



Government of Western Australia
Department of Water and Environmental Regulation



Waste and recycling in Western Australia 2019-20



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Introduction

This report presents data on, and trends in, waste recovery and disposal in Western Australia (WA) during the 2019–20 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 268 liable persons for the 2019–20 reporting period, including local governments, recyclers and non-metropolitan landfills. Other data sources obtained are detailed in the methodology (Appendix C).

This report replaces two long-running series of reports published by the Waste Authority: *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 provide for a more complete dataset compared with previous years under the voluntary reporting scheme.

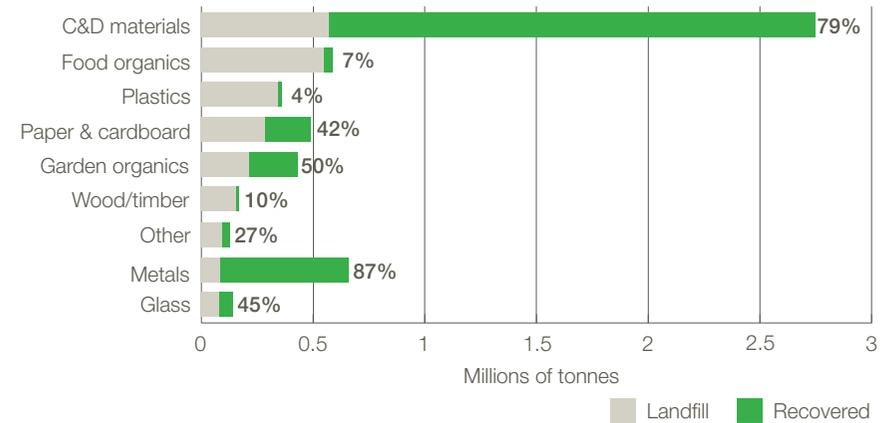
Data published in the report is also dynamically presented in Power BI reports available on the Waste Authority's [website](#). More details are available in Appendix E.



Waste and recycling in Western Australia 2019–20

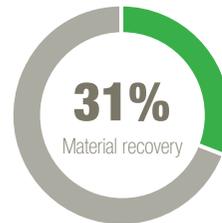


Recovered materials



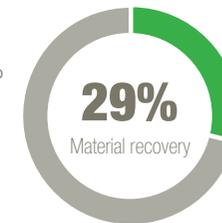
Domestic waste

1.49 million tonnes collected
 19 kg kerbside waste collected per week per household
 70 kg bulk garden waste collected per year per household
 61 kg bulk waste collected per year per household



Perth and Peel MSW

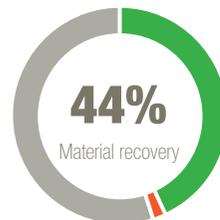
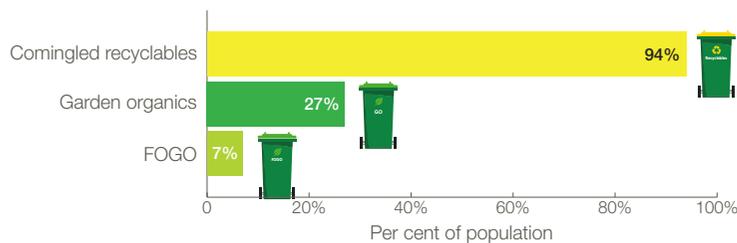
2025/30 Targets 67%/70%
 Materials recovered Mt 0.35
 Landfilled Mt 0.75
 Generated Mt 1.10



Major regional centre MSW

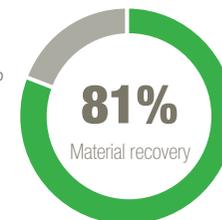
2025/30 Targets 55%/60%
 Materials recovered Mt 0.04
 Landfilled Mt 0.10
 Generated Mt 0.14

Kerbside collections provided to households



Commercial and industrial

2025/30 Targets 75%/80%
 Materials recovered Mt 0.74
 Energy recovered 0.03
 Landfilled Mt 0.89
 Generated Mt 1.66



Construction and demolition

2025/30 Targets 77%/80%
 Materials recovered Mt 2.23
 Landfilled Mt 0.51
 Generated Mt 2.74

Key findings for 2019–20

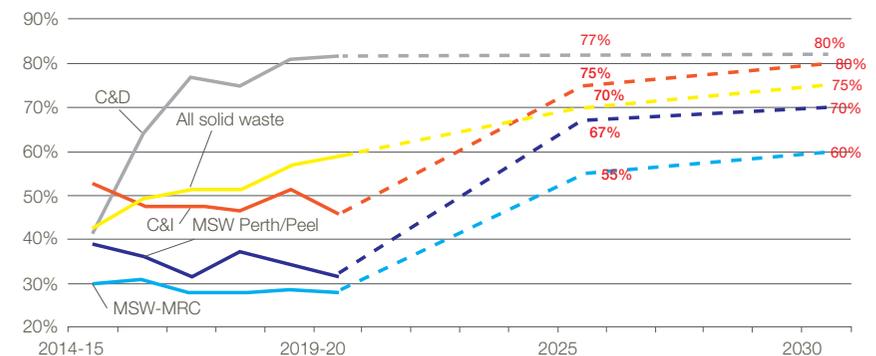
Statewide trends in recycling and disposal

- 5.8 million tonnes of waste were reported as being generated.
- Reported waste generation increased by 909,000 tonnes (18%) from 2018–19, most likely due to more complete datasets obtained through mandatory reporting requirements.
- The total amount of material recovered was 3.4 million tonnes, representing an increase of 581,000 tonnes (21%) from 2018–19.
- There were 2.4 million tonnes of waste sent to landfill, which is an increase of 285,000 tonnes (13%) from the previous financial year.
- Waste generated from the construction and demolition (C&D) sector increased by eight per cent from 2018–19 to 47 per cent, due in part to an increase in reports received from C&D waste recyclers.



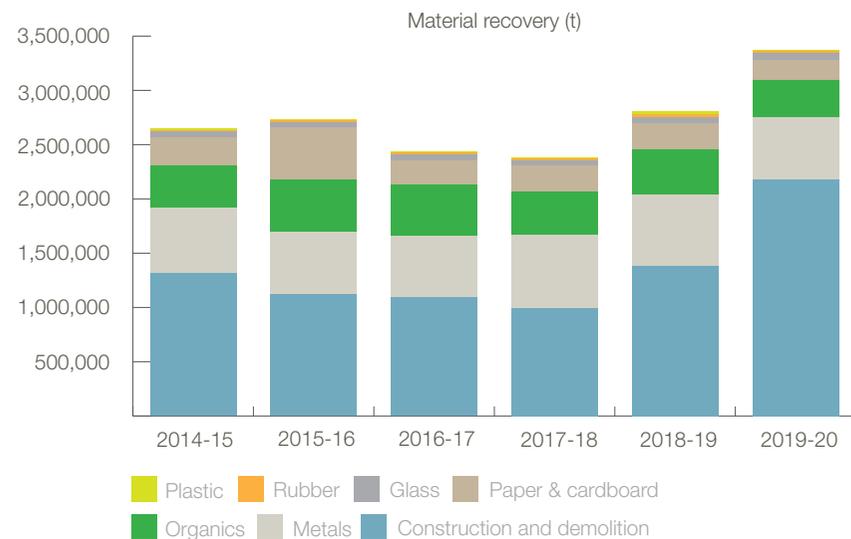
Progress towards waste strategy targets

- The total amount of waste generated per capita increased by 316 kg to 2,165 kg, most likely due to more data being received as part of the new mandatory reporting requirements. This is under the 2025 target of a maximum of 2,209 kg per capita.
- The material recovery rate for solid waste was 58 per cent, a one per cent increase from 2018–19.
- WA exceeded the waste strategy material recovery target of 80 per cent for the C&D waste stream. Stockpiles of unprocessed waste, which are not included in the calculation of waste generation, are likely contributing to this figure.
- There have not been any sustained improvements in the recovery rates in the municipal solid waste (MSW) and commercial and industrial (C&I) waste streams since 2014–15. Improving material recovery rates to meet waste strategy targets will require substantial increases in the quantities of waste recovered, in particular through food organics and garden organics (FOGO) recycling.



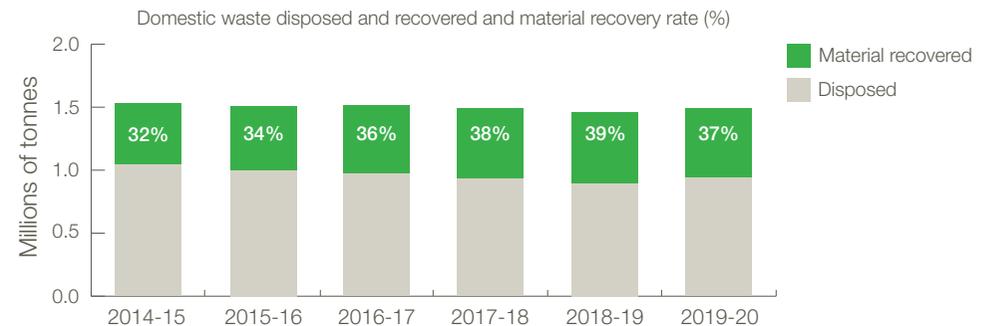
Materials recovered

- A total of 2.6 million tonnes (77%) materials were recovered for processing in WA.
- Waste materials processed in the state are predominantly those in the C&D category (2.2 million tonnes recovered), as well as organics and glass.
- In 2019–20, WA was still reliant on overseas markets for processing waste tyres, plastic, paper and cardboard; waste types which will be subject to phased export bans from 2021.



