Version 1: January 2021

AUSTRALIAN PACKAGING CONSUMPTION & RECYCLING DATA 2018-19

APCO
AUSTRALIAN PACKAGING COVENANT ORGANISATION

Acknowledgements
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Authors
Report prepared by Envisage Works, IndustryEdge, Randell Environmental Consulting and Sustainable Resource Use on behalf of the Australian Packaging Covenant Organisation.

Contents

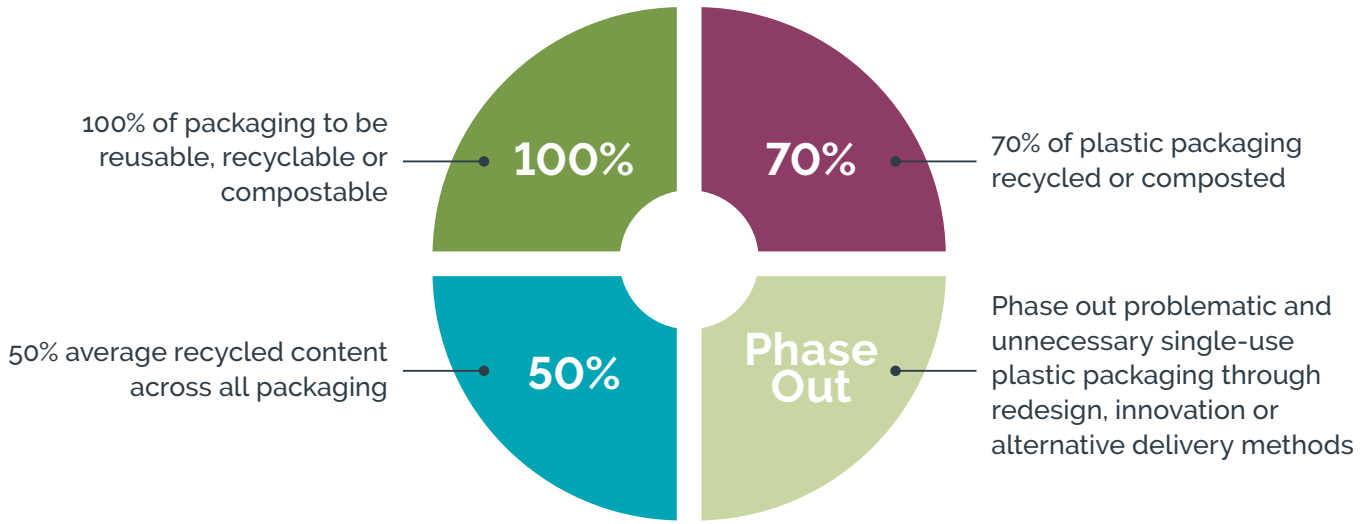
Executive summary

Background

In 2018, all levels of Australian government, including representatives from local, state and territory and federal governments, came together with industry to launch Australia's 2025 National Packaging Targets (2025 Targets), providing a clear mandate to deliver a new sustainable pathway for packaging in Australia.

This report provides packaging consumption and recovery data for Australia for financial year 2018–19, to inform the measurement of progress towards the 2025 Targets.

The data in this report is also intended to support strategic planning across the life cycle of packaging – design, manufacturing, use, disposal and end-of-life – to improve sustainability.



Australia's 2025 National Packaging Targets

Packaging consumption

Total packaging placed on market (POM) in Australia in 2018–19 is estimated at 5.92 million tonnes. POM means that the packaging has been made available to the end-consumer (including business users). It includes locally manufactured and imported packaging (filled or unfilled).

Of the 5.92 million tonnes of packaging POM in 2018–19, over half was paper & paperboard packaging (55.1%), followed by glass packaging (21.7%), plastic packaging (16.9%), metal packaging (4.2%), and single-use wood packaging (2.1%)[1].

Estimates for packaging POM by material group are provided in Table E-1 and Figure E-1. The accuracy range estimates for each of the material groups are also provided as error bars in Figure E-1.

Table E-1 *Packaging POM in 2018–19, by material group*

MATERIAL GROUP	TOTAL POM		ACCURACY RANGE
	(TONNES)	(%)	(±%)
Paper and paperboard	3 262 000	55.1%	7%
Glass	1 283 000	21.7%	12%
Plastic	1 000 000	16.9%	20%
Metal	246 000	4.2%	17%
Wood	124 000	2.1%	35%
Total	**5 916 000**	**100.0%**	**11%**

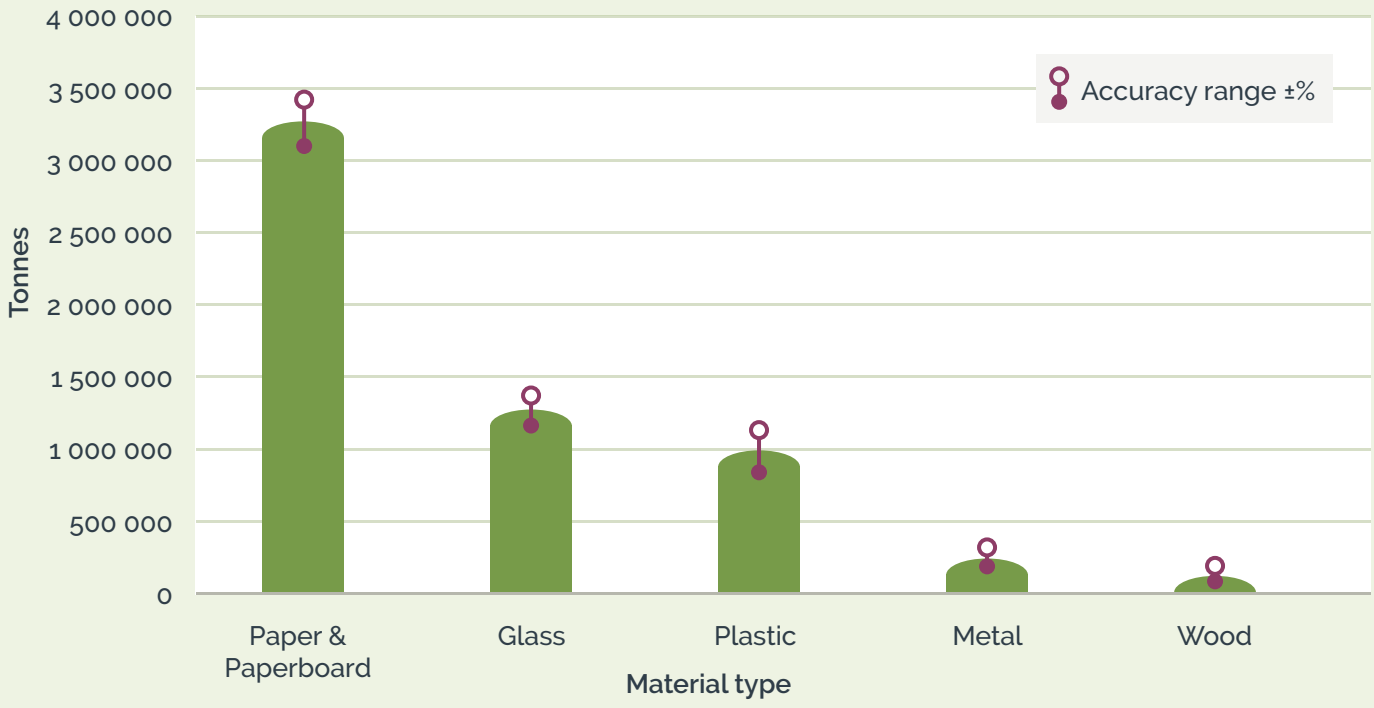


Figure E-1 *– Packaging POM in 2018–19, by material group (tonnes)*

1 For the first time this year single-use wood packaging is included in the scope of the dataset.

Table E-2 compares POM data by material group for 2017–18 and 2018–19. This year, single-use wood packaging (estimated at 124 kilotonnes (kt) is included in the scope of the dataset for the first time, along with some additional types of business-to-business (B2B) steel packaging (20 kt). Excluding these quantities, packaging POM was 5.77 million tonnes, which was a 5.9% increase on the 2017–18 packaging POM estimate of 5.45 million tonnes.

There was strong growth in paper & paperboard packaging consumption between 2017–18 and 2018–19 due to many factors, including above average growth of corrugated cardboard used in the business-to-consumer (B2C) sector, and significant growth in the amount of kraft paper used as void fill within boxes for transporting goods. Over the 12-month period, the proportion of plastic packaging fell from around 20% to 17% of total packaging POM.

***Table E-2** Packaging POM in 2017–18 and 2018–19, by material group*

MATERIAL GROUP	2017–18 POM (TONNES)	2018–19 POM (TONNES)	CHANGE (%)
Paper and paperboard	2 901 000	3 262 000	12%
Glass	1 273 000	1 283 000	1%
Plastic	1 067 000	1 000 000	-6%
Metal	213 000	246 000	16%
Wood	NR[a]	124 000	NR[a]
Total	**5 453 000**	**5 916 000**	**8%**

a) NR – Not reported.

Overall packaging recovery

Total Australian post-consumer packaging recovery in 2018–19 is estimated at 2.98 million tonnes (±14%).

Of the packaging recovered in 2018–19, over two thirds was paper & paperboard packaging (68.6%), followed by glass packaging (19.2%), plastic packaging (6.1%), metal packaging (4.6%), and wood packaging (1.5%).

