as using crushed C&D waste in the construction of internal roads in a landfill. Although this waste is ultimately subsumed by the landfill, it avoids the use of virgin, excavated materials. In 2022–23, at least 80,000 tonnes of waste included in the disposal tonnes above was used for a beneficial purpose at a landfill.

The department collects limited information about the material composition of waste disposal. In 2022–23, liable landfills reported that 68 per cent of waste received at their facilities was ‘mixed putrescible waste’, 19 per cent was C&D waste types, 3 per cent contaminated soils, and the remainder other waste types.

The waste strategy protect target is for no more than 15 per cent of the Perth and Peel regions’ waste to be disposed to landfill by 2030. In 2022–23, 30 per cent – 1.6 million tonnes – of the regions’ waste was landfilled (Figure 7). The observed steady decline in the disposal rate is anticipated to accelerate with two waste-to-energy plants expected to begin operating in the Perth region in the near to medium term.



Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion %	Tonnes	Proportion %	Tonnes	Proportion %
MSW	677,201	43	295,901	30	973,102	38
C&I	642,712	41	432,910	44	1,075,622	42
C&D	261,836	17	257,657	26	519,493	20
Total	1,581,749	100	986,468	100	2,568,217	100

Table 4 Disposal to landfill by waste stream and region 2022–23

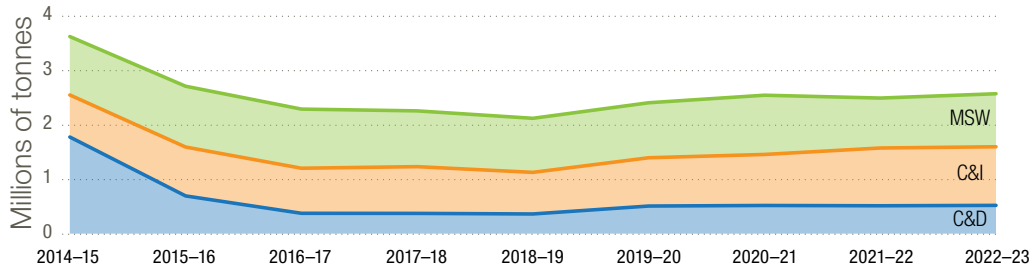


Figure 6 Annual disposal by waste stream

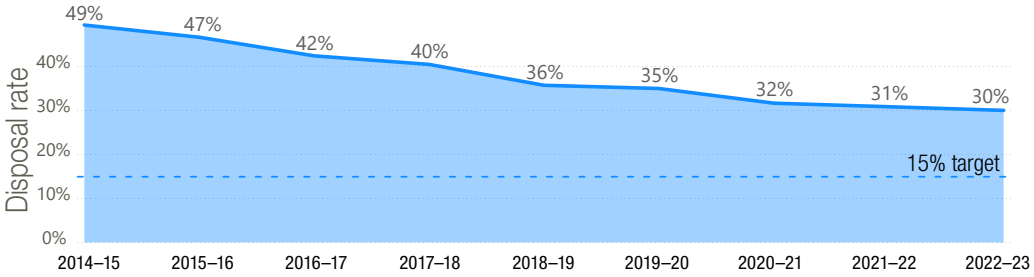


Figure 7 Disposal rate in the Perth and Peel regions

Focus on litter

The Keep Australia Beautiful Council (KABC) measures litter twice yearly using the Australian Litter Measure Methodology (AusLM). The methodology counts litter in the Perth Metropolitan Area at 57 different sites over 247 individual transects. Litter is measured at six different site types including beaches, parks, main roads, industrial areas, retail and residential areas.

Data shows that plastic is the highest material found by both count (57 per cent) and volume (28 per cent).

Cigarette butts and filters were found to be the most common item by count (20 per cent), while discarded tyres made the biggest contribution to the volume of litter (13 per cent) followed closely by paper and cardboard food packaging (12 per cent).

Industrial and main road sites contained the highest levels of litter observed, while beaches had the lowest.

Data shows that plastic is the highest material found by both count and volume.

Top 15 Items by count

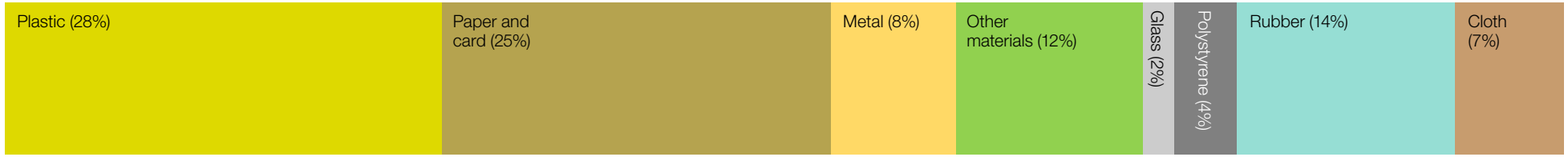
Item	Number	/1,000 m^2
Cigarette butts and filters	3,456	32.95
Hard plastic fragment (small)	1,715	16.35
Paper and card fragment (small)	1,620	15.44
Soft plastic fragment (small)	988	9.42
Food/confectionery wrappers	979	9.33
Glass fragment (small)	528	5.03
Hard plastic fragment (medium)	397	3.79
Lids (Beverage container lids/caps)	331	3.16
Paper tissues/napkin	327	3.12
Lids, bottle tops, can ring pulls	324	3.08
Paper and card fragment (medium)	295	2.81
Aluminium foil wrap	295	2.81
Polystyrene fragment (small)	293	2.79
Tape/narrow soft plastic film	282	2.68
Paper/card food packaging	257	2.45

Top 15 Items by volume

Item	Total (l)	(l)/1,000 m^2
Tyres	150.00	1.43
Paper/card food packaging	128.25	1.22
Clothing	56.00	0.53
Food/confectionery wrappers	48.95	0.47
Construction materials	42.66	0.41
Rope/string	33.80	0.32
Packages and boxes	31.25	0.30
Aluminium foil wrap	29.45	0.28
Non-food package	26.25	0.25
Insulation and packaging	25.00	0.24
Other food package	22.25	0.21
Other metal item	21.65	0.21
Other plastic item	20.85	0.20
Strapping band	20.70	0.20
Other cloth item	20.70	0.20

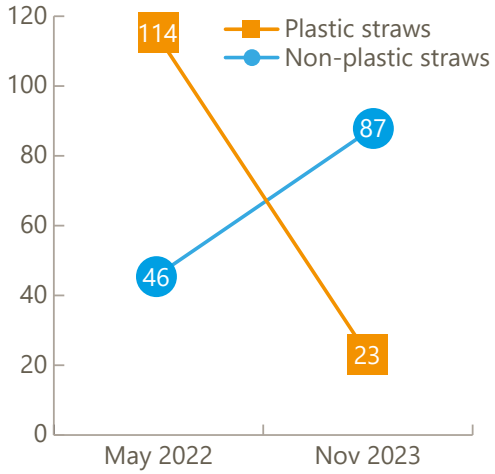
Litter count by source material

Litter volume by source material



Trends emerging in the litter stream

The action that the State Government has taken to reduce the use of single-use plastics has had an interesting effect on the litter stream. There has been a reduction in the occurrence of banned items, but an increase in the incidence of items that have replaced these items. For example, there has been a reduction in the number of plastic straws seen in the litter stream but a significant increase in the number of paper straws counted. Even though the numbers are small, they suggest that while plastic items are being replaced with non-plastic items, the littering behaviour around these items has not changed.