Domestic waste

- 144 local governments in WA (including five regional councils) collected 1.49 million tonnes of domestic waste from their residents, 37 per cent of which was recovered. The waste strategy recovery targets are 67 per cent in Perth and Peel and 55 per cent in major regional areas by 2025, and 70 per cent in Perth and Peel and 60 per cent in major regional areas by 2030.
- The three-bin FOGO system was the best performing kerbside system for material recovery, with an average recovery rate of 50 per cent (highest performing was 64%), compared with only 18 per cent for local governments with two-bin systems.
- The City of Bunbury had the highest overall material recovery rate (63%), thanks to its well-established FOGO kerbside collection system.
- Less than 10 per cent of the population had access to a FOGO bin; 27 per cent had a garden organics only (GO) bin; and 94 per cent had access to a comingled recycling bin in 2019–20.



Performance against waste strategy targets

The state's waste strategy sets out targets for waste avoidance, material recovery, landfill diversion and environmental protection. This includes diverting waste from landfill. The 2014–15 financial year is used as the baseline against which targets for avoidance are measured. Progress against targets for 2019–20 is provided in Table 1.

	Sector	2014–15 baseline	2019–20	Targets 2025 2030
Avoid targets	Overall	2,452 kilograms per capita	2,165 kilograms per capita 12% reduction	10% reduction 20% reduction
	MSW	621 kilograms per capita	534 kilograms per capita 14% reduction	5% reduction 10% reduction
	C&I	642 kilograms per capita	614 kilograms per capita 4% reduction	5% reduction 10% reduction
	C&D	1,188 kilograms per capita	1,017 kilograms per capita 14% reduction	15% reduction 30% reduction
Material recovery targets	Overall	42% recovery	58% recovery 1% increase since 2018–19	70% recovery 75% recovery
	MSW (Perth and Peel)	39% recovery	31% recovery 3% decrease since 2018-19	67% recovery 70% recovery
	MSW (Major regional centres)	30% recovery	29% recovery unchanged from 2018-19	55% recovery 60% recovery
	C&I	53% recovery	44% recovery 6% decrease since 2018–19	75% recovery 80% recovery
	C&D	42% recovery	81% recovery unchanged from 2018–19	77% recovery 80% recovery
Protect target	Overall	49%* of Perth regions' waste disposed of to landfill *Peel region data included as non-metropolitan source prior to 2018–19	35% of Perth and Peel regions' waste disposed of to landfill 0.3% decrease since 2018–19	Nil No more than 15% of Perth and Peel regions' waste is disposed of to landfill

Table 1 Performance against waste strategy targets for 2019–20.

Waste generation

Introducing mandatory reporting under the WARR Regulations has provided for a more complete dataset than previous voluntary surveys. In 2019–20, returns from an additional 39 recyclers were received, bringing the total to 109. This, combined with additional landfill data, has resulted in an increase of over 909,000 tonnes in reported waste generation, compared with last year: 3.4 million tonnes of this was material recovery, 2.4 million tonnes were disposed of to landfill, and 0.03 million tonnes was energy recovery.

Total reported waste generation per capita increased by 313 kg to 2,165 kg. Despite the reported increase, this result exceeds the 2025 target of 2,209 kg per capita.

Figure 1 shows the trend in reported waste generation between 2014–15 and 2019–20.



Figure 1 Reported waste generation for WA, 2014–15 to 2019–20. Note: prior to 2019–20, waste recovered as energy was reported as ‘recovered’.

The composition of waste generated in 2019–20 changed. Most of the additional data provided was from C&D recyclers, so the proportion of C&D waste increased by 8 per cent to 47 per cent, as shown in Figure 2. The waste generation composition by waste stream is similar to that observed in 2014–15.

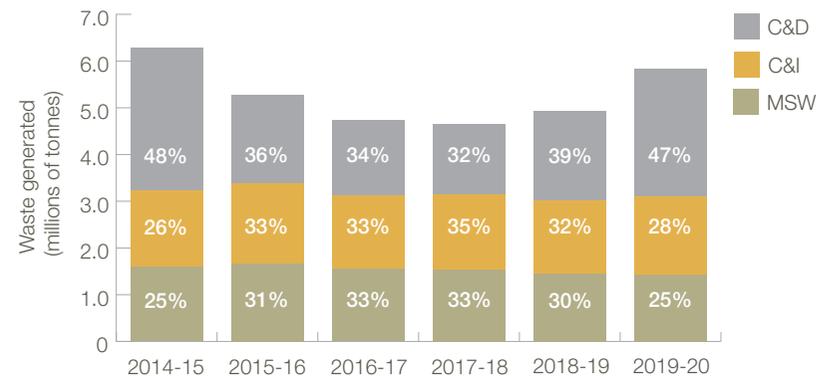


Figure 2 Waste generation composition by waste stream, with labels indicating percentage contribution.

Total waste generation and generation per capita in 2019–20 for the MSW, C&I and C&D waste streams are presented in Table 2 and Table 3. Generation rates per capita were higher in the non-metropolitan regions for MSW and C&I, while C&D waste was higher in the Perth and Peel regions.

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion	Tonnes	Proportion	Tonnes	Proportion
MSW	1,101,372	25%	333,696	24%	1,435,068	25%
C&I	987,894	22%	664,929	48%	1,652,823	28%
C&D	2,356,074	53%	381,046	28%	2,737,120	47%
Total	4,445,340	100%	1,379,672	100%	5,825,011	100%

Table 2 Waste generation by waste stream (tonnes and per cent), 2019–20.

	Perth and Peel regions	Non-metropolitan regions	Western Australia
Population	2,151,420	539,295	2,690,715
MSW (per capita)	512	619	533
C&I (per capita)	459	1,233	614
C&D (per capita)	1,095	707	1,017
Total (per capita)	2,066	2,558	2,165

Table 3 Waste generation per capita by waste stream, 2019–20 (proportions same as shown in Table 2).

Figures 3 to 5 show the trends in waste generation and generation per capita between 2014–15 and 2019–20 by waste stream. Since 2014–15, MSW waste generation per capita has decreased from 621 tonnes to 533 tonnes (14%), exceeding the 2030 target of 559 kg per capita.

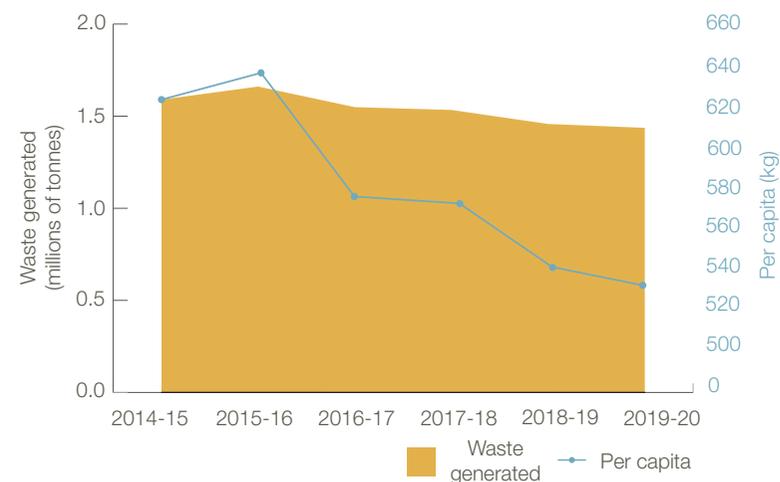


Figure 3 Waste generation and generation per capita for MSW.

C&I waste generation per capita has decreased from 642 tonnes in 2014–15 to 614 tonnes (4%). This is close to meeting the 2025 target of 610 kg per capita.

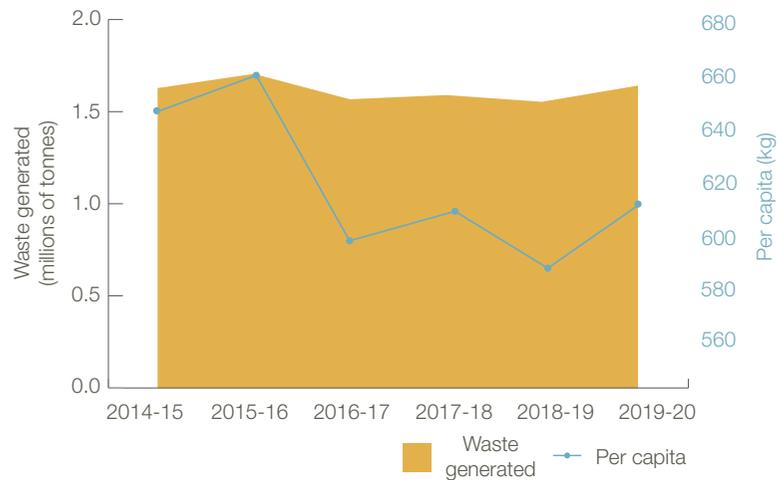


Figure 4 Waste generation and generation per capita for C&I.

C&D waste generation per capita has increased from 2018–19 due to an increase in the number of C&D recyclers reporting. Since 2014–15, reported C&D waste generation per capita has decreased by 170 kg per capita to 1,017 kg per capita (14%). This is close to meeting the 2025 target of 1,010 kg per capita.

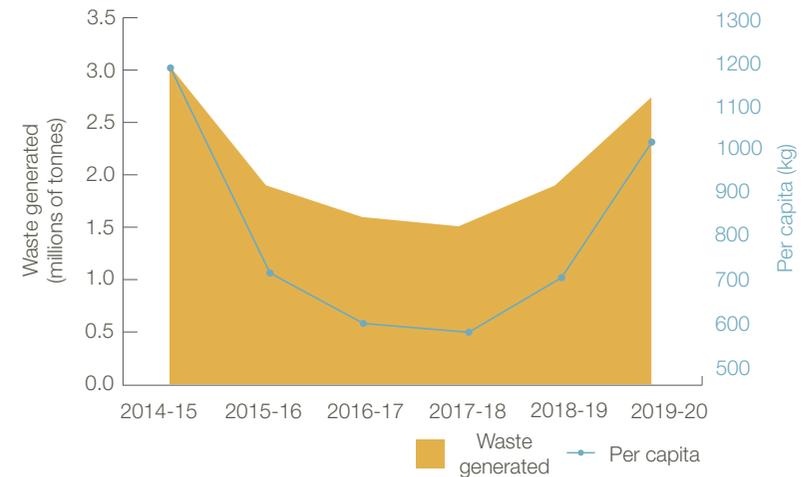


Figure 5 Waste generation and generation per capita for C&D.