Estimates for post-consumer packaging recovery by material group are provided in Table E-3 and Figure E-2. The estimates include post-consumer packaging collected through municipal, commercial and industrial (C&I), and container deposit scheme (CDS) collection services.

Table E-3 *Post-consumer packaging recovery in 2018–19, by material group*

MATERIAL GROUP	RECOVERY		ACCURACY RANGE
	(TONNES)	(%)[a]	(±%)
Paper and paperboard	2 045 000	68.6%	13%
Glass	574 000	19.2%	16%
Plastic	182 000	6.1%	14%
Metal	137 000	4.6%	12%
Wood	44 000	1.5%	50%
Total	**2 982 000**	**100.0%**	**14%**

a) Percent contribution to the total amount of packaging recovered, and not the recovery rate.

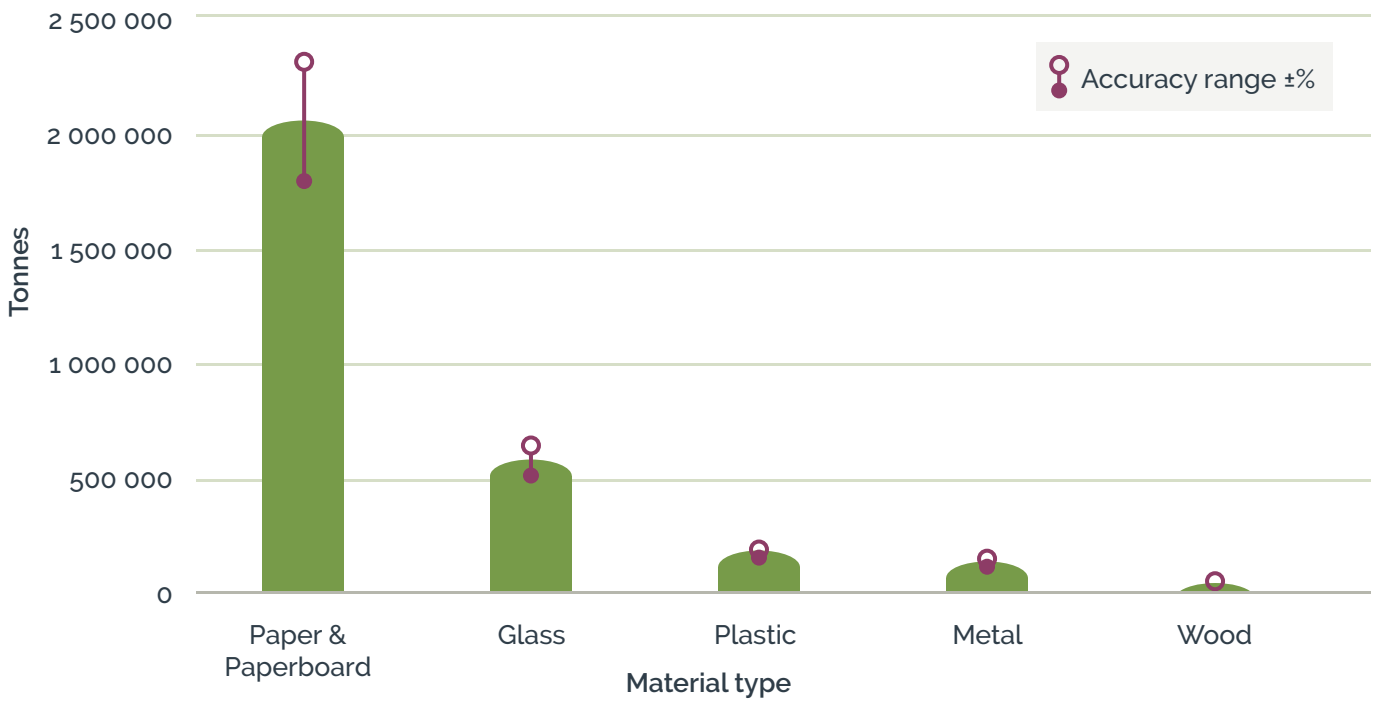


Figure E-2 *– Post-consumer packaging recovery by material group in 2018–19 (tonnes)*

Table E-4 compares recovery data by material group for 2017–18 and 2018–19. For the first time this year single-use wood packaging recovery is included (an estimated 44 kt), along with some additional types of B2B steel packaging (17 kt). Excluding these quantities, packaging recovery was 2.92 million tonnes, which was a 9.3% increase on the 2017–18 packaging POM estimate of 2.67 million tonnes.

Table E-4 *Post-consumer packaging recovery in 2017–18 and 2018–19, by material group*

MATERIAL GROUP	2017–18 RECOVERY (TONNES)	2018–19 RECOVERY (TONNES)	CHANGE (%)
Paper and paperboard	1 817 000	2 045 000	13%
Glass	582 000	574 000	-1%
Plastic	173 000	182 000	5%
Metal	102 000	137 000	35%
Wood	NR[a]	44 000	NR[a]
Total	**2 673 000**	**2 982 000**	**12%**

a) NR – Not reported.

Packaging recovery rates

Packaging recovery rates are shown in Table E-5 and Figure E-3.

The Australian post-consumer packaging recovery rate in 2018–19 is estimated at 50%. This is based on the recovery of each material group divided by the related amount of packaging POM.

Paper & paperboard had the highest recovery rate at 63%, followed by metal packaging at 56%, glass packaging at 45%, wood packaging at 36%, and plastic packaging at 18%.

***Table E-5** – Post-consumer packaging recovery rates in 2018–19, by material group*

MATERIAL GROUP	POM (TONNES)	RECOVERY (TONNES)	RECOVERY RATE (%)
Paper & paperboard	3 262 000	2 045 000	63%
Glass	1 283 000	574 000	45%
Plastic	1 000 000	182 000	18%
Metal	246 000	137 000	56%
Wood	124 000	44 000	36%
Total	**5 916 000**	**2 982 000**	**50%**

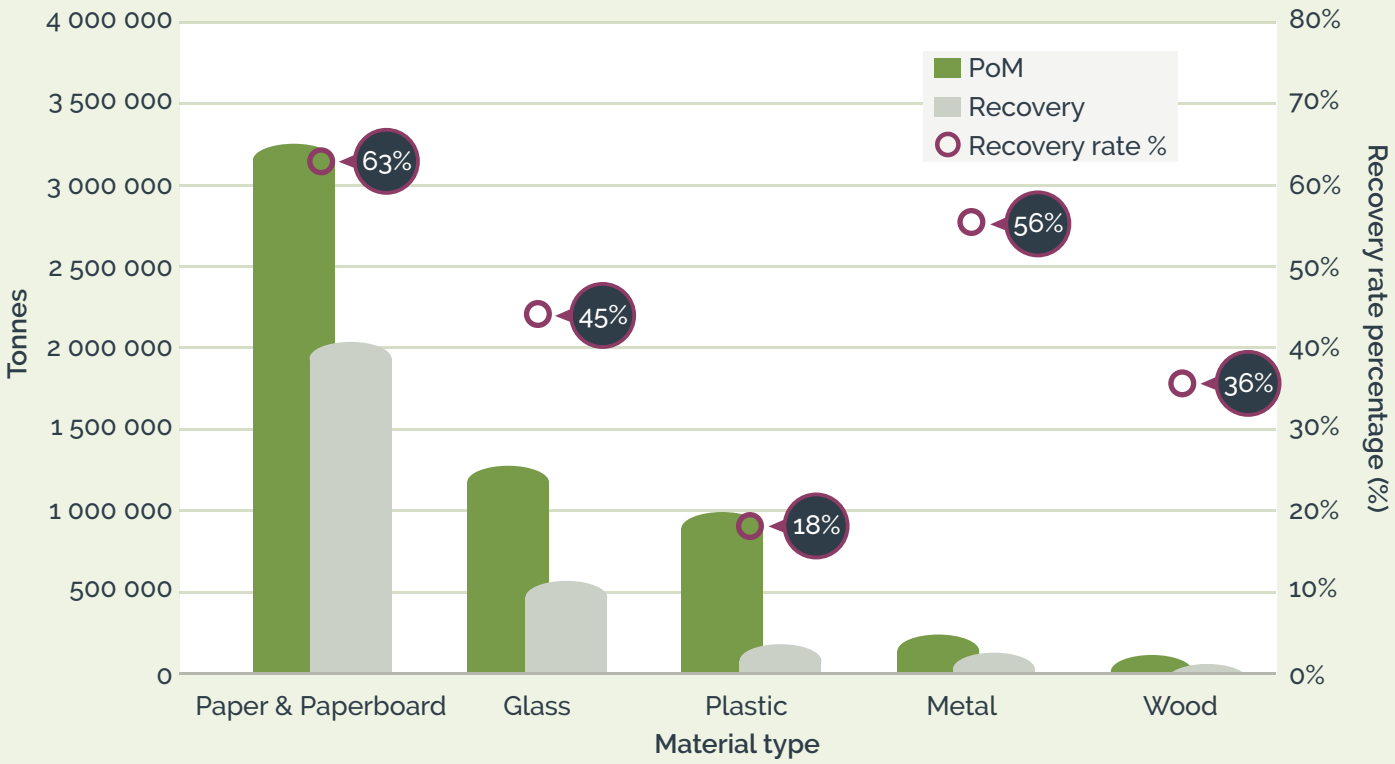


***Figure E-3** – Post-consumer packaging recovery rates in 2018–19, by material group*

Table E-6 and Figure E-4 compare recovery rates by material group for 2017–18 and 2018–19. There was a marked increase in the metal packaging recovery rate, underpinned by increasing aluminium beverage recovery due to expansion of CDS collection services in NSW and Queensland in 2018–19.