Number of straws found during AusLM litter surveys in May 2022 and November 2023

Beverage containers

The container deposit scheme has had a significant impact on the level of litter in Western Australia. Prior to its introduction, about 44 per cent of the volume of litter was made up of beverage containers using the National Litter Index. Although not directly comparable, the volume of beverage containers measured in 2022–23 is now about 5 per cent using the AusLM methodology. The 2022–23 AusLM litter survey report is available on the State Government website.

The volume of beverage containers measured in 2022–23 is now about 5 per cent using the AusLM methodology.

Waste recovery

Overall material recovery and trends

A total of 4.4 million tonnes of waste materials were recovered in 2022–23, an increase of 169,000 tonnes (4 per cent) when compared to recovery in 2021–22. Data on material recovered by waste stream and material category in 2022–23 are provided in Tables 5 and 6.

The reported total tonnes of materials recovered from the waste stream increased significantly with the introduction of mandatory reporting in 2019–20. Since then, reported total tonnes of material recovered each year has continued to increase (see Figure 8). The most recent increase in reported overall material recovery from 2021–22 to 2022–23 was primarily driven by an increase in materials recovered from the C&D waste stream (166,000 tonnes or a 4 per cent increase). There was also a smaller increase in recovered materials, mostly scrap metals, from the C&I waste stream (33,000 tonnes or a 4 per cent increase). The tonnes of materials recovered from the MSW stream fell by 33,000 tonnes (7 per cent) over the same period. This is due to one South West organics processor reporting no recovery in 2022–23 and the atypical capture of C&D materials in the MSW stream in 2021–22.

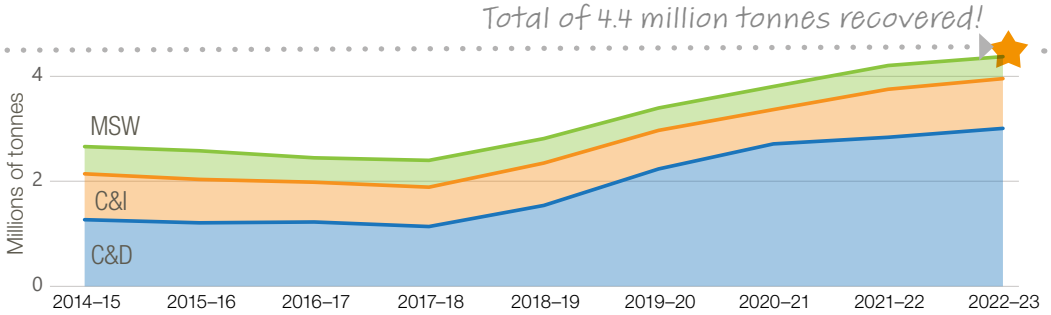


Figure 8 Material recovery (t) by waste stream from 2014–15

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion %	Tonnes	Proportion %	Tonnes	Proportion %
MSW	374,659	10	43,064	6	417,723	10
C&I	673,202	18	271,875	38	945,077	22
C&D	2,603,489	71	396,759	56	3,000,248	69
Total	3,651,350	100	711,698	100	4,363,048	100

Table 5 Material recovery by waste stream, 2022–23

Category consolidated	2021–22		2022–23	
	Tonnes	%	Tonnes	%
C&D waste	2,793,867	67	2,985,288	68
Metals	657,811	16	682,701	16
Organics	380,915	9	336,452	8
Paper and cardboard	220,550	5	219,413	5
Glass	88,206	2	88,153	2
Plastic	19,834	<1	24,472	1
Rubber	23,852	1	8,224	<1
Hazardous waste	4,855	<1	15,431	<1
Textiles	3,499	<1	2,145	<1
Bulky wastes	444	<1	592	<1
Other	585	<1	176	<1
Total	4,194,418	100	4,363,047	100

Table 6 Material recovery by category, 2021–22 and 2022–23

MSW material recovery

In 2022–23, 418,000 tonnes of materials were recovered from the MSW stream (Figure 9). Organic waste (mostly garden waste) made up 48 per cent of the recovered materials, followed by paper and cardboard at 21 per cent. Glass (20 per cent) was the next most recovered material, by weight, from the MSW stream.

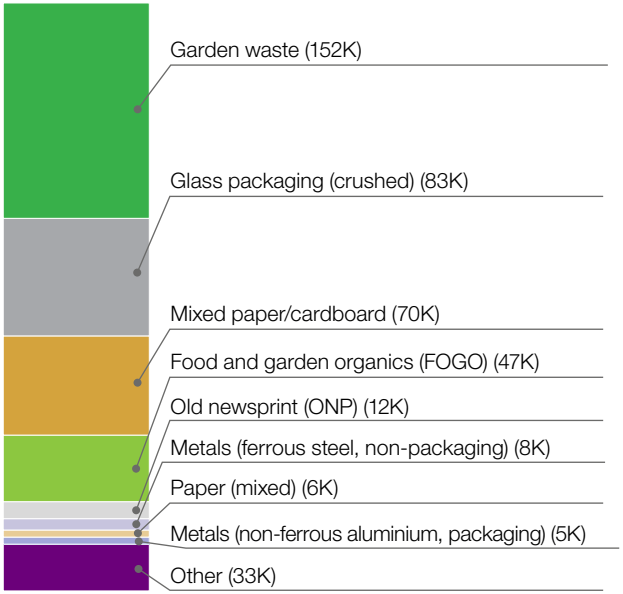


Figure 9 Materials recovered (t) from the MSW stream in 2022–23

C&I material recovery

In 2022–23, 945,000 tonnes of materials were recovered from the C&I waste stream (Figure 10). Metals (mostly steel) made up 67 per cent of the recovered materials, followed by paper and cardboard at 14 per cent. Organic materials (12 per cent) were the next most recovered material, by weight, from the C&I waste stream.

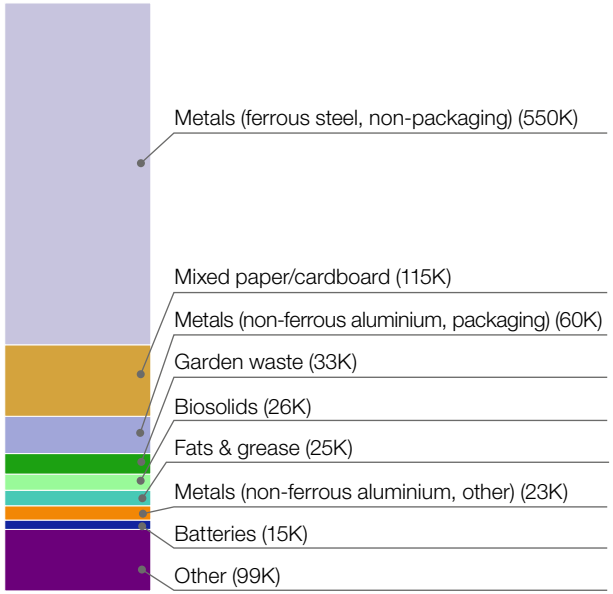


Figure 10 Materials recovered (t) from the C&I stream in 2022–23

C&D material recovery

In 2022–23, 3 million tonnes of materials were recovered from the C&D waste stream (Figure 11). Construction and demolition type materials made up 98 per cent of the recovered materials. Thirty-five per cent of these materials were described by recyclers as ‘mixed C&D waste’, with 21 per cent of C&D recovery consisting or soil and sands, followed by concrete at 19 per cent.