Disposal

A total of 2.4 million tonnes of waste was disposed of to landfill in WA in 2019–20. This has increased by 285,000 tonnes since 2018–19, in part due to the inclusion of wasted exempted from the waste levy used in the construction and maintenance of landfills (which has only been partly included in previous reporting periods).

The waste strategy includes a target that no more than 15 per cent of the Perth and Peel regions’ waste is disposed of to landfill by 2030. In 2019–20, 35 per cent or 1,552,645 tonnes of the Perth and Peel regions’ waste was landfilled.

Waste disposed of to landfill by waste stream for 2019–20 is provided in Table 4. Disposal trends are provided in Figure 6. Note that prior to 2019–20, the Peel region was included in the non-metropolitan region category.

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion	Tonnes	Proportion	Tonnes	Proportion
MSW	754,531	49%	254,845	30%	1,009,376	42%
C&I	481,102	31%	405,033	48%	886,135	37%
C&D	317,012	20%	190,247	22%	507,259	21%
Total	1,552,645	100%	850,125	100%	2,402,770	100%

Table 4 Disposal by waste stream, 2019–20.

The amount of waste disposed of to landfill has been relatively steady for MSW and C&I since 2014–15. There was 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.

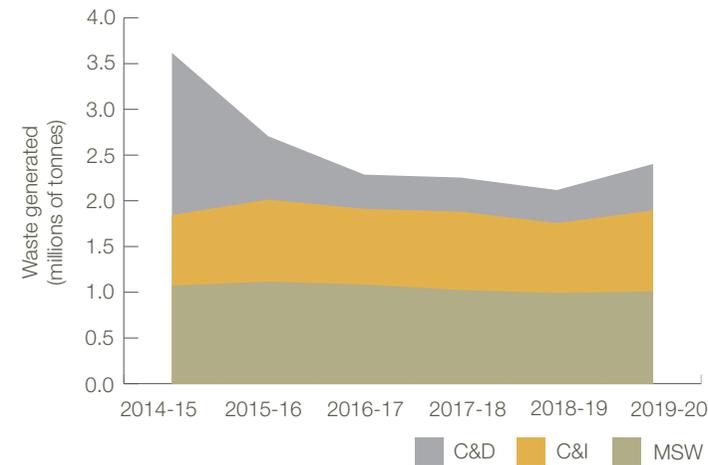


Figure 6 Disposal by waste stream.

Recovery

Overall material recovery and trends

In 2019–20, 3.4 million tonnes of materials were recovered, which is an increase of 581,000 tonnes from 2018–19. Material recovered by waste stream for 2019–20 is provided in Table 5.

Waste stream	Perth and Peel regions		Non-metropolitan regions		Western Australia	
	Tonnes	Proportion	Tonnes	Proportion	Tonnes	Proportion
MSW	346,554	12%	78,788	15%	425,342	13%
C&I	478,766	17%	253,724	49%	732,490	22%
C&D	2,039,062	71%	190,799	36%	2,229,861	66%
Total	2,864,381	100%	523,312	100%	3,387,693	100%

Table 5 Material recovery by waste stream, 2019–20.

The total amount of material recovery has increased over the past two reporting periods (Figure 7). The most recent increase coincides with additional recyclers reporting under the mandatory reporting requirements.

The quantity of MSW reported as recovered declined from 520,000 tonnes in 2014–15 to 426,000 tonnes in 2019–20 (Figure 7). Sixty-one per cent of this decline is associated with decreased reporting of C&D material types in the MSW stream (71,000 tonnes in 2014–15 compared with 14,000 tonnes in 2019–20).

Material recovery in the C&I waste decreased by 15 per cent from 872,000 tonnes in 2014–15 to 732,000 tonnes in 2019–20 (Figure 7). This decline is partly attributable to a reduction in the reporting of C&D material types in the C&I waste stream (130,000 tonnes in 2014–15 compared with

21,000 tonnes in 2019–20). The C&I recovery rate can be volatile due to the influence of the international market price for scrap metal, which accounts for the majority of material recovery within the C&I waste stream.

Material recovery in the C&D waste stream in 2019–20 was 2.23 million tonnes. There was a significant increase in reported C&D recovery over the past two reporting periods, particularly in 2019–20. The most recent increase coincides with additional reporters under the mandatory reporting requirements.

Material recovery quantities, sources and destinations are provided in Appendix B and can also be accessed from the accompanying dashboards (see Appendix E for more details).

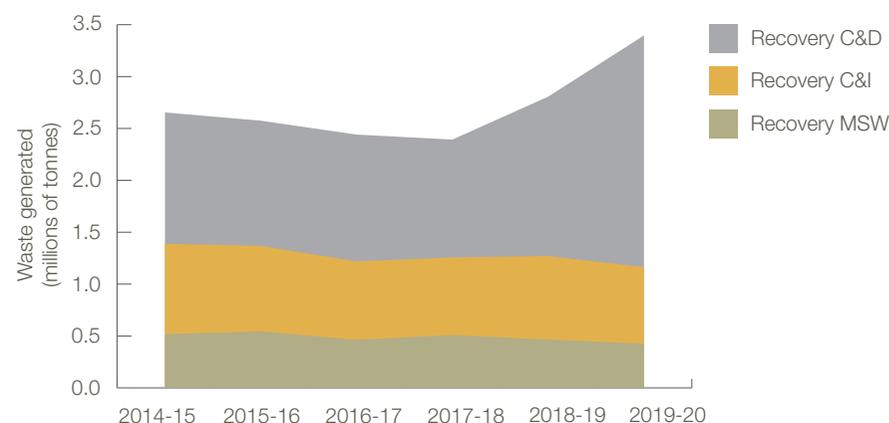


Figure 7 Recovery by waste stream.

MSW material recovery

Overall material recovery and trends

Four hundred and twenty-five thousand tonnes of materials from the MSW stream were recovered in 2019–20. Of this, 53 per cent was organic waste (mostly garden waste). Paper and cardboard were the next most commonly recovered materials, comprising 21 per cent of total MSW recovery.

Organics, paper and cardboard represent the largest opportunities for increasing MSW recovery in the future (see Figure 8).

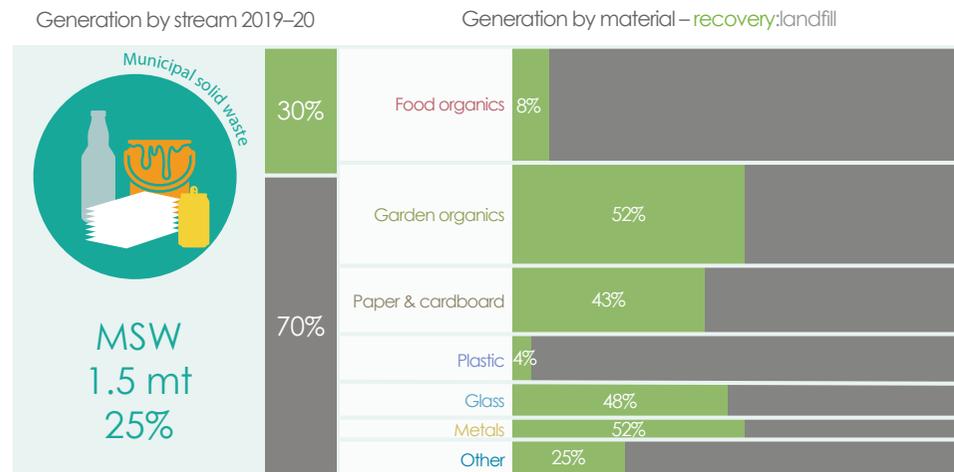


Figure 8 Reported MSW generation shown as material recovery (green) and landfill (grey) by material category in 2019–20. Width of bars represent estimated generation as a proportion of total MSW generation, with estimated material recovery rate (%).

C&I material recovery

A total of 732,000 tonnes of materials from the C&I waste stream were recovered in 2019–20. Sixty-three per cent of this was metals. Paper and cardboard (14%) and organics (14%) were the next most commonly recovered materials from the C&I waste stream.

Paper and cardboard, organic waste and plastics represent the largest opportunities for increasing C&I recovery in the future (see Figure 9).

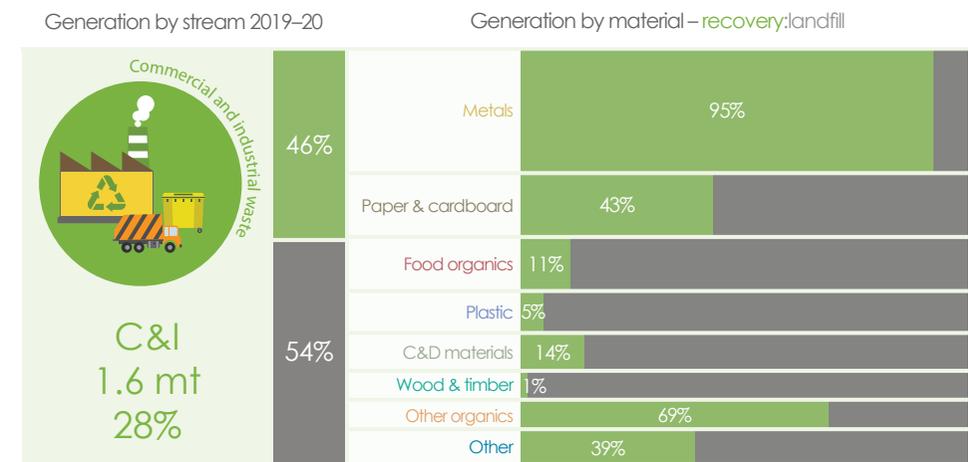


Figure 9 Reported C&I waste generation shown as material recovery (green) and landfill (grey) by material category in 2019–20. Width of bars represent estimated generation as a proportion of total C&I waste generation, with estimated material recovery rate (%).