The increase in scope for the survey in 2018-19 (single-use wood packaging and additional B2B steel packaging) had a negligible impact on the overall recovery rate calculation.

***Table E-6** – Post-consumer packaging recovery rates in 2017–18 and 2018–19, by material group*

MATERIAL GROUP	2017–18 RECOVERY RATE (%)	2018–19 RECOVERY RATE (%)
Paper & paperboard	63%	63%
Glass	46%	45%
Plastic	16%	18%
Metal	48%	56%
Wood	NR[a]	36%
Total	**49%**	**50%**

a) NR – Not reported.

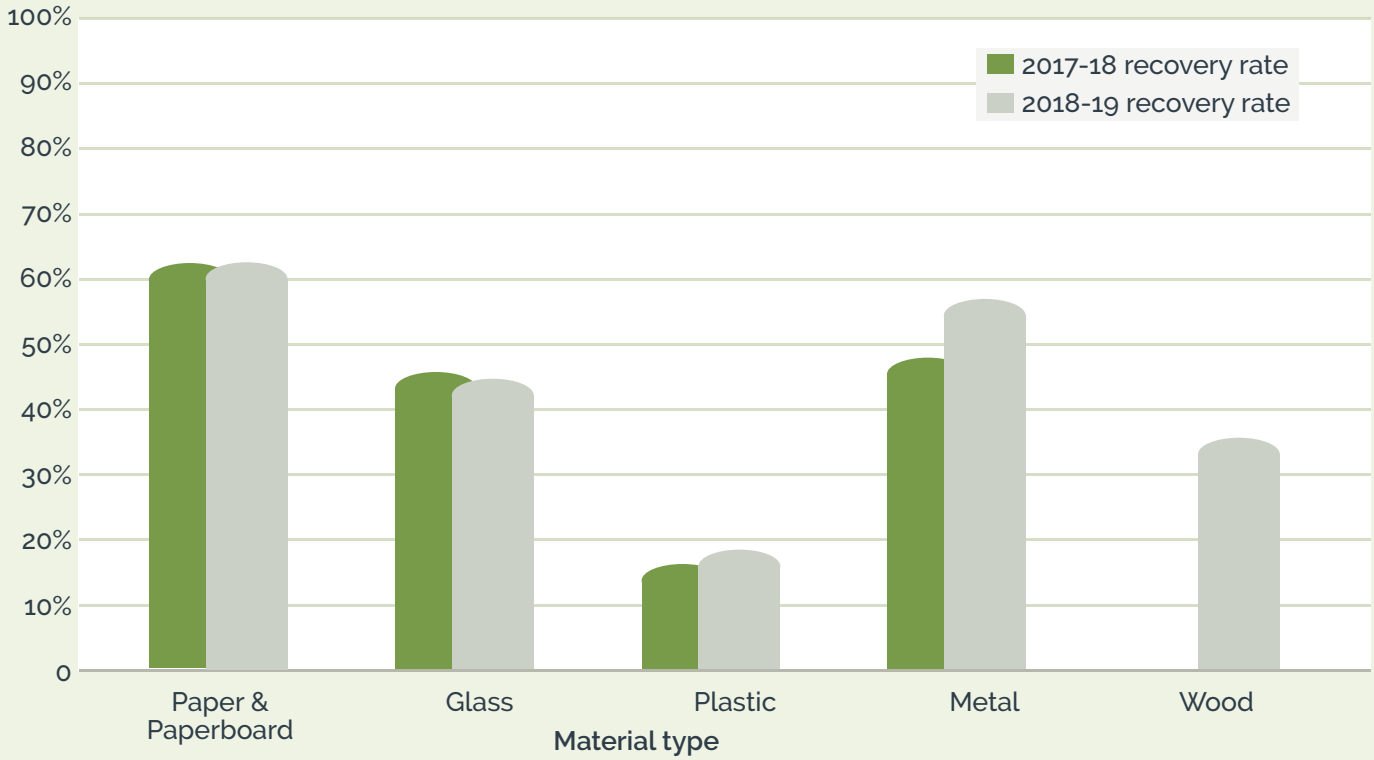


***Figure E-4** – Comparison of post-consumer packaging recovery rates in 2017–18 and 2018–19, by material group (tonnes)*

Packaging recycled content

Estimates of the recycled content in packaging POM in 2018–19, by material group, are provided in Table E-7 and Figure E-5. The post-consumer recycled (PCR) content across all packaging was 2.2 million tonnes, or 38% of total packaging POM. The pre-consumer recycled content was 0.7 million tonnes (12%), and nearly 3.0 million tonnes (50%) was sourced from virgin (primary) feedstocks.

***Table E-7** – Packaging POM in 2018–19, by material group and recycled content*

MATERIAL GROUP	POST-CONSUMER SOURCE		PRE-CONSUMER SOURCE		VIRGIN SOURCE		TOTAL
	(TONNES)	%	(TONNES)	%	(TONNES)	%	(TONNES)
Paper & paperboard	1 667 000	51%	554 000	17%	1 041 000	32%	3 262 000
Glass	474 000	37%	84 000	7%	724 000	56%	1 283 000
Plastic	37 000	4%	29 000	3%	934 000	93%	1 000 000
Metal	59 000	24%	73 000	30%	114 000	46%	246 000
Wood	0	0%	0	0%	124 000	100%	124 000
Total	**2 237 000**	**38%**	**741 000**	**12%**	**2 939 000**	**50%**	**5 916 000**

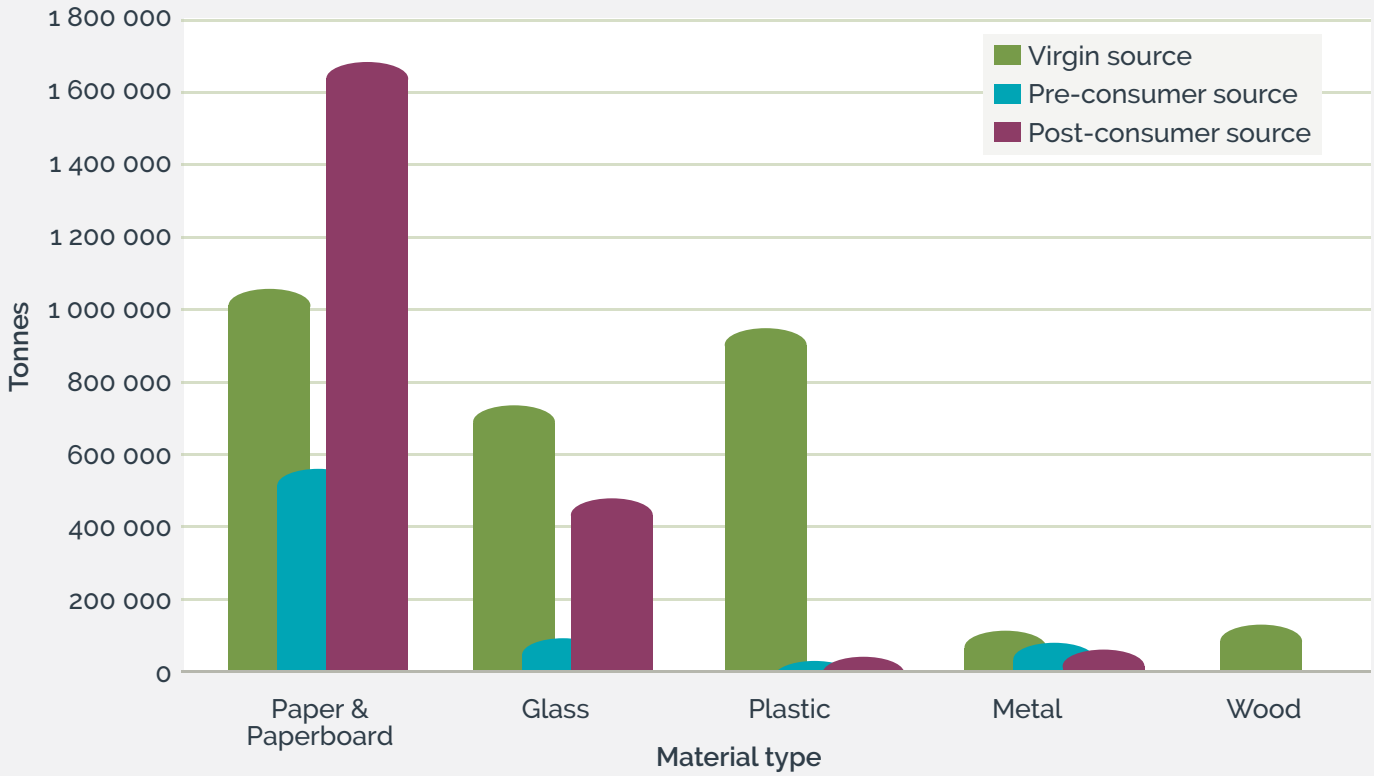


***Figure E-5** – Recycled content in packaging POM by material group (tonnes)*

Table E-8 compares the PCR content of packaging by material group in 2017–18 and 2018–19. The total quantity of PCR material in packaging increased by an estimated 322 kt (17%).