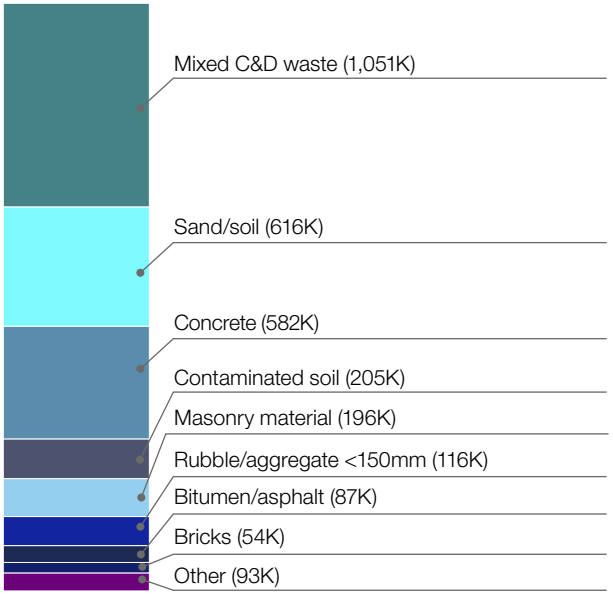
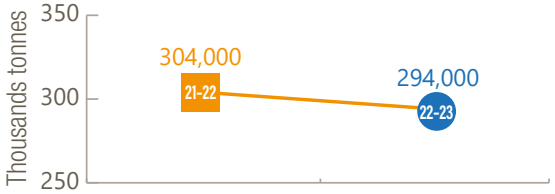


Figure 11 Materials recovered (t) from the C&D stream in 2022–23

Materials recovery facilities

Materials recovery facilities (MRFs) as defined in this report typically receive comingled recycling collections from kerbside collections or sort dry recyclables collected from commercial premises. In 2022–23, five MRFs lodged an annual return and reported receiving a total of 294,000 tonnes of mixed recyclables. The MRFs reported an average material recovery rate of about 84 per cent.



Of the five MRFs, three sorted recyclables primarily from the MSW stream and the other two sorted waste primarily from the C&I waste stream. The MRFs reported recovering 136,000 tonnes of recyclables from the MSW stream. Figure 13 shows the composition of the materials sorted and recovered from the MSW stream in 2022–23. The MRFs also reported sorting and recovering 104,000 tonnes of recyclables from the C&I stream, with paper and cardboard comprising 78 per cent of the materials recovered at MRFs from the C&I stream (Figure 14).

MRFs commented that poor source separation and export bans (see section Regulated waste exports) were impacting markets for recovered materials.

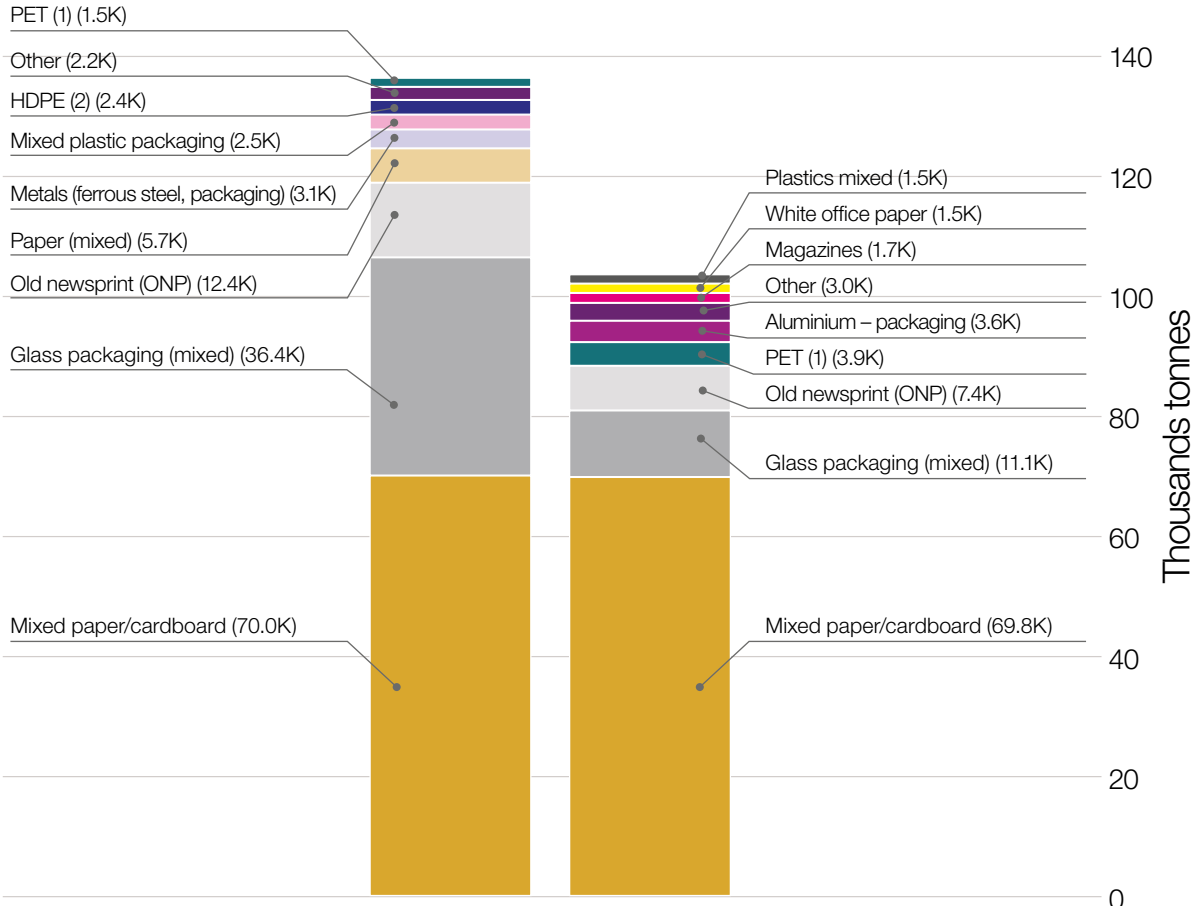


Figure 13 Materials recovered from the MSW stream at MRFs in 2022–23

Figure 14 Materials recovered from the C&I waste stream at MRFs in 2022–23

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 2022–23, 50,607 tonnes of eligible containers were collected at refund points and delivered for recycling. More than 41,000 tonnes of this material was glass that was processed in WA then sent to South Australia to be recycled back into glass bottles.

Prior to the introduction of Containers for Change on 1 October 2020, the return rate for eligible containers was 34 per cent. In 2022–23 the return rate had increased to 63 per cent. Quarterly and rolling return rates since the commencement of the scheme are shown below (Figure 15).

The CDS has resulted in a general decline in beverage containers recovered through kerbside collections, although this varies significantly by material type. The number of aluminium containers recovered through kerbside collection has remained consistent since the scheme commenced while the number of glass containers has reduced significantly.

Overall, about 9.8 per cent of eligible containers collected in 2022–23 was recovered through kerbside collections. This has reduced from 11.6 per cent in 2021–22.

Further information about MSW recovery, including collection systems is available in the 'Domestic waste' section of this report.