C&D material recovery

In 2019–20, 2.23 million tonnes of material was recovered from the C&D waste stream. Ninety-six per cent (2.15 million tonnes) of this was C&D material, most of which was described as ‘mixed’. Other materials recovered from this stream included scrap metal (73,000 tonnes) and organic wastes (9,000 tonnes) (Figure 10).

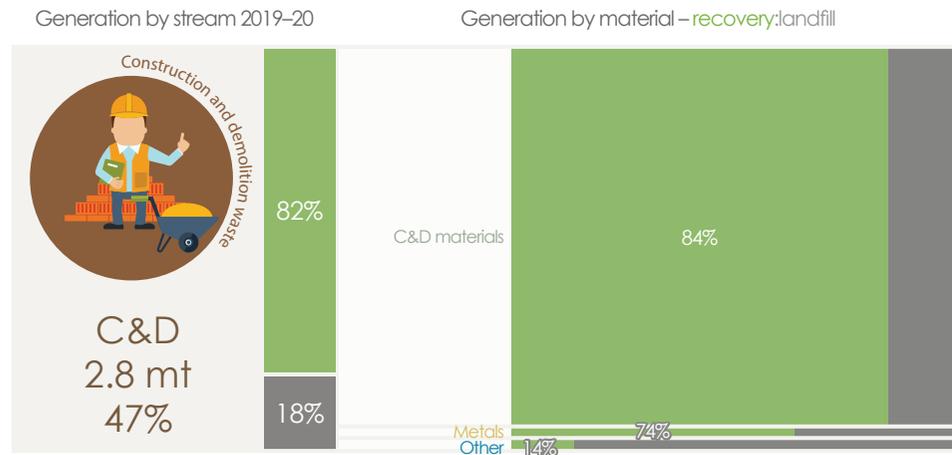


Figure 10 Generation of C&D waste shown as material recovery (green) and landfill (grey) by material category in 2019–20.

Material recovery facilities

Material recovery facilities (MRFs) mostly receive comingled recycling collections from households. Of the nine MRFs that lodged an annual return, five reported recovering 114,000 tonnes of recyclables from the MSW stream. The composition of MSW recovered by MRFs in 2019–20 is shown in Figure 11 below.

Eight MRFs also reported recovering 81,000 tonnes of recyclables from the C&I stream. Most (89%) of these recovered materials were paper and cardboard.

In 2019–20, MRFs reported 46,000 tonnes of recycling losses. A fire at a large metropolitan MRF in November 2019 contributed to these losses. It resulted in the closure of the MRF for the remainder of the financial year, with recyclables diverted to other MRFs. The rebuilt MRF recommenced full operations in June 2021.

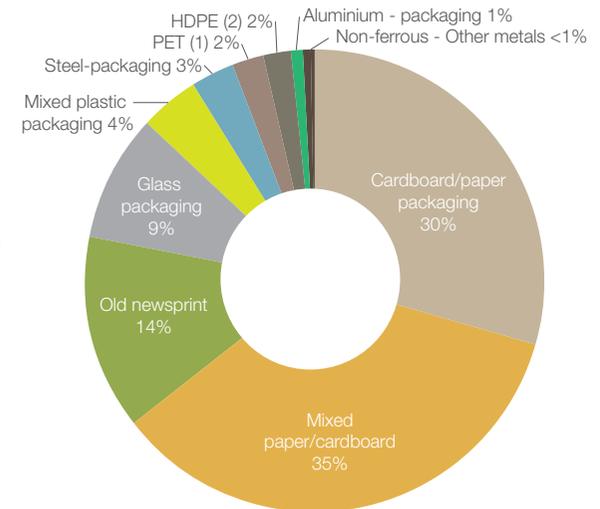


Figure 11 Material composition of MSW recovered at MRFs in 2019–20.

Destination

Table 6 shows the destination of material recovered from the waste stream in 2019–20. About 76 per cent (2.60 million tonnes) of recovered waste was reprocessed within the state and 23 per cent (0.79 million tonnes) was sent overseas for reprocessing. Only very small quantities (less than 10,000 tonnes) were sent interstate for reprocessing.

Waste stream	Final processing in Western Australia		Interstate		Exported		All recovered
	Tonnes	% of recovered waste	Tonnes	% of recovered waste	Tonnes	% of recovered waste	Tonnes
MSW	294,108	70%	1,903	0%	129,330	30%	425,342
C&I	143,901	20%	6,845	1%	581,745	79%	732,490
C&D	2,159,183	97%	71	0%	70,607	3%	2,229,861
Total	2,597,192	76%	8,819	0%	781,682	23%	3,387,693

Table 6 Destination of recovered materials by waste stream (tonnes).



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

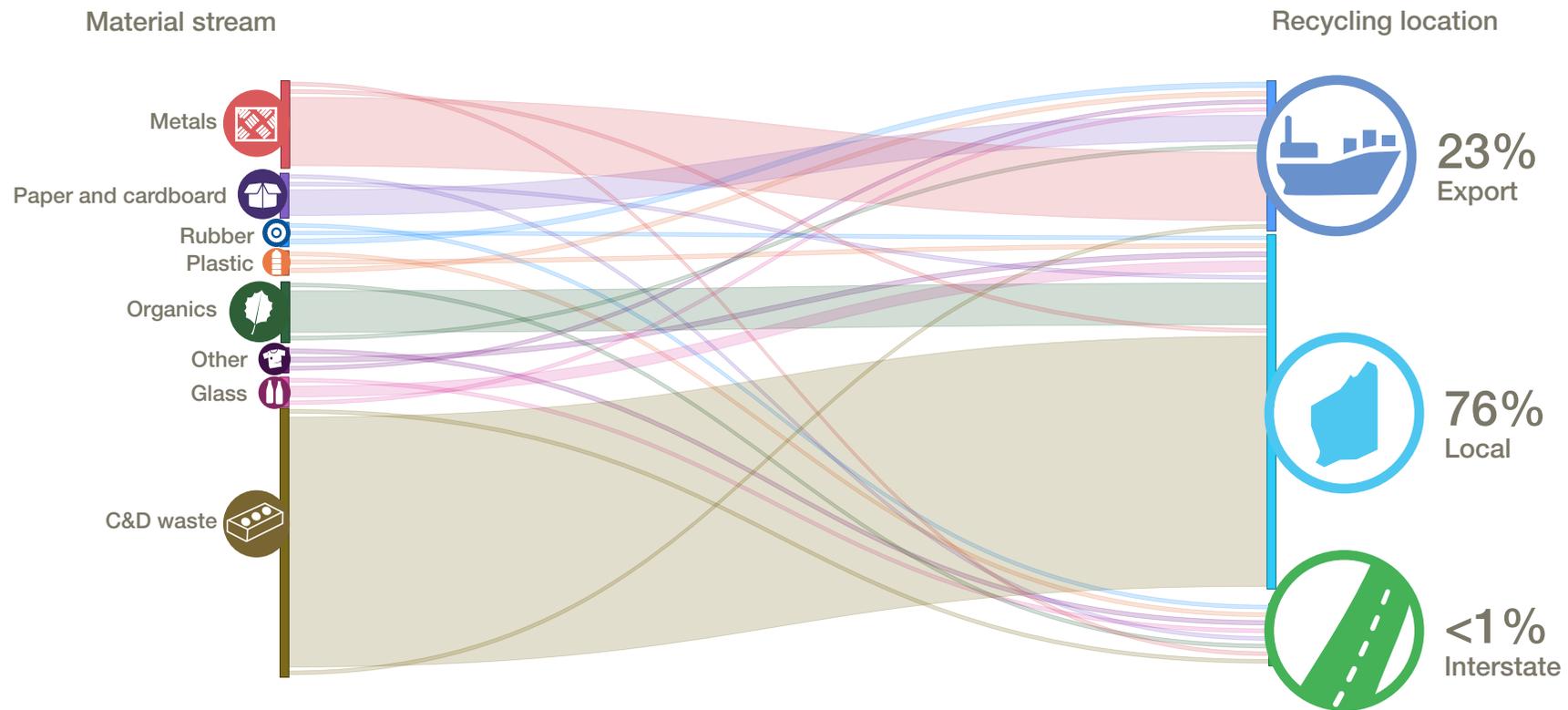


Figure 12 Waste recovery flows by processing destination and material category.

Figure 12 illustrates that in 2019–20, WA was reliant on export markets for some waste types which are subject to phased export bans from 2021. The total reported quantities of these waste types are listed in Table 7.

Waste type	Exported (t)	Commentary
Plastics	8,275	Reported tonnes represent plastics not reprocessed in WA. An additional 2000 tonnes of locally reprocessed plastics were also exported.
Tyres	27,810	Includes exported tyres reported for recovery as tyre-derived fuel.
Paper and cardboard	194,295	All paper and cardboard types (i.e., includes separated scrap).
Glass	0	

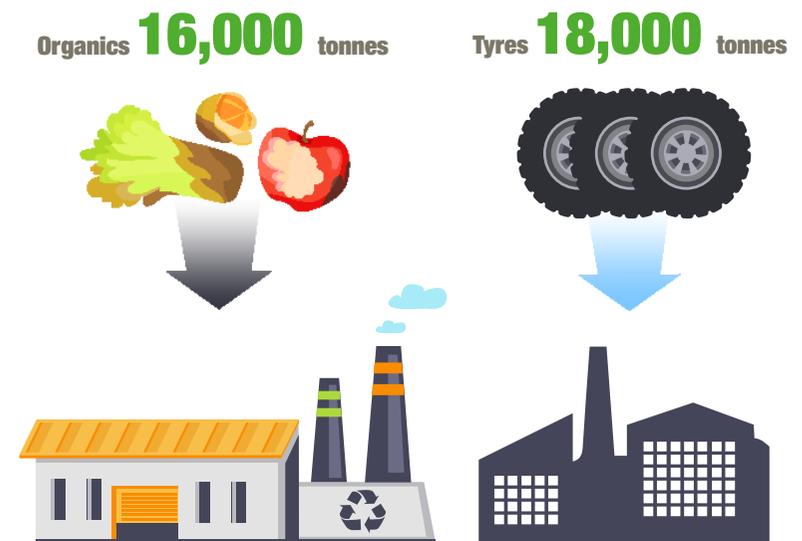
Table 7 Waste plastic, tyres, paper and cardboard directly exported overseas from WA in 2019–20. Not all reported tonnes may be subject to the phased export bans.