***Table E-8** – Packaging PCR content in 2017–18 and 2018–19, as a percentage of packaging POM, by material group*

MATERIAL GROUP	2017–18		2018–19	
	(TONNES)	(%)	(TONNES)	(%)
Paper & paperboard	1 421 000	49%	1 667 000	51%
Glass	407 000	32%	474 000	37%
Plastic	23 000	2%	37 000	4%
Metal	64 000	30%	59 000	24%
Wood	NR[a]	NR[a]	0	0%
Total	**1 915 000**	**35%**	**2 237 000**	**38%**

a) NR – Not reported.

There was modest growth reported in PCR content of paper & paperboard packaging between 2017–18 and 2018–19, but more significant growth in the PCR content of glass. This may be due to an increase in the quantity and quality of supply following the implementation and growing maturity of CDS in the ACT, NSW and Queensland.

In relation to plastics, there was some new reprocessing capacity commissioned in 2018–19 for reprocessing post-consumer plastic packaging back into packaging. In addition, there was an increased quantity of PCR resins imported into Australia by plastic packaging manufacturers, attributed to a lack of local supply of suitable quality PCR resin to meet local demand.

Packaging recyclability

Estimates of packaging recyclability by recyclability classification and material group are provided in Table E-9 and Figure E-6. Throughout the report the term 'Packaging recyclability' includes both recyclable and compostable packaging.

The method for determining packaging material recyclability uses scores based on the Packaging Recyclability Evaluation Portal (PREP) assessment framework.

It is estimated that 5.3 million tonnes (89%) of packaging POM in 2018–19 has good recyclability. This is dominated by paper & paperboard (of which 91% has good recyclability) and glass (of which 100% has good recyclability). Almost all (99%) of metal packaging is classified as having good recyclability, while only 66% of plastic packaging is classified as having good recyclability.

Around 0.5 million tonnes (9%) of packaging is classified as having poor recyclability or not being recyclable. Around half of this is plastic packaging, with the remaining half mostly paper & paperboard packaging.

The 'unknown' classification includes packaging for which the packaging material or format are unknown, which makes it difficult to determine recyclability.

Table E-10 compares the quantities of packaging with a 'good recyclability' classification in 2017–18 and 2018–19.

***Table E-9** – Recyclable packaging POM in 2018–19, by recyclability classification*

MATERIAL GROUP	GOOD RECYCLABILITY (TONNES)	POOR RECYCLABILITY (TONNES)	NOT RECYCLABLE (TONNES)	UNKNOWN (TONNES)	TOTAL (TONNES)
Paper & paperboard	2 962 000	232 000	42 000	27 000	**3 262 000**
Glass	1 283 000	0	0	0	**1 283 000**
Plastic	663 000	196 000	55 000	87 000	**1 000 000**
Metal	243 000	3 000	0	0	**246 000**
Wood	121 000	0	1 000	2 000	**124 000**
Total (tonnes)	**5 273 000**	**431 000**	**97 000**	**116 000**	**5 916 000**
Total (%)	**89%**	**7%**	**2%**	**2%**	**100%**

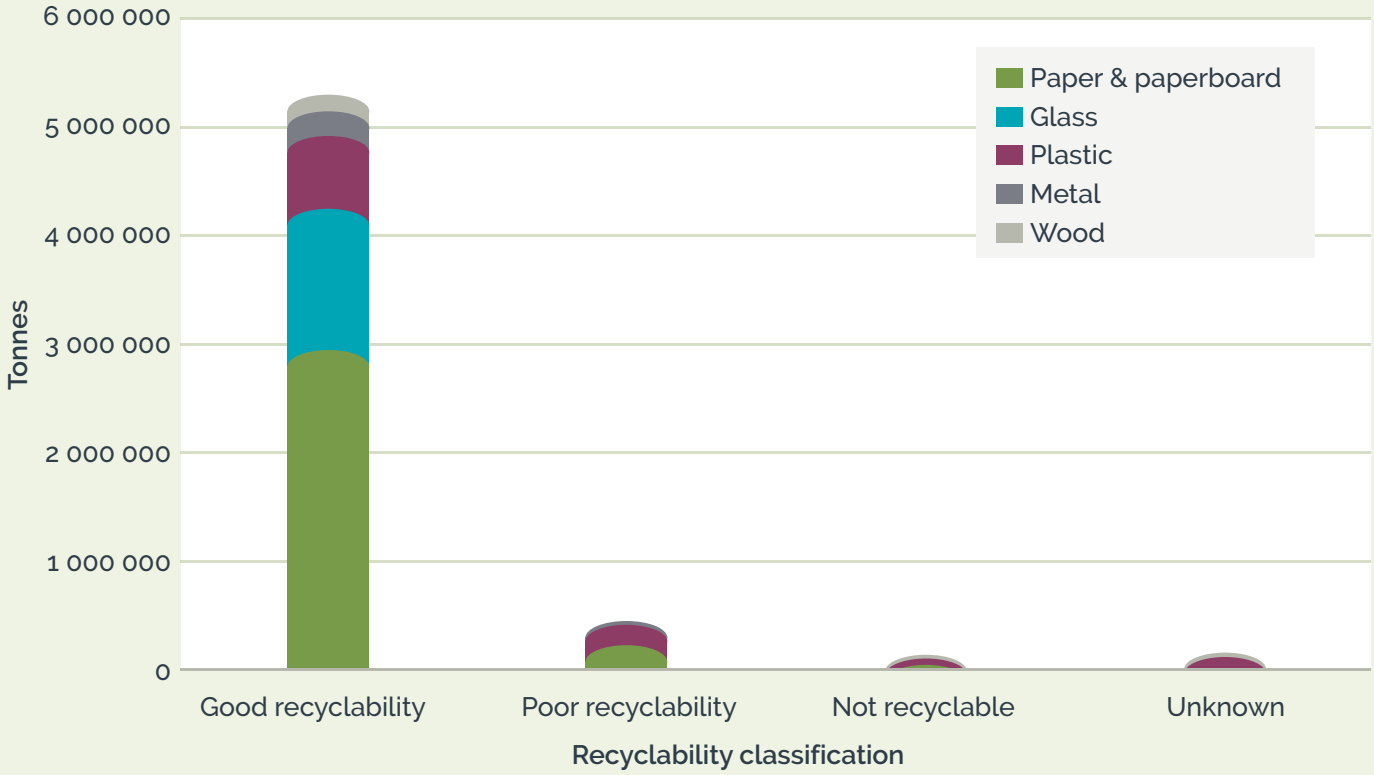


***Figure E-6** – Recyclable packaging POM in 2018–19 (tonnes)*

***Table E-10** – Packaging with a 'good recyclability' classification in 2017–18 and 2018–19, by material group*

MATERIAL GROUP	2017–18		2018–19	
	(TONNES)	(% OF POM)	(TONNES)	(% OF POM)
Paper & paperboard	2 682 000	92%	2 962 000	91%
Glass	1 273 000	100%	1 283 000	100%
Plastic	627 000	59%	663 000	66%
Metal	201 000	95%	243 000	99%
Wood	NR[a]	NR[a]	121 000	98%
Total	**4 783 000**	**88%**	**5 273 000**	**89%**

a) NR – Not reported.

Packaging in landfill

A total of 2.9 million tonnes of post-consumer packaging were disposed to landfill in 2018-19, which was 50% of packaging POM. The lost value of this material is estimated at $520 million, at a weighted average value of $176/tonne. This is the potential value of the packaging if it had been sorted and recycled rather than disposed to landfill.

Recycling also helps to reduce greenhouse gas (GHG) emissions. Table E-11 presents indicative estimates of the reduction in GHG emissions if all landfilled packaging had been recycled in 2018–19.

The national reduction that could have been achieved is estimated at nearly 2 million tonnes of CO_2 emissions, at a weighted average of 0.7 tonnes CO_2 /tonne diverted to recycling. This would be equivalent to removing 470 000 cars from the road.

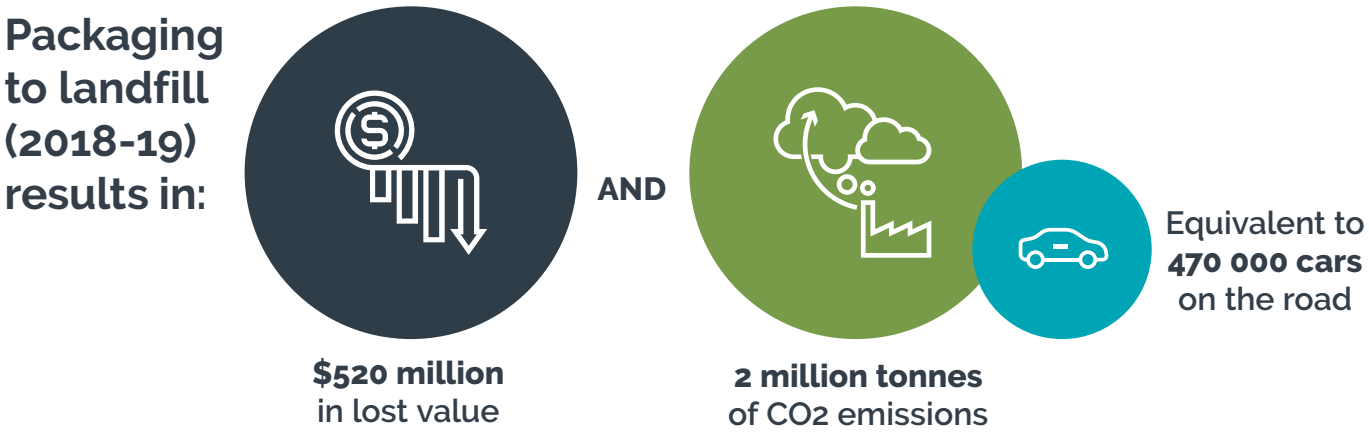


***Table E-11** – Indicative GHG emissions that could be reduced through diverting landfilled packaging to recycling (based on 2018-19 tonnages, by material group)*

MATERIAL GROUP	LANDFILL (TONNES)	EMISSION FACTOR (t CO2-e /t)	AVOIDED EMISSIONS (t CO2-e)
Paper & paperboard	1 218 000	0.169	205 790
Glass	709 000	0.528	374 470
Plastic	818 000	0.704	576 380
Metal	109 000	6.281	686 300
Wood	80 000	1.350	107 560
Total	**2 934 000**	**0.665**	**1 950 490**

Packaging reuse

For the first time this year material flows associated with selected reusable packaging systems have been quantified. This is a pilot exercise to develop the method for incorporating reusable packaging flows into the core consumption and recovery dataset in the future.