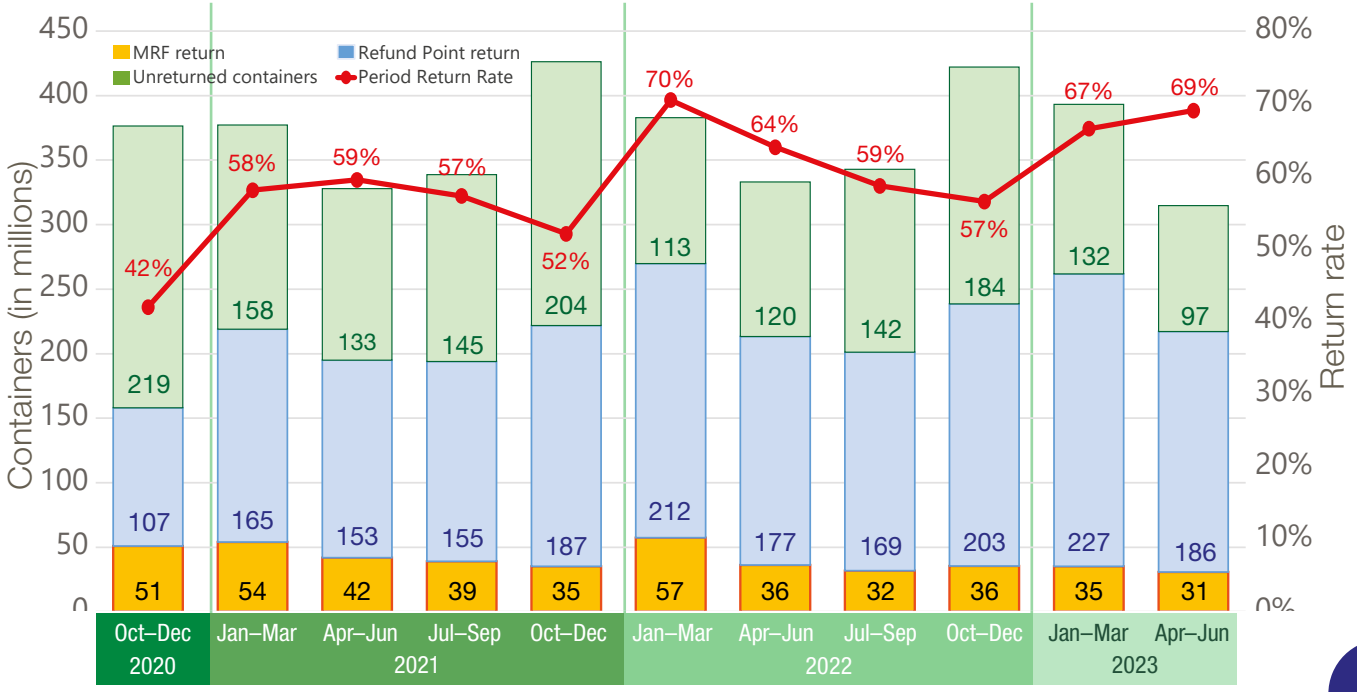


Figure 15 Containers for change returns and return rates from scheme start

Destination

About 78 per cent (3.4 million tonnes) of waste was reprocessed and recovered within WA and 19 per cent (0.82 million tonnes) was sent overseas for reprocessing. Smaller quantities of recovered materials (0.15 million tonnes) were sent interstate for reprocessing (Table 7).

Almost all (99 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 (62 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 category are represented in Figure 16.

The effect of recent export bans of specific waste types is examined more closely in the section below.

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 %	Tonnes
MSW	257,859	61.73	48,048	11.50	111,815	26.77	417,722
C&I	151,231	16.00	99,291	10.51	694,555	73.49	945,077
C&D	2,975,761	99.18	2,483	0.08	22,005	0.73	3,000,249
Total	3,384,851	77.58	149,822	3.43	828,375	18.99	4,363,048

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

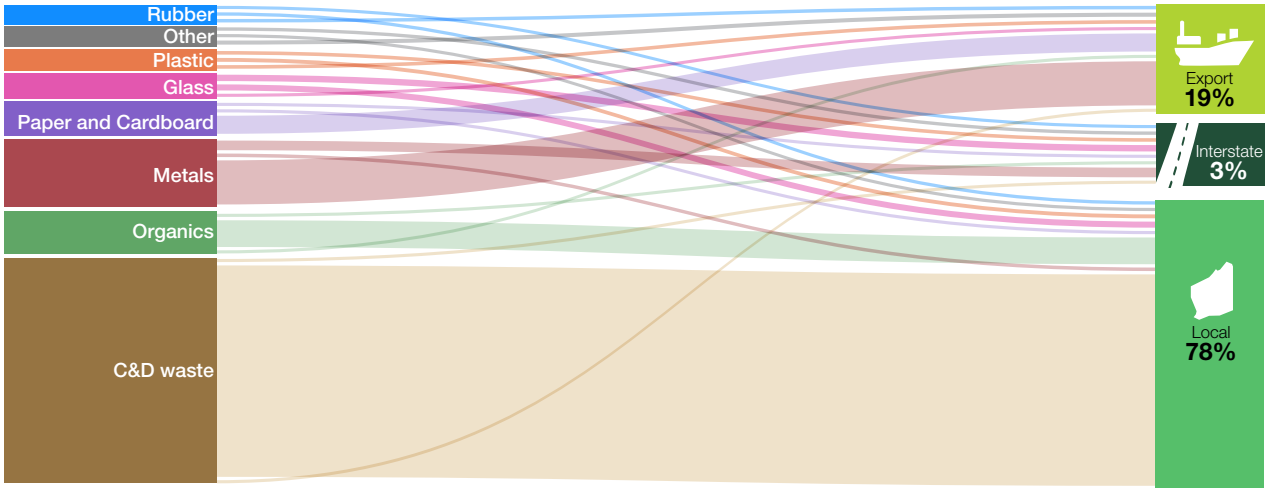


Figure 16 Recovered material flows by processing destination and material category in 2022–23

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 again reported in 2022–23 that market conditions for their recovered materials had weakened because of the export bans.

In WA, glass is typically either crushed locally or sent interstate for recovery. The ban has no direct impact on the local market for recovered glass.

As shown in Figure 17, there was a significant one-year increase in local scrap plastic recovery in 2022–23. Scrap plastics sent for reprocessing interstate also remained high relative to the tonnes sent interstate prior to the 2021 export restrictions. The overall tonnes of recovered plastics have increased since the introduction of the export bans.

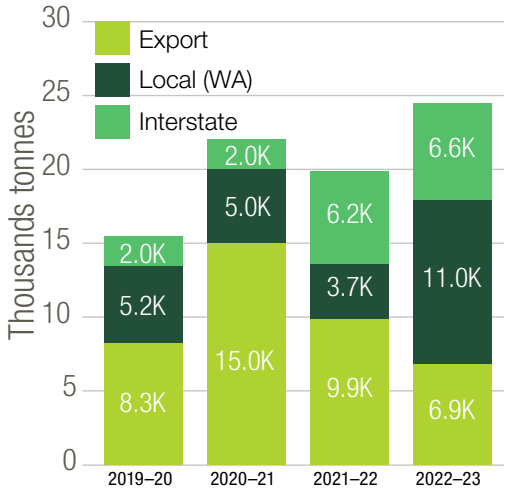


Figure 17 Destination of scrap plastic recovered, 2019–20 to 2022–23

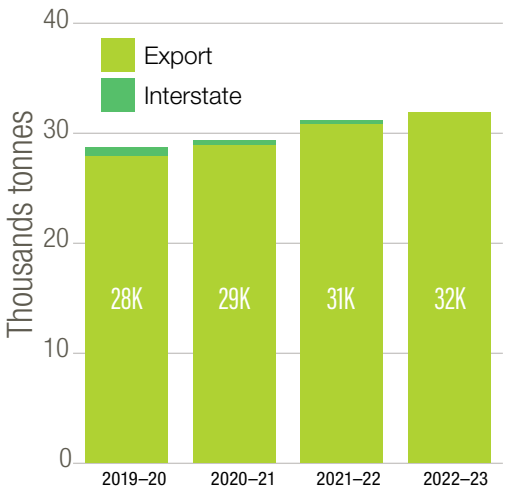


Figure 18 Destination of recovered tyres, 2019–20 to 2022–23

Most used tyres recovered in WA were exported prior to the ban. There has been a small but steady increase in the tonnes of used tyres exported for recovery (includes tyre-derived fuel) (Figure 18).