Energy recovery

About 35,000 tonnes of waste were recovered as energy in 2019–20. Ninety-nine per cent of this was sourced from the C&I sector. Around half was recovered as tyre-derived fuel and the other half recovered as biogas.

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

Landfill gas capture has not been included as energy recovery.





Material recovery: focus on HDPE

From 1 July 2021, plastic waste will be subject to regulations which will limit its export from Australia under the Australian Government’s *Recycling and Waste Reduction Act 2020*. Historically, WA has exported most of its collected plastic waste overseas for recycling. High density polyethylene (HDPE) was the most commonly consumed polymer type in WA in 2019–20, used mostly for consumer packaging but also within the built environment. An estimated 66,600 tonnes of HDPE was consumed in the state in 2019–20, with 6,100 tonnes (<10%) collected for recycling. MRFs reported recovering 3,141 tonnes of the polymer in 2019–20. Fifty-two per cent of all collected HDPE waste was exported for recycling.

Over the past five years, an average of 6,100 tonnes of HDPE per year has been recovered, and 62 per cent exported for recycling per year. In 2020, there were nine HDPE reprocessors in WA, capable of reprocessing over 9,000 tonnes of HDPE, with increases in capacity planned for the next five years. Plastic recyclers commented that while there is good demand for recycled HDPE, there is a need to develop local end markets for plastic recycling further.

Figure 13 shows the detailed flows of HDPE recyclate in WA as it enters the waste stream.

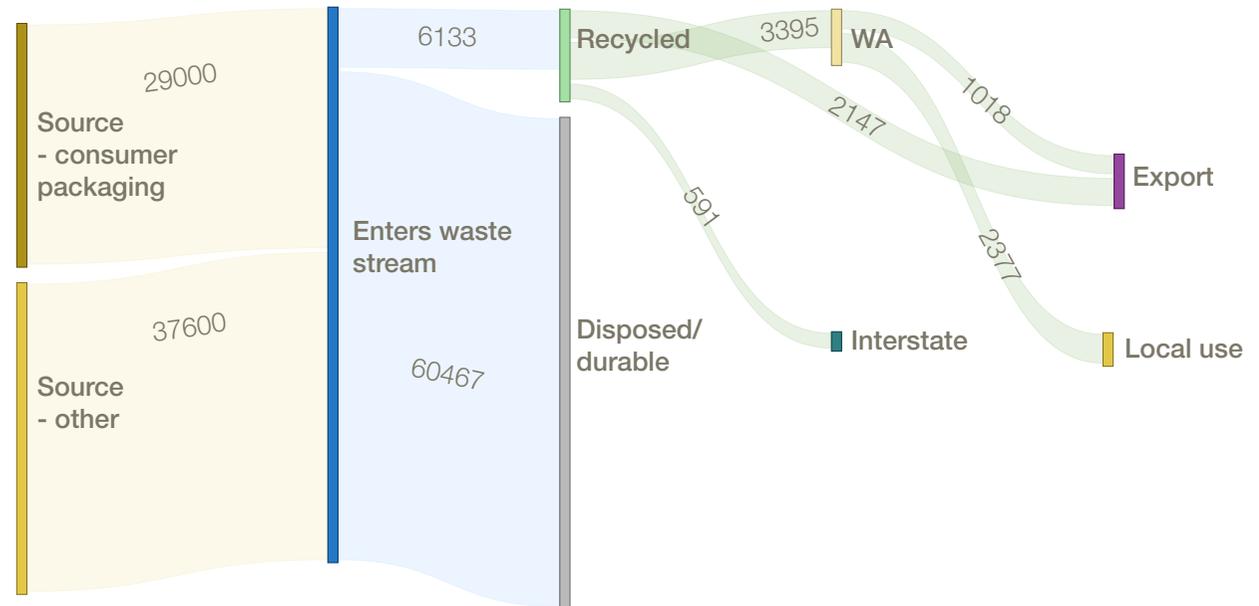


Figure 13 Sources and flows of HDPE in WA in 2019–20.

Material recovery rate

The material recovery rate for solid waste in WA in 2019–20 was 58 per cent, an increase of one per cent from 2018–19.

Figure 14 shows the trends in material recovery rates from 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 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.

Reported material recovery has increased with the introduction of mandatory reporting requirements in 2019.

The 2019–20 material recovery rate for the C&D waste stream exceeds the 2030 target. However, this is most likely inflated by stockpiles of unprocessed waste (as discussed in the stockpiles section below).

Material recovery rates in the MSW and C&I waste streams have not shown any sustained improvements since 2014–15. Improving material recovery rates to meet waste strategy targets in these sectors will require substantially increased material recovery. The waste strategy's aim to transition all local governments in the Perth and Peel regions to three-bin FOGO systems by 2025 will help improve material recovery rates.

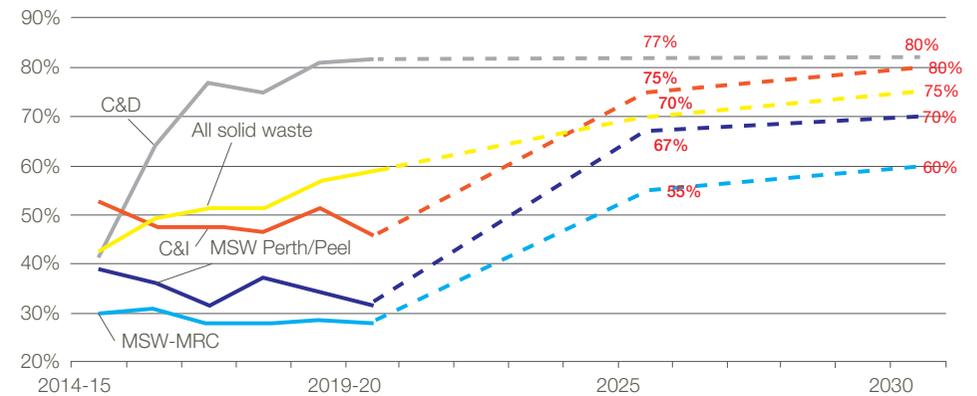


Figure 14 Material recovery rates against the waste strategy targets (red). Note that prior to 2019–20, material recovery rates included waste recovered as energy.

Stockpiles

Recyclers reported stockpiling over 1.88 million tonnes of waste as of 30 June 2020 (Table 8). Eighty-six per cent of this was C&D waste. 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 can contribute to the artificial inflation of the C&D waste stream's material recovery rate.

Material category	General and organic recyclers		MRF	Total
	Reprocessed	Unprocessed		
C&D waste	858,163	758,250		1,616,413
Organics	62,030	73,121		135,151
Other	48,570	13,900		62,470
Metals	48,989	5,044	269	54,302
Glass	2,714	1,488	959	5,161
Paper and cardboard	199		3,430	3,629
Rubber	1,267	360		1,627
Hazardous waste	254			254
Total	1,022,186	852,163	4,658	1,879,007

Table 8 Stockpiled waste at recyclers as of 30 June 2020 (tonnes).

Figure 15 provides a breakdown of the stockpiled C&D material types. The most common stockpiled material is 'mixed C&D waste', with 426,000 tonnes reprocessed and 461,000 unprocessed. Large quantities of reprocessed sand/soil and rubble/aggregate and unprocessed bitumen are also stockpiled. The presence of large C&D stockpiles indicates a current lack of demand for recycled C&D products.

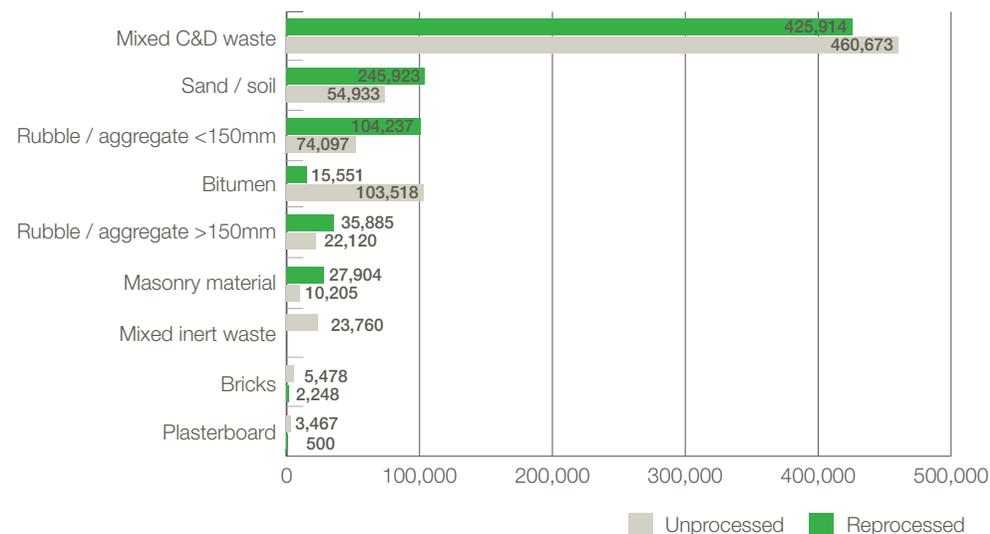


Figure 15 Tonnes of stockpiled C&D materials as of 30 June 2020.