Five established reusable packaging systems in Australia were selected for this pilot quantification:

- **Kegs** – Beer kegs only.
- **Pallets** – Reusable timber and plastic pallets only, including display pallets; single use pallets are excluded.
- **Milk crates** – Non-collapsible plastic crates; limited to dairy product applications only.
- **Returnable plastic crates (RPCs)** – Collapsible plastic crates; limited to major supermarket systems only (i.e. ALDI, Coles and Woolworths).
- **Reusable shopping bags** – Reusable non-woven polypropylene (PP) bags and reusable low-density polyethylene bags (supermarket type).

These five reusable packaging systems enabled the avoidance of an estimated 1.7 million tonnes of single-use packaging in 2018-19. Approximately 89% of the avoided single-use packaging consumption benefit is provided by reusable pallets and beer kegs. The net theoretical reduction in packaging use was 1.6 million tonnes, as there was 0.1 million tonnes of reusable packaging PoM in 2018–19.

Progress towards the 2025 National Packaging Targets

Figure E-7 summarises the progress towards the 2025 National Packaging Targets for 2017–18 and 2018–19.

Refer to the *2017-18 Packaging Consumption and Recycling Data report* for more details on the 2017-18 results.

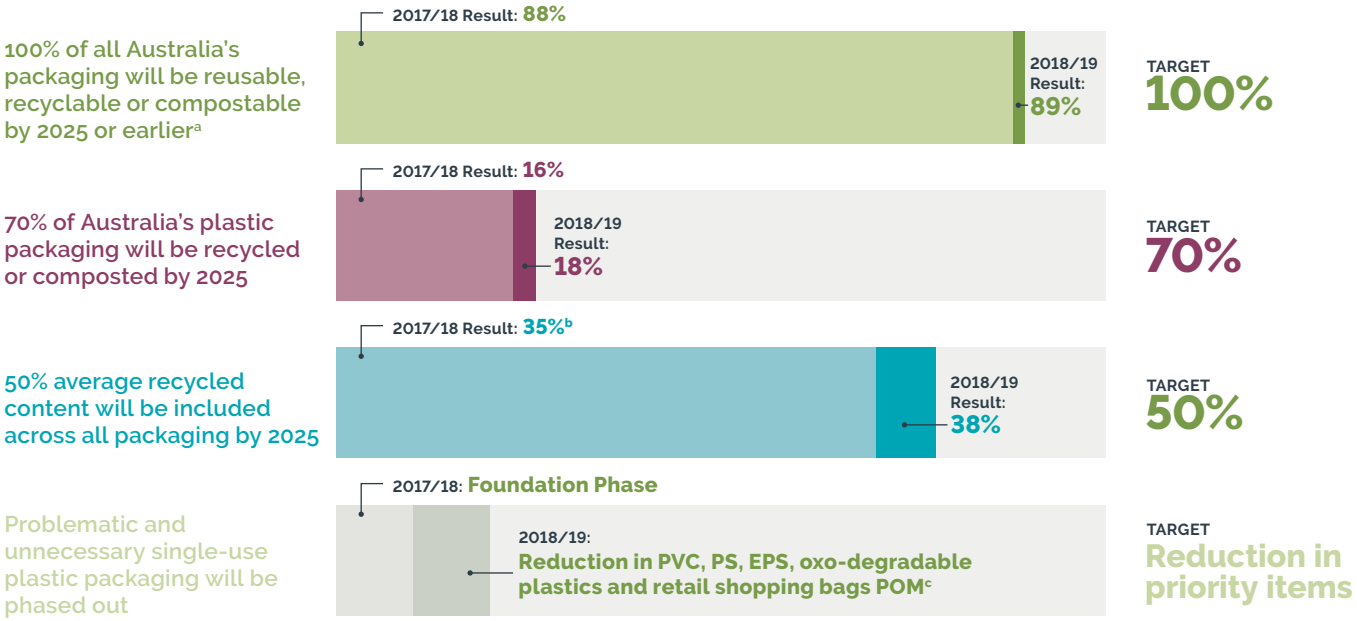


***Figure E-7** – Summary of the National Packaging Targets and progress to 2018–19*

a) Reusable packaging flows are not included in this data.
b) Post-consumer recycled content only. Does not include manufacturing scrap (pre-consumer) recycled content.
c) These estimates are subject to a relatively large accuracy range and significant changes in year-on-year reporting.

Project method

Consumption quantification

Locally manufactured Australian packaging consumption was determined through national surveys of packaging manufacturers and importers. Data was estimated for all significant survey non-respondents based on publicly available data or through consultation with others in the industry.

Imported and exported new packaging was determined through analysis of Australian Harmonized Tariff Item Statistical Code (HTISC) data.

Recovery quantification

Australian packaging recovery was determined through national surveys of packaging reprocessors, with recovery data estimated for all significant survey non-respondents.

Exported scrap packaging was determined through analysis of Australian Harmonized Export Commodity Classification (AHECC) data, and surveys of reprocessors and exporters.

Recovery is measured at the out-going gate of the secondary processing facility for the used packaging. This is the point at which the processed material is typically 'input ready' for the manufacture of new packaging or other products. Examples of secondary processing facilities include paper mills, glass beneficiation facilities, plastics flaking and washing facilities, and metal smelting facilities.

The overseas processing losses associated with the export of sorted but unprocessed materials have been estimated based on the losses reported by local operators of secondary processing facilities.

1 INTRODUCTION

1.1 This project

This report provides packaging consumption and recovery data for Australia for the 2018–19 financial year. This is compared to the 2017–18 financial year (baseline) packaging consumption and recovery data where relevant.

The data is intended to inform progress towards the 2025 National Packaging Targets (2025 Targets) and support strategic planning across all levels of the life cycle of packaging: design, manufacturing, use, disposal and end-of-life fate.

The 2025 Targets are:

- **100% of all Australia's packaging will be reusable, recyclable, or compostable by 2025 or earlier.**
- **70% of Australia's plastic packaging will be recycled or composted by 2025.**
- **50% average recycled content will be included across all packaging by 2025.** Note: this target was increased in early 2020 from 35% to 50%.
- **Problematic and unnecessary single-use plastic packaging will be phased out through design, innovation, or introduction of alternatives.**

Additional detail and data are also provided in the appendices:

- **Appendix A** - Glossary of terms and abbreviations used throughout this report.
- **Appendix B** – Packaging material and component lists.
- **Appendix C** - Consumption and recycling data by state and territory.
- **Appendix D** - Employment and capacity data.

1.2 Project method

Data sources

Packaging consumption and recovery data was obtained from a combination of sources, primarily:

- Packaging manufacturers and importers – National survey undertaken as part of this project.
- Packaging reprocessing facility operators – National survey undertaken as part of this project.
- Container deposit scheme (CDS) operators – National survey undertaken as part of this project.
- Reusable packaging system operators and users – Selective survey undertaken as part of this project.
- Australian import and export data (Australian Customs import/export *Harmonized Tariff Item Statistical Code* (HTISC) data extracts) (IndustryEdge, 2020a; 2020b).
- Audits of packaging component weights, to create a packaging component weights database.

Data collection and stakeholder consultation

Survey forms were prepared for the stakeholder groups listed above. Copies of the packaging manufacturer and reprocessor forms can be provided upon request.

Stakeholders to be surveyed were identified through previous survey contacts, APCO Membership lists, and the project team's industry knowledge. A summary of the packaging manufacturer and reprocessor survey outcomes by organisation type is provided in **Table 1.** All major manufacturers and reprocessors that were identified were contacted.

Table 1. Packaging manufacturer and reprocessor survey responses (facility count)

Organisation type	Complete – interview /phone/e-mail	Complete – estimated	No response or decline	Total
Manufacturer – fibre	4	5	0	9
Manufacturer – glass	5	0	0	5
Manufacturer – metals	8	3	0	11
Manufacturer – plastics	34	4	15	53
Reprocessor – fibre	4	6	0	10
Reprocessor – glass	7	4	0	11
Reprocessor – metals	5	0	0	5
Reprocessor – plastics	48	1	4	53
Container deposit scheme (CDS) coordinator/operator	4	1	1	6
Reusable packaging system operator	5	0	3	8
Reusable packaging system user	4	0	3	7
Energy recovery – WtE fuel manufacturer	2	0	0	2
Total	**130**	**24**	**26**	**180**

Generally, where a significant organisation declined to provide a response, or did not respond within the survey period, it was possible to estimate the level of activity based on publicly available data or through consultation with others in the industry.