Energy recovery

About 52,000 tonnes of waste was recovered as energy in 2022–23. Almost all (95 per cent) of this was sourced from the C&I sector. About 57 per cent was recovered as tyre-derived fuel, 40 per cent recovered as biogas and the remainder was wood waste combusted to produce energy.

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 Figure 18). It is included in the calculation of waste generation.

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

Stockpiled waste

Recyclers reported that 2.43 million tonnes of waste were stockpiled as at 30 June 2023 (Table 8). Most of this (90 per cent) was C&D type waste. The quantity of waste stockpiled at liable persons' facilities has increased by 630,000 tonnes since reporting commenced in 2019–20 (Figure 19). Over the most recent reporting period, 260,000 tonnes of reprocessed wastes were added to stockpiles at liable persons' facilities, while the quantity of stockpiled unprocessed waste fell by 16,000 tonnes.

In this report, waste stored in unprocessed stockpiles is not included in waste generation calculations. It is included when it is processed or disposed of to landfill. The exclusion of unprocessed waste added to stockpiles may result in under reporting of annual waste generation in some years and over reporting in others. The majority (68 per cent) of unprocessed waste at 30 June 2023 was mixed C&D waste (Figure 20). The most commonly stored recovered material type at liable person's premises was sands and soils (42 per cent of all stockpiled recovered materials).

Category consolidated	General and organic recyclers		Total stockpiled waste	Total stockpiled waste (%)
	Reprocessed (t)	Unprocessed (t)		
C&D waste	1,121,656	1,063,512	2,185,168	90%
Metals	106,123	36,806	142,232	6%
Organics	32,373	58,158	90,057	4%
Glass	6,229	3,456	9,684	<1%
Rubber	500	4,133	4,633	<1%
Paper and cardboard	357	6	363	<1%
Hazardous waste	-	288	288	<1%
Bulky wastes	214	36	250	<1%
Total	1,267,452	1,166,395	2,432,675	100%

Table 8 Stockpiled waste at liable persons' facilities as of 30 June 2023

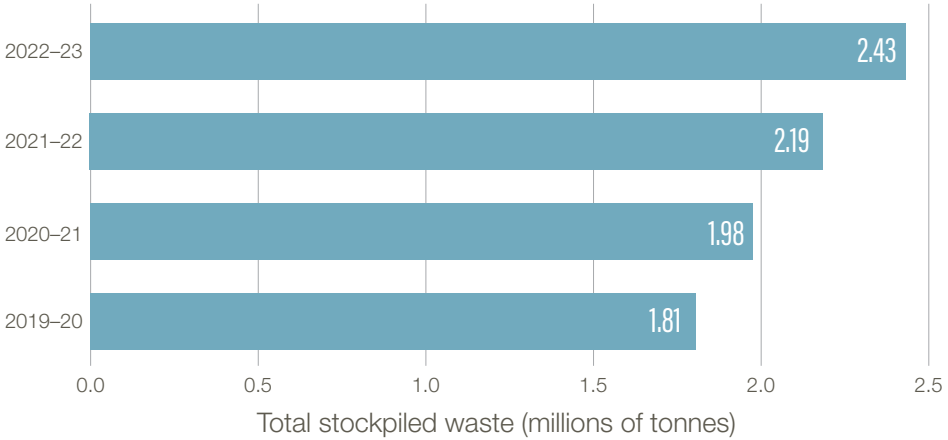


Figure 19 tonnes of processed and unprocessed waste stockpiled by liable recyclers

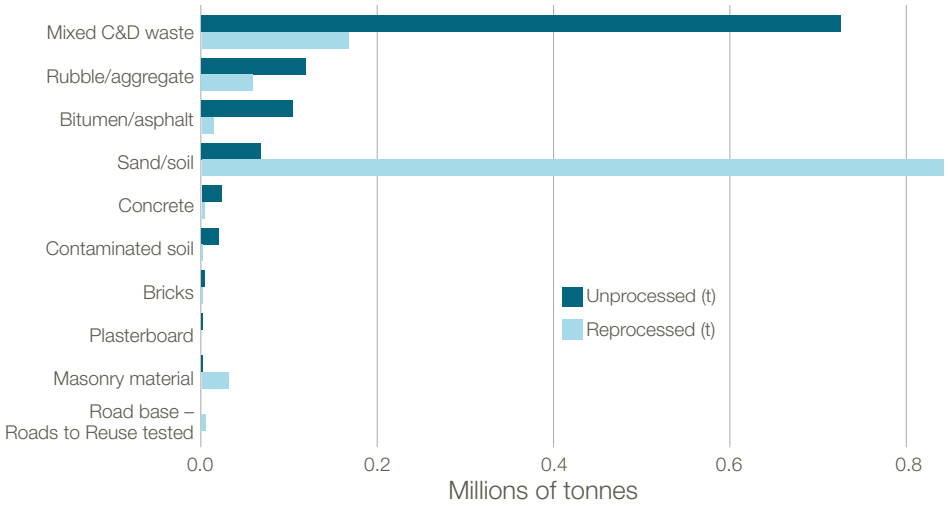


Figure 20 tonnes of processed and unprocessed waste by material type stored by liable recyclers

Waste collected by local governments

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 2022–23, 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	Kerbside system	Collected	Recovered	Domestic recovery rate	Kerbside Recovery Rate
City of Melville	Three bins – FOGO	45,164	30,079	67%	67%
Town of Cottesloe	Three bins – FOGO	3,558	2,302	65%	73%
City of Nedlands	Three bins – FOGO	10,571	6,699	63%	60%
Town of East Fremantle	Three bins – FOGO	3,472	2,096	60%	60%
Town of Bassendean	Three bins – FOGO	6,949	4,036	58%	62%

Table 9 Top five performing local governments by overall domestic waste recovery rates

Domestic waste collected and recovered

Local governments reported that providing waste and recycling services to their residents cost them $402 million in 2022–23.

In 2022–23, local governments collected 1.50 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 (24 per cent). Four local governments that provided their residents with kerbside FOGO collections achieved recovery rates greater than 60 per cent in 2022–23. 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 steady decline in the amount of domestic waste collected per capita (Figure 21).

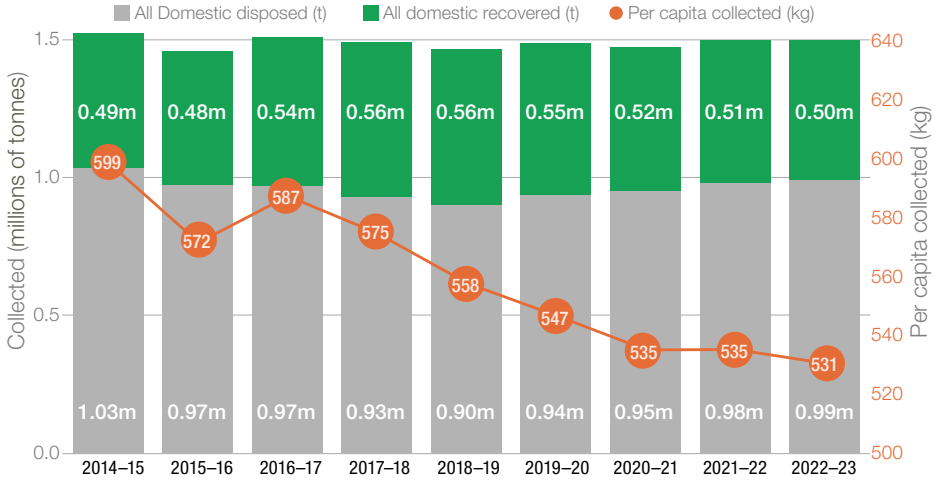


Figure 21 Total domestic waste collected (shown by recovered or disposed fate) and per capita domestic waste collected in WA since 2014–15

Most (65 per cent) domestic waste was collected from kerbside bins, 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 (2 per cent). Figure 22 shows the fate (recovery or disposal) of waste collected by each of these service types.