Trend data for stockpiles is not available. The quantity of stockpiled waste previously estimated in *Recycling activity in Western Australia 2018–19* is not considered to be directly comparable to that reported in 2019–20 due to different methodologies used.

Domestic waste

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 2019–20, 144 local governments and regional councils in WA reported to the department the waste services they provided to their residents and the quantities of waste they collected and recovered.

Domestic waste collected and recovered

In 2019–20, local governments collected 1.49 million tonnes of domestic waste from their residents and reported a 37 per cent material recovery rate. Overall material recovery was higher in the Perth and Peel regions (40%) compared with other regions in the state (28%). However, as seen in Table 9, the highest recovery rate was achieved outside the Perth and Peel regions by the City of Bunbury (63%), based on its well-established FOGO kerbside collection system.

Local government	Collected	Recovered	Collection systems ¹	Recovery rate
City of Bunbury	18,365	11,552	FOGO; VS; drop-off	63%
Shire of Harvey	12,950	7,790	FOGO; drop-off	60%
City of Joondalup	80,983	46,098	AWT; GO; VS; drop-off	57%
City of Stirling	118,652	66,256	GO; AWT; VS; drop-off	56%
City of Nedlands	11,368	6,270	GO; VS	55%

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

¹All systems include comingled recyclable kerbside collections. FOGO = kerbside food organics and garden organics; GO = kerbside garden organics; VS = bulk vergeside collection (including garden waste) with recovery; AWT = mixed waste composting.

The amount of domestic waste collected in WA has remained relatively stable since 2014–15, with a small but steady decline in the amount of domestic waste collected per capita (Figure 16).

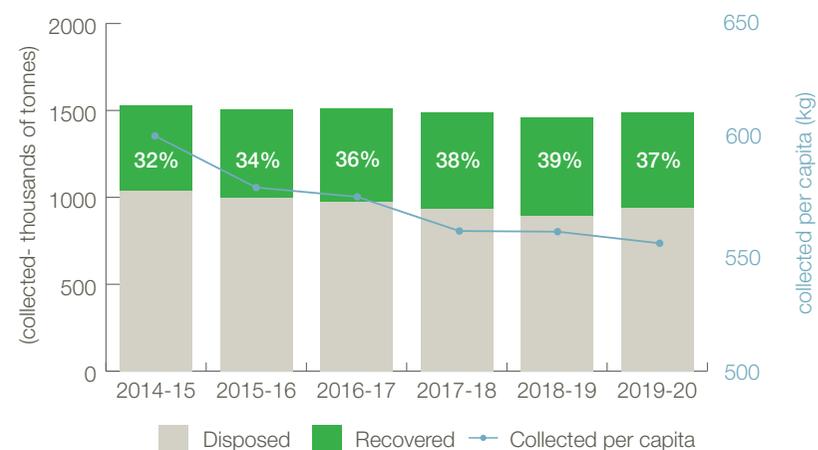


Figure 16 Total domestic waste collected (shown by recovered or disposed fate), per capita domestic waste collected, and recovery rates in WA since 2014–15.

Most domestic waste was collected through kerbside services (67%), followed by waste dropped off by residents to specialist collection facilities provided by local governments (23%). Smaller quantities were collected from bulk garden and bulky waste verge services, public place bins and special events services.

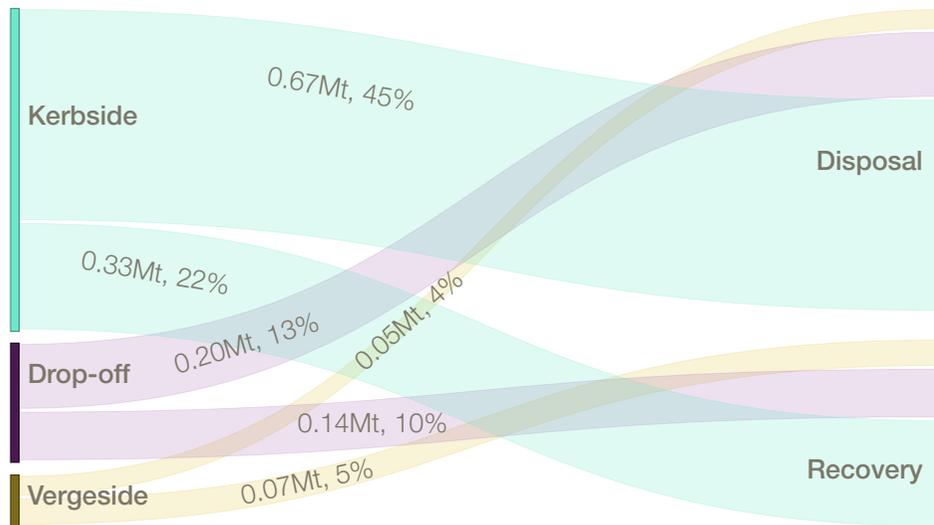


Figure 17 Waste collected and fate by service category. Labels show tonnes of flow and proportion (%) of total collected domestic waste. Waste collected from public places and special events is not shown, as it represents only 1% of collections.

Kerbside services

Local governments collected around one million tonnes of domestic waste through kerbside services in 2019–20 and recovered 331,000 tonnes (33%) of materials from the stream. Kerbside waste collections provide the largest potential for future increases in material recovery (see recovery and disposal by service, Figure 17).

In 2019–20, 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-topped bin). Thirty-five per cent of the population were provided with a separate organics bin: nine per cent with a FOGO bin, and 27 per cent with a GO bin. The waste strategy aims for all local governments in Perth and Peel to have a three-bin FOGO system in place by 2025.

Figure 18 shows waste recovery and disposal for each type of kerbside service provided by local governments in 2019–20. Fifty-two per cent or 516,000 tonnes of the domestic waste collected from kerbside services was transported directly to landfill (red-topped bin), illustrating the opportunity for further recovery of resources from this service category.

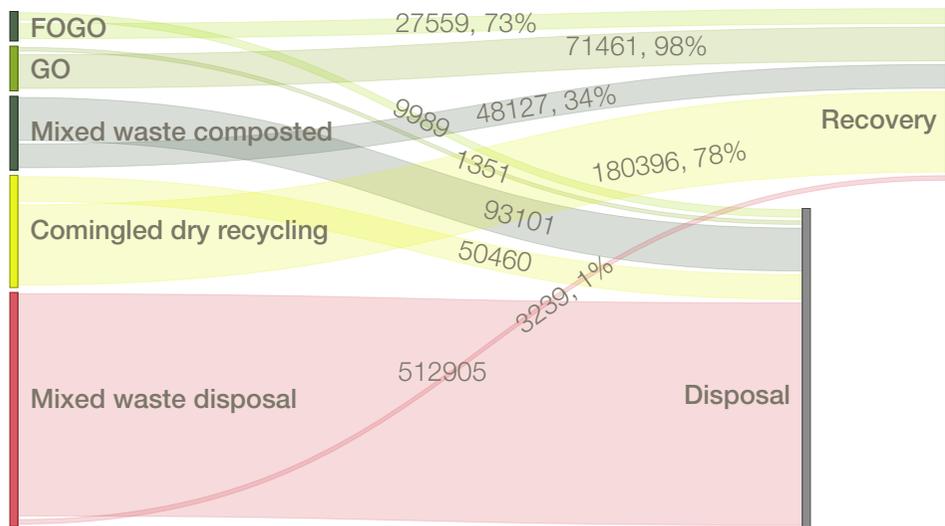


Figure 18 Kerbside services, recovery and disposal, with flow tonnes and recovery rates (%).

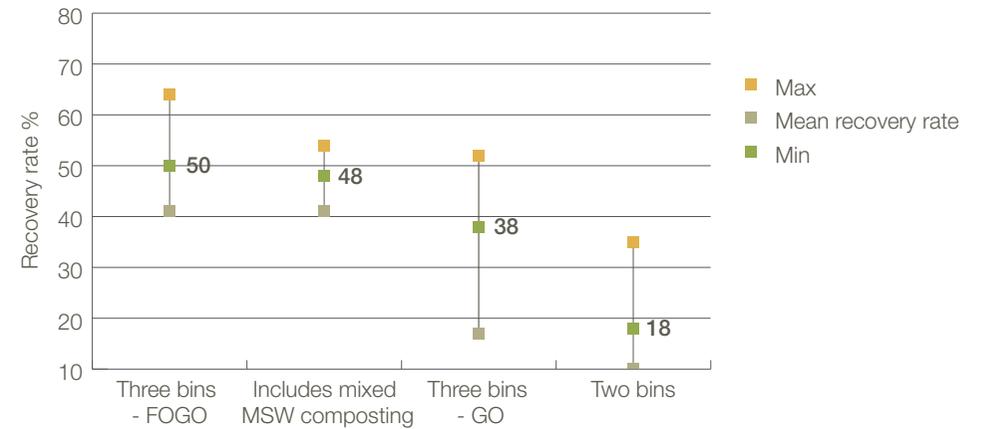


Figure 19 Mean, maximum and minimum reported recovery rates for kerbside systems in 2019–20.

Note that systems which included any mixed MSW composting were assigned to this category. Three-bin system performance includes local governments where not all residents are provided with a third bin (i.e., there is a mix of two- and three-bin collections).

The best performing kerbside systems for material recovery in 2019–20 were those with a third bin for the recovery of combined FOGO materials. Three-bin systems had an average recovery rate of 50 per cent, compared with only 18 per cent for two-bin systems without organics composting.

Figure 19 on the right shows the mean and range of reported recovery rates of kerbside systems in 2019–20.