It was not possible to estimate production for 15 non-responding plastic packaging manufacturers. However, whole of market estimates of packaging consumption in 2018–19 were available through the 2018–19 Australian Plastics Recycling Survey (Envisage, 2020), and the estimates of packaging consumption, i.e. materials placed on the market (POM), were scaled based on the data in this report.

It was not possible to estimate recovery for four non-responding (potential) plastic packaging reprocessors. One of these reprocessors is relatively large and probably did accept significant quantities of scrap plastic packaging during 2018–19. Assuming these four reprocessors did not export any product, then local recovery of scrap packaging may be understated in this report by possibly 2 000–3 000 tonnes of plastic packaging recovery (~2% of recovery stated in this report).

However, if these four reprocessors sold any process scrap product into export markets (which was likely to some degree), these quantities would be picked up in the analysis of the 2018–19 Australian Customs export data, and so the unquantified amount of scrap plastic packaging recovery would be less.

Determination of packaging consumption

Australian packaging consumption from local sources was determined through a survey of packaging manufacturers nationally to obtain data on the following packaging attributes:

- Packaging placed on market (POM) by material type – see Appendix B for the consumption related material types list.
- Location of material source – local or overseas.
- Packaging manufacturing losses to recycling or landfill.
- Packaging component group – bottle or jar, carton or box, closure or label, etc.
- Degradability rating.
- Recycled content source – post-consumer, pre-consumer or virgin (primary) source.
- Packaging jurisdiction of use.
- Packaging sector of use, allocated to:
    - Business-to-consumer (B2C) – At home use.
    - Business-to-consumer (B2C) – Away-from-home (AfH) use.
    - Business-to-business (B2B).
- Packaging destination by Australian and New Zealand Standard Industrial Classification (ANZSIC) division of use.
- Market growth and capacity change estimates.

POM means that the packaging has been made available to the end-consumer (including business users). The subsequent disposal is following the intended use of the packaging and is considered 'post-consumer' disposal. Packaging losses prior to the point of POM are considered ‘pre-consumer’ losses.

Australian consumption of packaging through the import of finished goods and the import of semi-finished packaging (e.g. sheets of paperboard and rolls of plastic film for local filling) were determined through an extensive analysis of Australian import and export data for the 2018–19 financial year. This was based on the review and analysis of 3 600 Customs import codes and 2 300 export codes.

Codes over threshold values for either quantity or dollar value were allocated on a line-by-line basis to packaging material types and components and converted to an estimated equivalent packaging mass basis. These allocations were based on code descriptors, or where this did not provide sufficient detail, on supporting research and manufacturer reports of their quantities of imported and exported imported packaging.

Determination of packaging recovery

Australian packaging recovery was determined through a survey of packaging reprocessors nationally to obtain data on the following packaging attributes:

- Recovery by material type – see Appendix B for the recovery related material types list.
- Level of reprocessing undertaken by facility.
- Packaging reprocessing losses to (downstream) recycling or landfill.
- Post-consumer or pre-consumer material source.
- Waste source sector by collection service – in terms of; municipal solid waste (MSW), commercial and industrial (C&I) waste, construction and demolition (C&D) waste, and container deposit scheme (CDS) collection services.
- Rigid/flexible classification for reprocessed plastic packaging.
- Packaging source jurisdiction (state or territory).
- Packaging recovery by ANZSIC division of generation.
- Material use application for processed product – packaging or non-packaging.
- Reprocessing capacity – current and planned changes.
- Stockpile estimates.

The location in the value chain at which recovery is measured is stated in all cases. Recovery is generally measured at the out-going gate of the secondary processing facility for the used packaging. This is the point that the processed material is typically 'input ready' for the manufacture of new packaging or other products. Examples of secondary processing facilities include paper mills, glass beneficiation facilities, plastics washing and flaking facilities, and metal smelting facilities.

For materials other than metals, overseas processing losses associated with the export of sorted but unprocessed materials have been estimated based on the losses reported by local operators of secondary processing facilities.

For metals, overseas processing losses associated with the export of sorted but unprocessed materials have been estimated based on IAI (2009, p. 26) and Antrekowitsch (2014) for aluminium and steel packaging losses respectively.

Packaging recovery includes increasing quantities of post-consumer scrap plastic packaging sent to energy recovery in 2018–19. This is estimated to have been 16 000 tonnes in 2018–19, compared with 2 000–4 000 tonnes in 2017–18.

Packaging recovery also includes estimates of recovery through composting facilities. This is primarily single-use wood packaging, fibre-based packaging (e.g. cardboard), and very small quantities of compostable plastics packaging.

Determination of packaging recovery rates

The packaging recovery rates determined in this report are based on the post-consumer packaging recovery measured at the out-going gate of the secondary processing facility for the used packaging, divided by packaging POM by material group/type.

It is important to note that when determining recovery rates, packaging POM is assumed to be equivalent to post-consumer used packaging. That is, all packaging placed on the market in 2018–19, also reached end-of-life and was made available for recovery in 2018–19.

Determination of packaging recyclability

The determination of packaging recyclability supports the evaluation of progress against the following 2025 National Packaging Target:

- 100% of all Australia's packaging will be reusable, recyclable or compostable by 2025 or earlier.

Throughout the report, the term *packaging recyclability* is used as an umbrella term for recyclable or compostable packaging.

This year, a pilot was undertaken to quantify five reusable packaging systems, with the results reported separately in **Section 6.** However, these estimates of reusable packaging POM are not yet incorporated into the 2025 Targets result.

The method for determining packaging recyclability uses classifications from on the Packaging Recyclability Evaluation Portal (PREP). Generalised PREP extracted classifications have been developed for each packaging material type and packaging component combination.

A recyclability classification scoring framework has been developed for both B2C and B2B packaging sectors of use. The assessment framework is based on scoring against the following three criteria:

- Collection system widely available (C).
- Sortable and technically recyclable (S/T).
- End-market available for recovered material (M).

An 'Overall recyclability classification' score has been determined for each packaging format, based on the scores for the three criteria above. The overall score is simply the lowest of the three criteria scores.

The B2C and B2B packaging sector scoring frameworks are summarised in Table 2 and Table 3. The primary difference is in the description of the collection system criteria.

Table 2. Recyclability classification score basis for each criterion – B2C packaging

Classification (score)	C	S/T	M
Good recyclability (2)	The material is widely collected at kerbside (>80% of the kerbside population has access to a council service) or is a soft plastic that can be dropped off at the REDcycle bins.	The material can be readily sorted at a MRF and causes no significant issues for reprocessors.	There is a well-established market for the reutilisation of the material.
Poor recyclability (1)	The material is less widely accepted at kerbside (between 60-80% of the kerbside population has access to a council service).	The material can be readily sorted at a MRF but will cause some issues for reprocessors leading to a loss of value.	The material will be classified as an outthrow or it will have a reduced market value that makes its recovery marginal.
Not recyclable (0)	The material is not widely accepted at kerbside (< 60% of the kerbside population has access to a council service).	The material can either not be readily sorted at a MRF or it impacts on the recovery of other materials at the reprocessor.	It is not economical to separate this material for reuse in other applications.

Table 3. Recyclability classification score basis for each criterion – B2B packaging

Classification (score)	C	S/T	M
Good recyclability (2)	Collection services for the material (to recovery) are offered by the major commercial collectors in metropolitan areas, at a similar or lower cost than landfill services.	The material can be readily sorted at a C&I MRF and causes no significant issues for reprocessors.	There is a well-established market for the reutilisation of the material.
Poor recyclability (1)	Collection services for the material (to recovery) might be offered by major commercial collectors but at higher cost than landfill services or availability of services is more limited.	The material can be readily sorted at a C&I MRF but will cause some issues for reprocessors leading to a loss of value.	The material will be classified as an outthrow or it will have a reduced market value that makes its recovery marginal.
Not recyclable (0)	No collection services for the material (to recovery) are offered by the major commercial collectors.	The material can either not be readily sorted at a C&I MRF or it impacts on the recovery of other materials at the reprocessor.	It is not economical to separate this material for reuse in other applications.

Determination of reusable packaging

This year, for the first time, a pilot quantification of the following five reusable packaging systems was undertaken:

- Kegs – Beer kegs only.
- Pallets – Reusable timber and plastic pallets only, including display pallets; single use pallets are excluded.
- Milk crates – Non-collapsible plastic crates. Limited to dairy product applications only.
- Returnable plastic crates (RPCs) – Collapsible plastic crates. Limited to major supermarket systems only (i.e. ALDI, Coles and Woolworths).

- Reusable shopping bags – Reusable non-woven PP (NWPP) bags, and reusable LDPE bags (supermarket type).

The plastics recovery data incorporated into this project is a subset drawn from a national survey (Envisage, 2020) of all reprocessors of scrap plastics sourced from all applications (not just packaging), and including exports.

For this reason, the plastics based reusable packaging systems listed above (milk crates, RPCs, shopping bags and plastic pallets) are included in the packaging consumption and recovery estimates provided in **Sections 2 and 3** of this report respectively. They were also included in the consumption and recovery quantifications in APCO's report last year, covering the 2017–18 financial year (APCO, 2019). These quantifications are also reported in **Section 6.**

However, the reusable metal and wood-based packaging systems listed above (kegs and timber pallets) are new additions to scope this year, and the related quantifications have not been incorporated into **Sections 2 and 3**, and are reported in **Section 6** only. The reasons for this are:

- The framework for quantifying reusable packaging systems is being piloted this year, and only selected packaging systems have been evaluated. The pilot reusable plastic packaging systems were already be covered in the core data collection activities, but the other material types were not.
- There are other reusable packaging systems yet to be rolled into the project data collection and reporting structure.
- To help maintain year-on-year comparability of the 2017–18 and 2018–19 datasets.