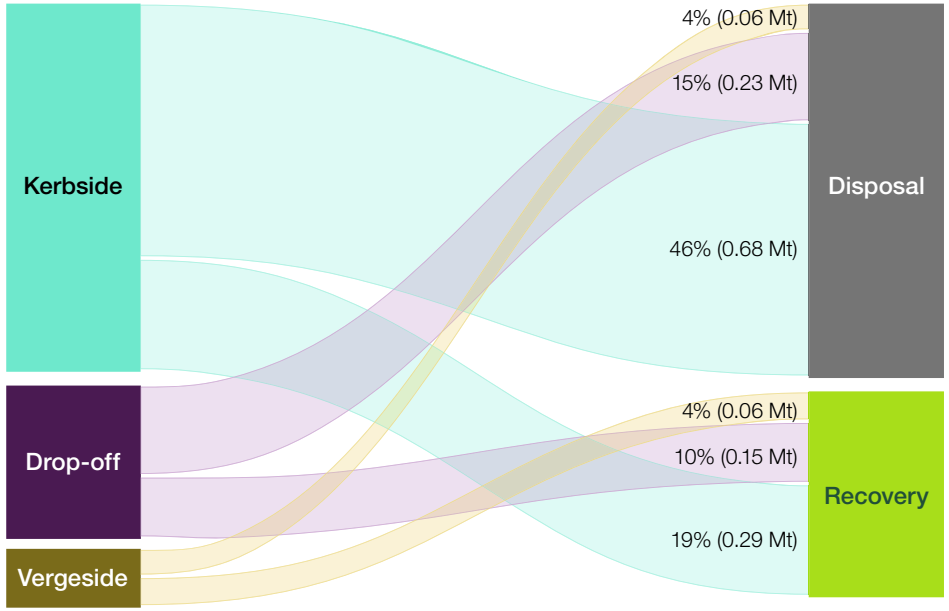


Figure 22 Waste collected and fate by service category. Labels show tonnes of flow and proportion (%) of total collected domestic waste. Waste collected from public places and special events is not shown

Regional sources of domestic waste

Local governments in the Perth and Peel regions collected 73 per cent of all domestic waste. The kilograms of recovered waste per capita was similar across the regions, but disposal to landfill per capita was 82 per cent higher outside the Perth and Peel regions (Table 10).

Waste stream	Perth and Peel regions	Non-metropolitan regions	Western Australia
Per capita recovered (kg)	176	180	179
Per capital disposal (kg)	550	302	352
Recovery rate	24%	37%	34%

Table 10 Sources and fates of domestic waste collected by local governments in 2022–23

Kerbside services

Local governments collected 971,000 tonnes of domestic waste from kerbside bins in 2022–23 and recovered 290,000 tonnes (30 per cent) of this waste. With 681,000 tonnes of kerbside waste sent to landfill in 2022–23, kerbside waste collections still provide a large potential for future increases in material recovery (see Figure 23).

In 2022–23, 98 per cent of the population had access to at least one kerbside waste service, and 94 per cent were provided with a comingled recycling service (yellow-lid bin). Seventeen per cent of the population was provided with a FOGO bin and 30 per cent with a garden organics (GO) bin.

The disposal and recovery fates for individual kerbside services in 2022–23 shows (Figure 24) that the majority (65 per cent) of the domestic waste collected from kerbside bins was still transported directly to landfill (red-lid bin), suggesting substantial opportunities for further recovery of resources from this service category.

The best-performing kerbside system for material recovery in 2022–23 was the three-bin system that enabled recovery of FOGO materials. Three-bin FOGO systems had an average recovery rate of 56 per cent, compared with only 14 per cent for two-bin systems without organics composting.

Figure 24 shows the mean and range of reported recovery rates of kerbside systems in 2022–23.