Kerbside services: material types recovered

In 2019–20, 147,000 tonnes of organic waste were recovered from kerbside services, making organics the most recovered type of domestic waste collected from kerbside bins. Other materials commonly recovered from kerbside services are shown in Figure 20.

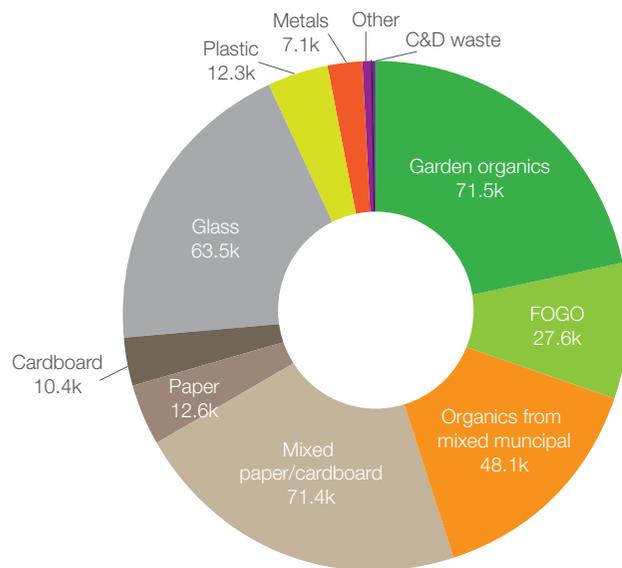


Figure 20 Most commonly recovered material types from kerbside services (tonnes).

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.
HDPE	High-density polyethylene, a commonly used thermoplastic.

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.
Liabile persons	Liabile 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.
MRC	Major regional council. Includes the cities of Albany, Bunbury, Busselton, Greater Geraldton and Kalgoorlie-Boulder.
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: <ul style="list-style-type: none"> • 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.
Regional council	A regional local government established under section 3.61 of the <i>Local Government Act 1995</i> .
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	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

ASK Waste Management 2020, [Recycling activity in Western Australia 2018–19](#), report prepared for the Waste Authority, Department of Water and Environmental Regulation, Perth.

Blue Environment 2020, [National waste report 2020](#), Department of Agriculture, Water and Environment, Perth.

Envisage Works 2021, *Australian plastic flows and fates 2019–20: Western Australian state data report*, unpublished.

Waste Authority 2018, [Waste avoidance and resource recovery strategy 2030](#), Department of Water and Environmental Regulation, Perth.

Western Australian Planning Commission 2018, [Western Australia tomorrow: Medium-term population forecasts](#), population report no. 11, report prepared by T Mulholland and A Piscielli, Department of Planning, Lands and Heritage, Perth.

Western Australian Planning Commission 2012, [Western Australia tomorrow: Household forecasts for all local government areas in Western Australia](#), population report no. 8, report prepared by T Mulholland and A Piscielli, Department of Planning, Lands and Heritage, Perth.

Appendix A: 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.

One hundred and seven liable recyclers, 16 liable landfills, 139 local governments and five regional councils lodged an 18C return for the 2019–20 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 was used to supplement recycling data for the metals and textiles material categories. The export data is available online through the Department of Agriculture, Water and Environment's [website](#).

Plastic recycling

Plastic recycling data was supplemented with data from Envisage Works 2020 (see References).

Population

Population data was sourced from Western Australian Planning Commission 2018 (see References).

The number of domestic premises was sourced from Western Australian Planning Commission 2012 (see References).

Population density was not considered when reporting the percentage of the population provided with a waste service.

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 2020 report (Blue Environment 2020), 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 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 17 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 are included as 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 of 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 2019–20, 41 per cent of reported recovered waste was weighed, 57 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-two 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. Estimated disposal outside the Perth and Peel regions was estimated on a per capita

basis and is subject to a higher degree uncertainty than directly reported disposal and recovery.

Audits

All annual returns were reviewed by department officers for completeness and consistency; however, no audits of the annual returns had been completed at the time of preparing this report. Targeted audits of local government and liable non-metropolitan annual returns had started. The data presented in this report may be updated in subsequent releases subject to the outcomes of the audits.

Comparability to previous reports

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

The definition of disposal includes waste that may be exempt from the waste levy. Metropolitan disposal in 2019–20 includes some waste disposal that was exempt from the levy which may not have been captured in previous years. The magnitude of this is estimated at about 100,000 tonnes of inert materials in 2019–20. Applied to the past four reporting periods, this is equivalent to about a five per cent increase in annual C&D generation.

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 and 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.

Data gaps

Organic waste is commonly collected, mulched and composted by different recyclers, with the processed materials becoming different ‘products’ at various points of the cycle. This opens the possibility of both double-counting and missing recovered organic products through annual return reporting. The department is developing guidance materials to improve future organics reporting.

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. The department is developing additional guidance about recording and reporting waste streams.

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: Recovery by material category, type, source and destination

Waste material types and categories shown as reported by liable recyclers under regulation 18B(3) of the WARR Regulations. Some categories and types listed below have been consolidated in the body of this report. Includes waste recovery as energy.

Category	Material type	Tonnes recovered	Source waste stream			Source region			Destinations	
			C&I	MSW	C&D	Perth and Peel	Regional	WA	Exported	Interstate
Bulky wastes	Electric and electronic goods	22	0%	100%	0%	0%	100%	0%	0%	100%
C&D waste	Bitumen	90,114	0%	0%	100%	100%	0%	100%	0%	0%
C&D waste	Bricks	11,333	0%	0%	100%	100%	0%	100%	0%	0%
C&D waste	Concrete	255,578	0%	0%	100%	98%	2%	100%	0%	0%
C&D waste	Masonry material	76,963	0%	0%	100%	100%	0%	100%	0%	0%
C&D waste	Mixed C&D waste	1,229,569	0%	0%	100%	87%	13%	100%	0%	0%
C&D waste	Mixed inert waste	147,383	0%	0%	100%	100%	0%	100%	0%	0%
C&D waste	Plasterboard	4,796	26%	0%	74%	100%	0%	100%	0%	0%
C&D waste	Rubble/aggregate <150mm	16,706	0%	0%	100%	100%	0%	100%	0%	0%
C&D waste	Rubble/aggregate >150mm	15,697	0%	0%	100%	100%	0%	100%	0%	0%
C&D waste	Sand/soil	303,702	6%	5%	90%	93%	7%	100%	0%	0%
Cardboard	Cardboard/paper packaging	118,857	72%	28%	0%	90%	10%	0%	100%	0%
Contaminated soil	Contaminated soil	28,915	9%	0%	91%	97%	3%	100%	0%	0%
Glass	Glass packaging (mixed)	63,456	17%	83%	0%	96%	4%	98%	0%	2%
Hazardous waste	Batteries	5,430	100%	0%	0%	94%	6%	0%	0%	100%
Metals	Metals: ferrous steel (non-packaging)	526,002	82%	5%	14%	57%	43%	0%	100%	0%
Metals	Metals: ferrous steel (packaging)	3,804	13%	87%	0%	88%	12%	0%	100%	0%
Metals	Metals: non-ferrous – aluminium (non-packaging)	18,769	71%	28%	1%	56%	44%	0%	100%	0%
Metals	Metals: non-ferrous – aluminium (packaging)	2,050	11%	89%		74%	26%	1%	99%	0%

Category	Material type	Tonnes recovered	Source waste stream			Source region			Destinations	
			C&I	MSW	C&D	Perth and Peel	Regional	WA	Exported	Interstate
Metals	Metals: non-ferrous – other	13,345	95%	2%	3%	61%	38%	0%	100%	0%
Mixed paper/ cardboard	Mixed paper/cardboard	31,836	15%	85%	0%	90%	10%	0%	100%	0%
Mixed putrescible waste	Mixed putrescible waste: C&I	74	100%	0%	0%	100%	0%	100%	0%	0%
Organics	Biosolids	28,729	56%	44%	0%	82%	18%	100%	0%	0%
Organics	Fats and grease	15,831	100%	0%	0%	100%	0%	100%	0%	0%
Organics	Food and garden organics	26,200	6%	94%	0%	36%	64%	100%	0%	0%
Organics	Food waste	24,767	99%	1%	0%	84%	16%	100%	0%	0%
Organics	Garden waste	187,035	24%	75%	0%	77%	23%	100%	0%	0%
Organics	Organics from mixed municipal waste	47,989	0%	100%	0%	100%	0%	100%	0%	0%
Organics	Other organic materials	3,748	0%	0%	100%	100%	0%	100%	0%	0%
Organics	Urban wood, timber, sawdust (also C&D waste)	17,610	73%	4%	23%	92%	8%	100%	0%	0%
Other	Other inert (specify)	12,871	63%	1%	35%	100%	0%	99%	0%	1%
Other	Other putrescible (specify)	4	100%	0%	0%	100%	0%	100%	0%	0%
Paper	Magazines	406	100%	0%		97%	3%	0%	100%	0%
Paper	Old newsprint	19,913	22%	78%	0%	86%	14%	0%	100%	0%
Paper	Paper (mixed)	16,507	24%	76%		86%	14%	0%	100%	0%
Paper	White office paper	6,798	100%	0%	0%	99%	1%	0%	100%	0%
Plastic	(1) PET	2,489	12%	88%		87%	12%	2%	88%	10%
Plastic	(2) PE-HD	6,133	52%	41%	7%	75%	25%	55%	35%	10%

Category	Material type	Tonnes recovered	Source waste stream			Source region			Destinations	
			C&I	MSW	C&D	Perth and Peel	Regional	WA	Exported	Interstate
Plastic	(3) PVC	2,580		50%	50%	100%		43%	35%	22%
Plastic	(4) PE-LD/LLD	1,000	100%			93%	7%	43%	56%	1%
Plastic	(5) PP	1,603	38%	62%		100%		26%	50%	24%
Plastic	(6) PS	404	75%	25%		100%		59%	41%	
Plastic	(6) PS-E	392	50%	50%		100%		59%	41%	
Plastic	(7) ABS/SAN/ASA	537	100%			90%	10%	47%	52%	1%
Plastic	(7) Nylon	118	100%			90%	10%		100%	
Plastic	(7) Other	192	100%			90%	10%	43%	57%	
Plastic	(7) PU	470	100%			90%	10%			100%
Plastic	Unknown polymer	1,888	61%	39%		90%	10%		87%	13%
Rubber	Other rubber, including conveyor belts	4,415	100%	0%	0%	12%	88%	1%	99%	0%
Rubber	Tyres	28,543	98%	2%	0%	77%	23%	0%	97%	3%
Textiles	Mixed textiles	990		100%		100%	0%		100%	

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

Waste material types and categories shown as reported by liable recyclers under regulation 18B(3) of the WARR Regulations. Some categories and types listed below have been consolidated in the body of this report.