Refer to **Section 6.2** for more detail on the reusable packaging systems quantification method.

1.3 Scope limitations

As discussed in **Section 1.2**, reusable packaging systems are now incorporated in the project scope, with two of these systems relating to entirely new categories POM and recovery data inclusions (which are only reported in **Section 6** this year). There are also other reusable packaging systems that are not yet included in the project scope. See **Table B-4** in **Appendix B** for a listing of all identified reusable packaging systems and their status with respect to scope inclusion/exclusion in the 2018–19 packaging data.

1.4 Comparability of 2018–19 data with previous years

The scope and calculation methods have been applied as consistently as possible across all packaging material types and components. However, it is important to note that there are a number of changes that have been adopted that may impact the comparability between the 2017–18 and 2018–19 datasets, and with studies prior to 2017–18.

Scope or method changes between 2017–18 and 2018–19

The noteworthy changes include:

- **Plastic and steel containers of >20 L are now included in the project scope** – Plastic and steel containers of >20 L were excluded from the 2017–18 packaging quantifications but are included in the 2018–19 project scope. This has added

around 20–30 kt of new consumption to packaging POM. This packaging type is almost entirely B2B related.

- **Wood based packaging is now included in the project scope** – Wood based packaging were excluded from the 2017–18 packaging quantifications, but single-use wood packaging is now included in 2018–19 data reported in **Sections 2 and 3**, and reusable wood pallets are included in **Section 6.** This has added 124 kt of new consumption to single-use packaging POM. This packaging type is almost entirely B2B related.

- **The recyclability classification scoring method has been updated** – In the prior report (APCO, 2019) the 2017–18 data recyclability classification scoring was based on a pilot method which has now been superseded. The 2017–18 method was similar, but not the same as the method applied in this report. The 2017–18 data has been rescored in this report using the updated method. See **Section 1.2** for more details.

Scope of method changes in 2017–18 that impact comparability with previous years

The noteworthy changes include:

- **This study has standardised packaging consumption to packaging POM** – Previous studies prior to 2017-18 may have included pre-consumer manufacturing losses and recovered scrap in either consumption and/or recovery estimates. This standardisation may have the impact of decreasing apparent consumption and/or recovery estimates compared to prior work, with a corresponding impact on recovery rates.
- **This study has standardised packaging recovery to materials recovered at the out-going gate of secondary processing facilities** – Previous studies prior to 2017-18 may have determined recovery at the incoming MRF gate or various points after that. This standardisation may have the impact of decreasing apparent recovery estimates compared to prior work, with different impacts on recovery rates depending on the recovery point previously adopted.
- **This study reports post-consumer recovery and recovery rates that do not include pre-consumer manufacturing scrap** – Previous studies prior to 2017-18 largely did not consider pre-consumer manufacturing scrap and post-consumer packaging recovery separately. Pre-consumer manufacturing scrap recovery rates can be very high compared to post-consumer recovery rates, so excluding pre-consumer scrap and publishing a discrete post-consumer recovery rate may have the impact of lowering the previously reported (combined pre- and post-consumer) recovery rate.

1.5 Data limitations and interpretation

- In the tables presented in this report, minor discrepancies may occur between summed totals presented in tables, and the apparent sums of the component items in tables, as summed totals and percentage values are calculated using component item values prior to rounding.
- Data in this report should be interpreted as having a maximum of three significant figures. However, to obtain a balance between the proper statement of the accuracy of the data, while minimising the apparent summation discrepancies previously mentioned, weight data in this report has generally been rounded to the nearest 1 000 tonnes.

- The accuracy ranges provided in this report are weighted sum averages of packaging manufacturer and reprocessor reported estimates of the level of accuracy (±%) of their reported packaging material POM or total reprocessing.

  The accuracy range provides an estimate of the range within which the true value can be found. The overall accuracy range has reduced from 13% in 2017–18 to 11% in 2018–19.

2 PACKAGING CONSUMPTION IN 2018–19

This section of the report provides estimates of packaging POM in Australia in 2018–19, with POM data reported at the following levels:

- Material group
- Material type
- Packaging component group
- Packaging number
- Packaging material source location
- Rigid/flexible plastic packaging
- Degradability rating
- Recycled content
- ANZSIC division.

A summary of data for each state and territory is provided in **Appendix C.**

2.1 Material group

Total single-use packaging POM in Australia in 2018–19 is estimated at 5.92 million tonnes (±11%). Estimates for packaging POM by material group are provided in **Table 4** and **Figure 1.** The aggregated accuracy range estimates for each of the material groups are also provided as error bars in **Figure 1.** The estimates include B2C and B2B packaging.

Of the 5.92 million tonnes of packaging POM in 2018–19, over half of this was paper & paperboard packaging (55.1%), followed by glass packaging (21.7%), plastic packaging (16.9%), metal packaging (4.2%) and wood packaging (2.1%).

Table 4. Packaging POM in 2018–19, by material group

Material group	Total POM		Accuracy range
	(tonnes)	(%)	(±%)
Paper & paperboard	3 262 000	55.1%	7%
Glass	1 283 000	21.7%	12%
Plastic	1 000 000	16.9%	20%
Metal	246 000	4.2%	17%
Wood	124 000	2.1%	35%
Total	**5 916 000**	**100.0%**	**11%**

POM means that the packaging has been made available to the end-consumer (including business users), and the subsequent disposal is following the intended use of the packaging and is considered 'post-consumer' disposal. Packaging losses prior to the point of POM are considered ‘pre-consumer’ losses and are not included in **Table 4.**

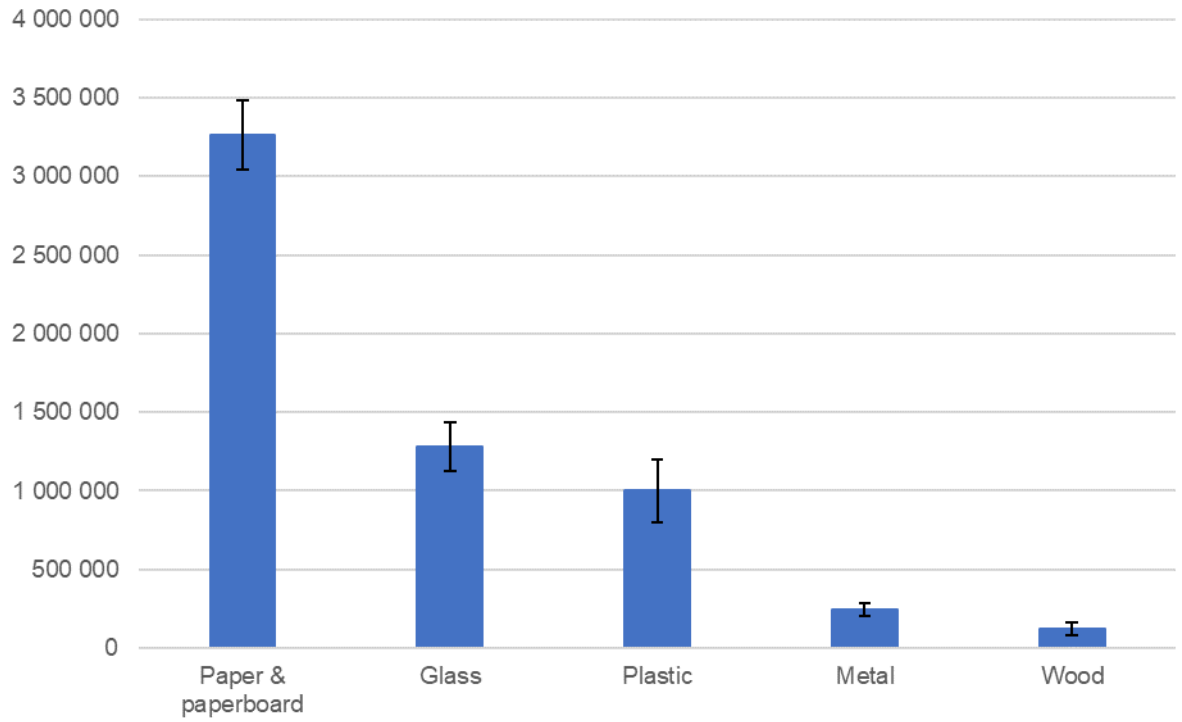


Figure 1. Post-consumer packaging recovery by material group in 2018–19

Table 5 and **Figure 2** compare the POM data by material group for 2017–18 and 2018–19. This year, for the first time, single-use wood packaging is included in the scope of the dataset (124 kt), along with some additional types of B2B steel packaging (20 kt). Excluding these quantities, packaging POM was 5.77 million tonnes which is a 5.9% increase on the 2017–18 packaging POM estimate of 5.45 million tonnes.

Table 5. Packaging POM in 2017–18 and 2018–19, by material group

Material group	2017–18 POM (tonnes)	2018–19 POM (tonnes)	Change (%)
Paper & paperboard	2 901 000	3 262 000	12%
Glass	1 273 000	1 283 000	1%
Plastic	1 067 000	1 000 000	-6%
Metal	213 000	246 000	16%
Wood	NR	124 000	NR
Total	**5 453 000**	**5 916 000**	**8%**

NR – Not reported.