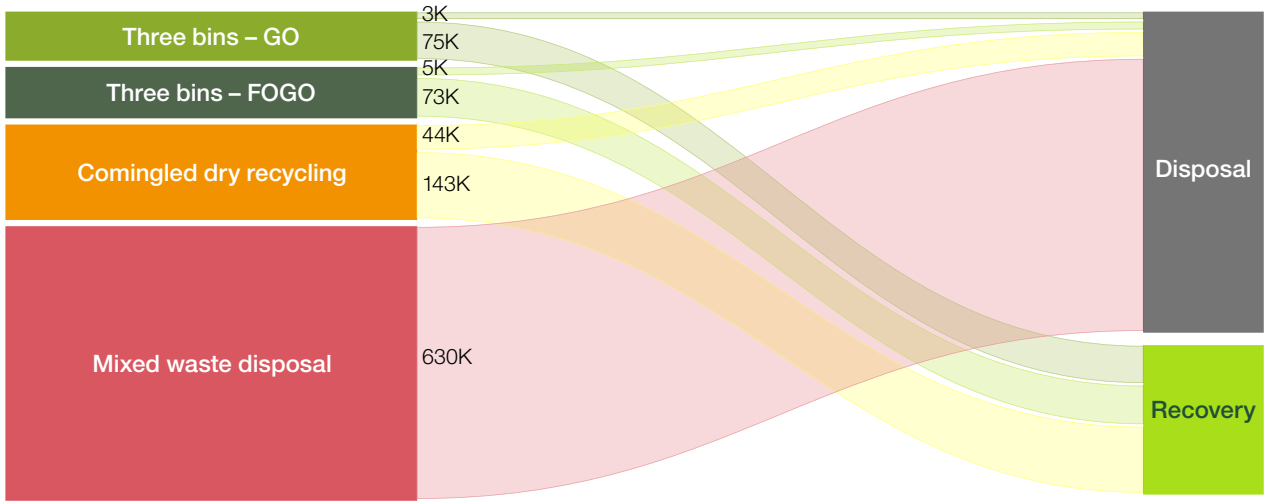


Figure 23 Kerbside services, recovery and disposal, with flow tonnes

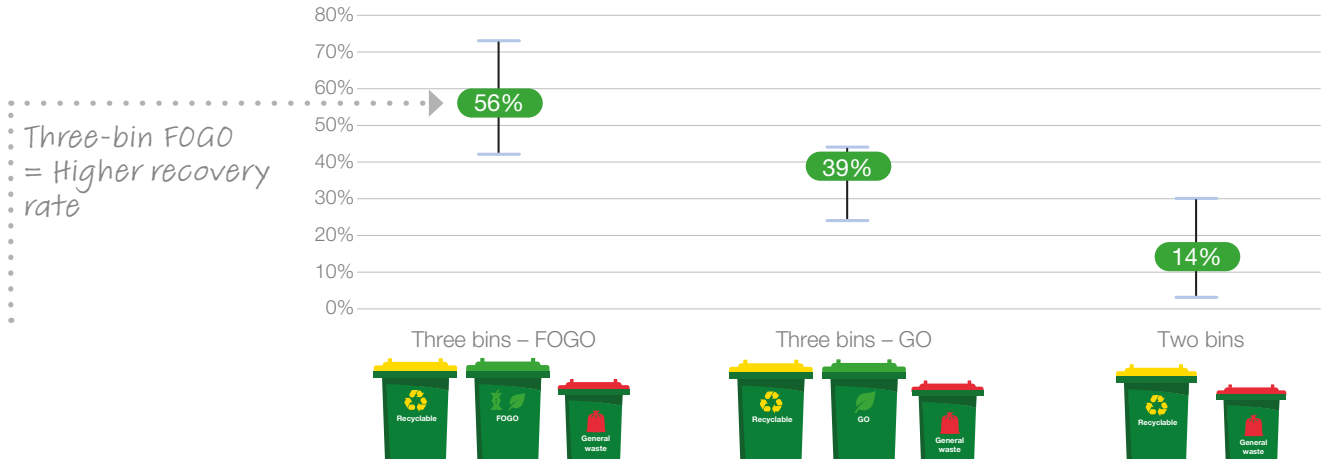


Figure 24 Mean, maximum and minimum recovery rates for kerbside systems in 2022–23

Materials recovered from the kerbside

In 2022–23, 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 83,000 tonnes of paper and cardboard. The composition of materials recovered from kerbside services are shown in Figure 25.

Further information about local government services for domestic waste collection and performance data for individual local governments can be accessed from the waste data portal on the Waste Authority website.

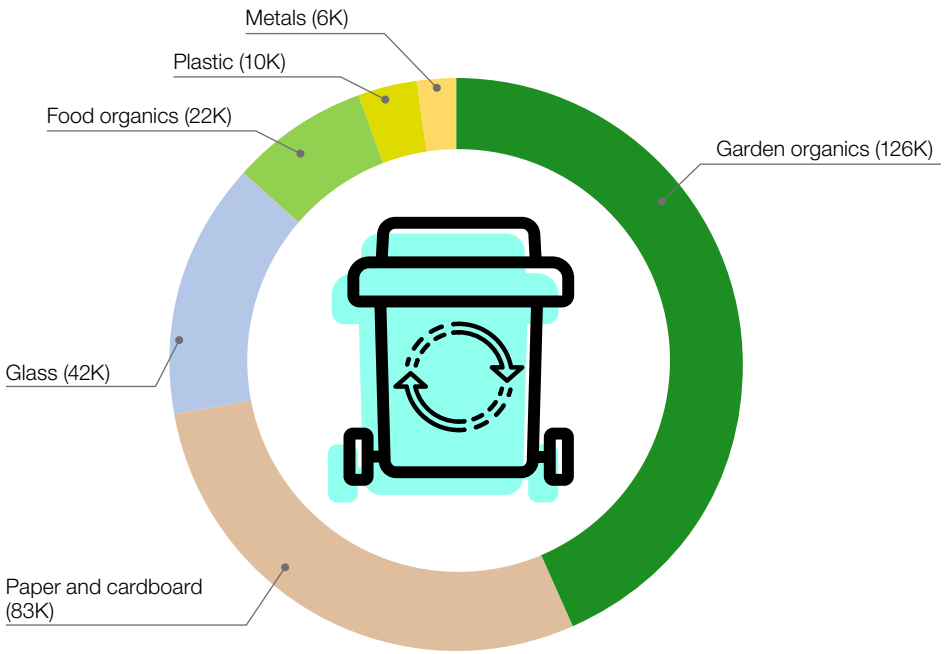


Figure 25 Composition of materials recovered from kerbside services in 2022–23 (tonnes)

Local government waste plans

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 waste plan reports for the 2022–23 financial year to the department in 2023. The reports set out the progress that each local government has made in implementing the actions in their waste plans under the WARR Act. This information is used to assess whether local governments are delivering their waste services consistent with the waste strategy and making progress towards delivering the waste strategy targets.

It should be noted that the data in these reports was current as of 30 June 2023. Local governments' status in relation to the waste strategy targets set out below may have changed since their reports were submitted. 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 2022–23 waste plan annual reports:

- Ten 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 have committed to providing a FOGO service by 2025.
- Nine 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.
- Two local governments have been unable to commit to implementing FOGO by 2025 but are assessing the feasibility of providing a FOGO service by 2030. One of these local governments already delivers a GO service and the other has committed to implementing GO by 2025.
- One local government from a major regional centre (not captured by the FOGO target) has determined that it is currently not feasible to implement FOGO.

Figure 26 shows the FOGO status of local governments in the Perth and Peel region as reported in their 2022–23 waste plan reports.

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

Modelling commissioned by the Waste Authority found that three-bin FOGO kerbside services can achieve material recovery rates of up to 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 2022–23 waste plan annual reports:

- Twelve 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.
- Ten 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 are ongoing with these local governments on how they might achieve consistency with the waste strategy.
- Four 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 27 shows the waste-to-energy status of local governments as reported in their 2022–23 waste plan reports.

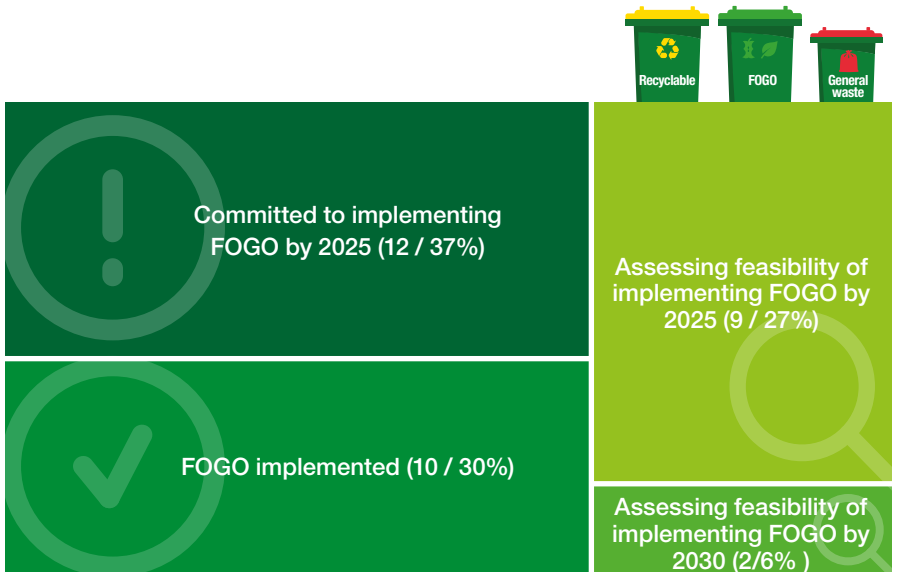


Figure 26 FOGO status of local governments in the Perth and Peel regions as reported in 2022–23 waste plan reports

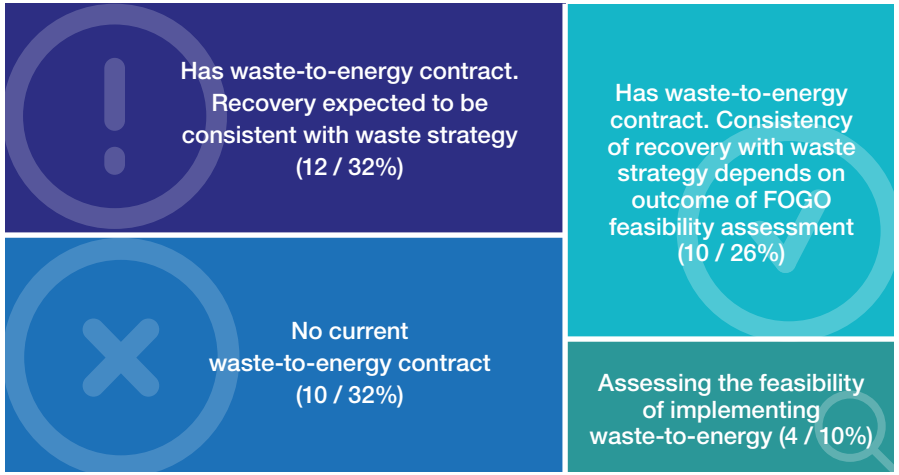


Figure 27 Waste-to-energy status of local governments as reported in their 2022–23 waste plan reports

Focus on Household Hazardous Waste

The Household Hazardous Waste (HHW) program funds local governments and regional councils to collect, store, recover and dispose of flammable, toxic, explosive or corrosive hazardous waste generated by households. If not treated or disposed of correctly, these products can pose a threat to public health and the environment.