Kerbside services	Region	Collected	Recovered	Recovery rate	Percentage of population provided with service
Mixed waste collected and transported to landfill directly or via a transfer station	Western Australia	516,144	3,239	1%	93%
	Non-metropolitan (other) region	142,662		0%	91%
	Peel region	42,387		0%	98%
	Perth metropolitan region	331,095	3,239	1%	93%
Comingled dry recycling	Western Australia	230,855	180,396	78%	94%
	Non-metropolitan (other) region	35,302	26,305	75%	69%
	Peel region	12,806	10,513	82%	98%
	Perth metropolitan region	182,746	143,578	79%	100%
Garden organics only	Western Australia	72,812	71,461	98%	27%
	Non-metropolitan (other) region	2,098	1,898	90%	7%
	Perth metropolitan region	70,714	69,563	98%	34%
Combined food organics and garden organics	Western Australia	37,549	27,559	73%	9%
	Non-metropolitan (other) region	18,773	18,285	97%	19%
	Perth metropolitan region	18,776	9,275	49%	6%
Mixed waste collected and processed in a composting facility	Western Australia	141,228	48,127	34%	29%
	Perth metropolitan region	141,228	48,127	32%	40%

Vergeside services		Region	Collected	Recovered	Recovery rate	Percentage of population provided with service
Domestic green waste vergeside collection services	Western Australia		57,485	56,459	98%	84%
	Non-metropolitan (other) region		8,054	7,596	94%	31%
	Peel region		4,526	4,526	100%	96%
	Perth metropolitan region		44,905	44,338	99%	97%
Domestic hard waste vergeside collection services	Western Australia		65,848	15,089	23%	84%
	Non-metropolitan (other) region		3,671	547	15%	31%
	Peel region		3,862	1,133	29%	98%
	Perth metropolitan region		58,315	13,409	23%	97%
Specific product vergeside collection (e.g. white goods, mattresses, e-waste)	Western Australia		2,446	1,840	75%	37%
	Non-metropolitan (other) region		400	12	3%	3%
	Perth metropolitan region		2,046	1,828	89%	48%
Public place and special events services		Region	Collected	Recovered	Recovery rate	
Waste (garbage)	Western Australia		19,363	815		4%
	Non-metropolitan (other) region		7,903	2		0%
	Peel region		1,766			0%
	Perth metropolitan region		9,694	813		8%
Recycling	Western Australia		568	453		80%
	Non-metropolitan (other) region		124	108		87%
	Perth metropolitan region		444	345		78%

Drop-off services	Region	Collected	Recovered	Recovery rate
Mixed waste drop-off facilities	Western Australia	181,257	9,487	5%
	Non-metropolitan (other) region	103,171	2,198	2%
	Peel region	9,469	337	4%
	Perth metropolitan region	68,617	6,953	10%
Dry recyclables drop-off (includes paper/cardboard, packaging containers)	Western Australia	14,731	13,840	94%
	Non-metropolitan (other) region	6,724	5,832	87%
	Peel region	217	217	100%
	Perth metropolitan region	7,791	7,791	100%
Green waste drop-off	Western Australia	89,119	81,380	91%
	Non-metropolitan (other) region	36,479	29,634	81%
	Peel region	3,744	3,003	80%
	Perth metropolitan region	48,897	48,743	100%
Hard waste or bulk rubbish drop-off	Western Australia	46,449	30,825	66%
	Non-metropolitan (other) region	22,869	16,522	72%
	Peel region	3,022	3,004	99%
	Perth metropolitan region	20,558	11,299	55%
Waste recovered for sale at a tip shop	Western Australia	6,389	4,621	72%
	Non-metropolitan (other) region	1,340	1,336	100%
	Perth metropolitan region	5,048	3,284	65%
Other	Western Australia	4,850	4,846	3%
	Non-metropolitan (other) region	429	425	99%
	Perth metropolitan region	4,421	4,421	100%

Appendix D: 2019–20 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 report for 2019–20.

Scope

Number of reporting local governments: 139

Percentage of all local governments: 100

Additionally, five regional councils reported about the recycling services they provided to member councils.

Kerbside recycling services

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

Material type	Bin capacity (L)	Frequency	Local governments
Comingled dry recyclables	240	weekly	4
	240	fortnightly	88
	240	other	2
	360	fortnightly	2
	other		3

Other recycling services

Seventy local governments reported providing drop-off recycling services for dry recyclables to their residents. Three regional councils also provided the same service to their residents.

Premises in Western Australia

Residential: 1,070,962 (ABS: 2016 Census QuickStats)

Commercial: Unavailable

Premises with kerbside recycling services

Residential: 1,007,000

Commercial: 28,000 (includes comingled and ‘mixed recycling’ service types)

Average fee per premises charged by councils for recycling services

Residential: \$123 (based on 25 responses)

Commercial: \$188 (for a single 240L bin recycling service, based on 36 responses)

Median per premises cost to councils for recycling services

Residential: \$48

Commercial: \$111

Resident participation rate in kerbside recycling services

Eighty-seven per cent

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

Local governments reported 13,840 tonnes of dry recyclables dropped off by residents were recovered. Recovery by material type is shown in the table below.

Material type	Recovered
Paper and cardboard	5,204
Glass	1,225
Plastics	290
Other	7,172
Total	13,840

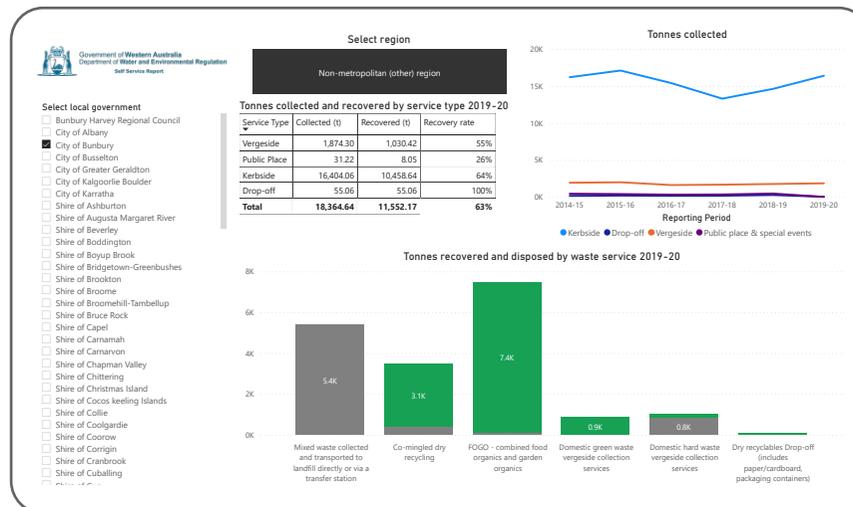
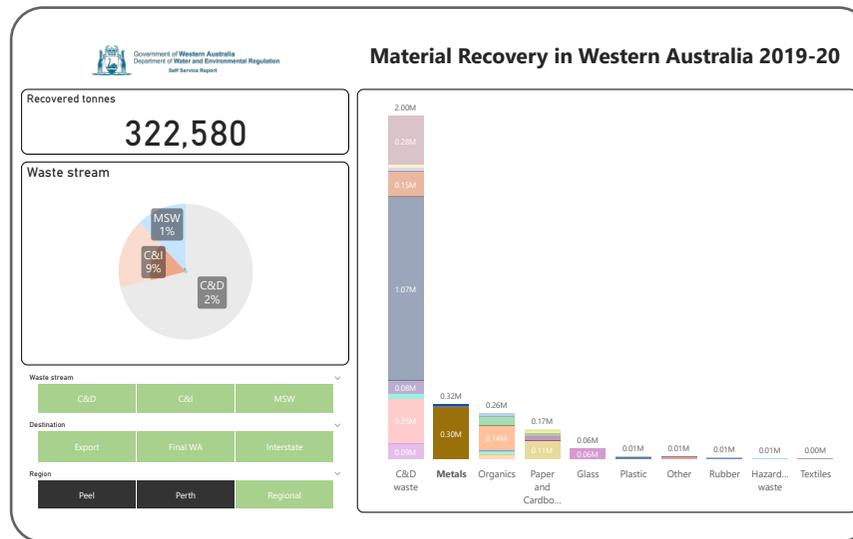
Appendix E: Waste and recycling dashboards

A series waste and recycling dashboards will be provided alongside this report, which allow users to select the combination of waste and recycling data of interest to them. The dashboards can be accessed from the waste data portal on the Waste Authority’s website.

Recycling dashboard

This dashboard allows users to filter 2019–20 recycling data based on waste stream, region, destination and material category.

The example to the right shows filters applied to display the quantity of recovered metal from the Perth and Peel regions in 2019–20. The total tonnes, detailed material types and waste stream sources are displayed.



Waste trends dashboard

This dashboard allows users to filter recycling and disposal data based on waste stream, region and year.

Domestic waste and recycling dashboard

This allows users to filter recycling data based on local government area, waste service types and region. It displays trends from 2014–15 onwards. An example of this dashboard is shown to the left, depicting the results when filtered for the City of Bunbury.

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