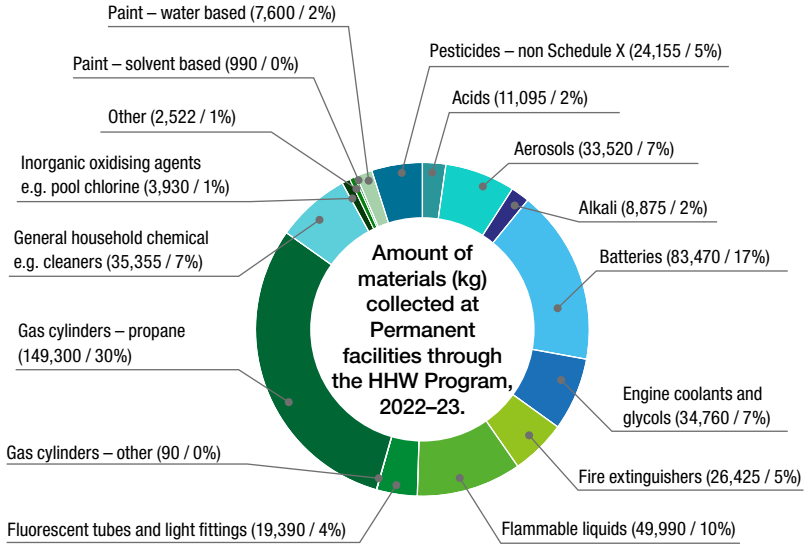
Since 2011, nearly 7,000 tonnes of HHW material have been collected from 15 permanent facilities and through collection events. In 2022–23, 491 tonnes of HHW materials were collected for safe recovery and disposal.

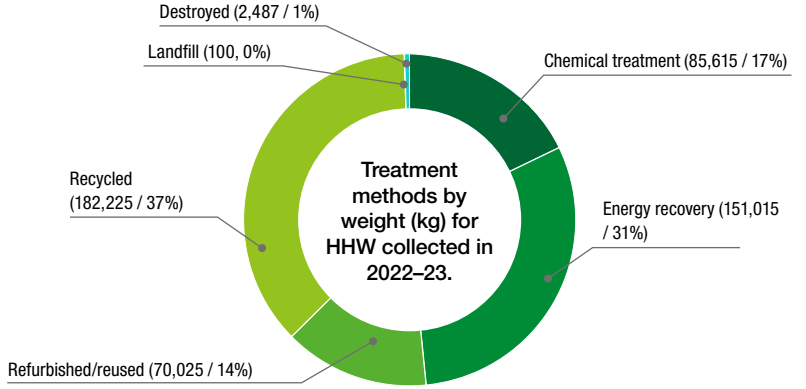
The most common types of HHW materials collected in 2022–23 by weight include gas cylinders, batteries, flammable liquids, engine coolants and glycols, and aerosols.

Most of the materials collected through the HHW program were diverted from landfill by being reused, recycled where possible, or treated to make safe and disposed of. Examples of fates of HHW materials include:

- Paint, flammables, aerosols, non-Schedule X pesticides and toxics are used as an alternative fuel source for cement kilns.
- Materials such as acids, alkalis, inorganic oxidising agents and general household chemicals are treated and made safe then discharged through a wastewater treatment plant.
- Fluorescent tubes are crushed, and the separated materials recycled.
- Kleenheat-accepted gas cylinders are put back into the market for reuse (94 per cent, with the 6 per cent unsuitable for reuse being recycled). For other gas cylinders, LPG is extracted and reused and the cylinders are recycled.
- Flares are destroyed by an explosives expert.
- PCB materials and Schedule X pesticides and CFC aerosols are treated and made safe through a pyrolysis process (Plasma Arc).
- Batteries are processed in Victoria where they are separated into steel, aluminium, copper and other constituent materials, which is sold for processing new materials.

Only a few materials need to be disposed of to landfill as there is currently no other viable, safe or sustainable option.






ORGANICS
FOR
COMPOST

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 *Local Government Act 1995*. 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.

Term	Definition
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).
Recycling	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: • excludes materials in stockpiles of unprocessed waste materials • includes all materials processed for recycling, whether they are quickly sold or used, or stockpiled for later sale or use. • excludes residuals that are sent to landfill or otherwise disposed of.
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	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.

Term	Definition
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.
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.

References

Australian Bureau of Statistics 2023, *Regional population*, ABS Website, accessed 21 February 2024.

Blue Environment 2023, *National waste report 2022*, The Department of Climate Change, Energy, the Environment and Water.

Blue Environment 2024, "Australian plastic flows and fates 2022–23 – Western Australia" (draft, unpublished). Prepared for the Department of Water and Environmental Regulation.

Department of Climate Change, Energy, the Environment and Water, *Waste Export Data Viewer – DCCEEW*, accessed 22 March 2024.

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*.

Department of Water and Environmental Regulation 2023, *Waste and recycling in Western Australia 2021–22*.

WA Return Recycle Renew 2023, *Annual Report 2022–23* [PDF 2.19 MB].

Waste Authority 2018, *Waste avoidance and resource recovery strategy 2030*.

A total of 4.4 million tonnes of waste materials was recovered in 2022–23, an increase of 166,000 tonnes (4 per cent) when compared to recovery in 2021–22.

Appendix: Methodology

Data sources

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

Regulation 18C of the WARR Regulations requires liable persons to report certain waste and recycling data annually to the department in accordance with approved procedures. The annual returns are lodged through an online portal. Ninety-eight liable recyclers, 15 liable landfills, 139 local governments and five regional councils lodged an 18C return for the 2022–23 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 22 March 2024.

Plastic recycling

Plastic recycling data was obtained both directly from recyclers and supplemented with data from the report (draft only) *Australian plastic flows and fates 2022–23 – Western Australia*, prepared for the Department by Blue Environment.

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 2022–23 was sourced from the Australian Bureau of Statistics as regional population (estimated resident population). Population for 2022–23 was estimated using a linear projection.

The number of domestic premises was sourced from the 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 data 2022* report (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 54 local governments.

The estimates were based on the defaults in the approved procedures, and averages calculated from data reported by local government from 2019–20 to 2022–22.

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 2022–23, 27 per cent of reported recovered waste was weighed, 65 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. About 98 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.

Point of measurement

Under the approved procedures, liable recyclers are required to report the amount of waste recovered, which includes processed and subsequently stockpiled materials. In practice, it has been observed that most recyclers are reporting recovered materials on an out-the-gate basis.

Audits

All annual returns were reviewed by department officers for completeness and consistency. Audits of three liable recycler, 2022–23 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, where possible, to record the waste stream from which the waste generated. 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.

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