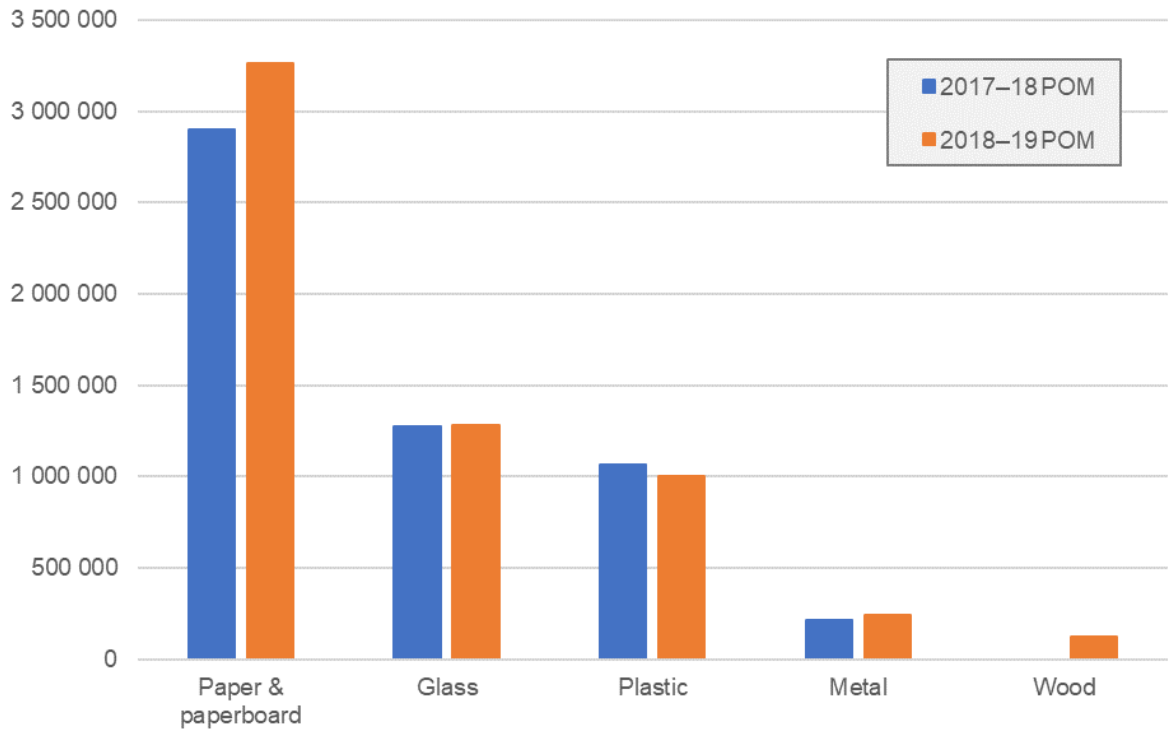


Figure 2. Packaging POM in 2017–18 and 2018–19, by material group (tonnes)

There was a strong increase in paper & paperboard packaging between 2017–18 and 2018–19 due to numerous factors, including above average increase in corrugated cardboard into the business-to-consumer (B2C) sector of use, and a significant increase in the use of kraft paper as void fill within boxes for transporting goods. Over the 12-month period, the proportion of plastic packaging fell from around 20% to 17% of total packaging POM.

2.2 Material type

Paper & paperboard packaging

Paper & paperboard packaging POM in Australia in 2018–19 is estimated at 3.3 million tonnes (±7%), which was 55.1% of all packaging POM. Estimates for paper & paperboard packaging POM by material type and sector of use are provided in **Table 6** and **Figure 3.**

In 2018–19, around 78% of paper & paperboard packaging was corrugated cardboard, of which 77% was used in the B2B sector, and 18% was used in B2C applications. The sector of use of the other 5% could not be identified.

Table 6. Paper & paperboard packaging POM in 2018–19, by material type and sector of use

Material type	B2C – At home[a]	B2C – AfH[a]	B2B	Other or unknown	Total		Accuracy range
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Boxboard/Cartonboard	216 000	0	68 000	4 000	**288 000**	**8.8%**	3%
Corrugated cardboard	434 000	36 000	1 948 000	126 000	**2 544 000**	**78.0%**	7%
HWS[b] carrierboard	10 000	10 000	0	0	**20 000**	**0.6%**	2%
Kraft paper	58 000	17 000	117 000	3 000	**195 000**	**6.0%**	5%
Moulded fibreboard	29 000	5 000	17 000	1 000	**51 000**	**1.6%**	12%
PCPB[c] – Aseptic	23 000	4 000	10 000	2 000	**38 000**	**1.2%**	10%
PCPB – Gable top	7 000	1 000	3 000	1 000	**12 000**	**0.4%**	10%
PCPB – Cold cup	1 000	4 000	1 000	0	**6 000**	**0.2%**	20%
PCPB – Hot cup	2 000	8 000	1 000	1 000	**12 000**	**0.4%**	20%
PCPB – Other	3 000	0	0	0	**4 000**	**0.1%**	10%
Other fibre packaging[d]	6 000	5 000	77 000	6 000	**94 000**	**2.9%**	8%
Total (tonnes)	**789 000**	**89 000**	**2 241 000**	**143 000**	**3 262 000**	**-**	**-**
Total (%)	**24.2%**	**2.7%**	**68.7%**	**4.4%**	**100.0%**	**100.0%**	**7%**

a) Business-to-consumer (B2C) – At home use / Business-to-consumer (B2C) – Away-from-home (AfH) use.
b) HWS – High wet strength carrierboard.
c) PCPB – Polymer coated paperboard.
d) Examples of other fibre packaging include paper bags and food wraps.

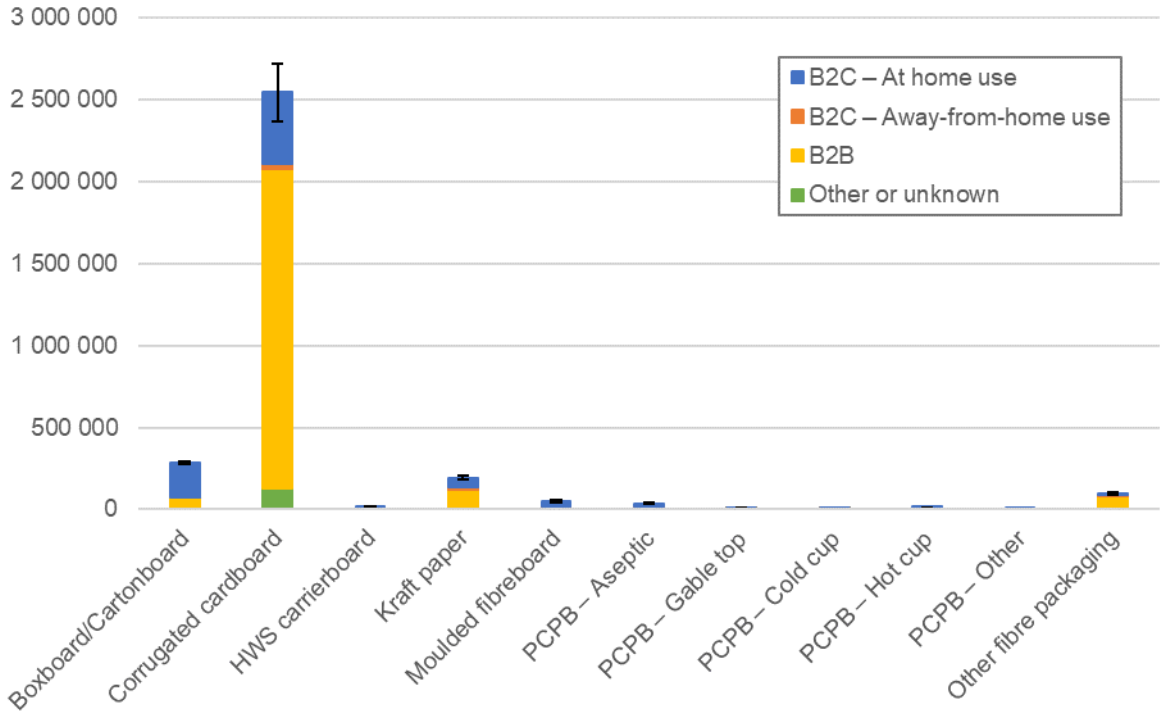


Figure 3. Paper & paperboard packaging POM in 2018–19, by material type and sector of use (tonnes)

Glass packaging

Glass packaging POM in Australia in 2018–19 is estimated at a little under 1.3 million tonnes (±17%), which was 21.7% of all packaging POM. Estimates for glass packaging POM by material type and sector of use are provided in **Table 7** and **Figure 4.**

Glass packaging consumption is determined for three main colours, which are amber, flint (clear) and green glass[1]. Flint glass makes up 50.2% of glass POM, followed by amber glass (29.7%) and green glass (20.1%). All glass packaging was used in consumer applications, with none reported as POM for the B2B sector.

Table 7. Glass packaging POM in 2018–19, by material type and sector of use

Material type	B2C – At home[a]	B2C – AfH[a]	B2B	Other or unknown	Total		Accuracy range
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Amber glass	248 000	133 000	0	0	**381 000**	**29.7%**	11%
Flint glass	483 000	161 000	0	0	**643 000**	**50.2%**	13%
Green glass	168 000	90 000	0	0	**258 000**	**20.1%**	11%
Total (tonnes)	**898 000**	**385 000**	**0**	**0**	**1 283 000**	**-**	**-**
Total (%)	**70.0%**	**30.0%**	**0.0%**	**0.0%**	**100.0%**	**100.0%**	**12%**

a) Business-to-consumer (B2C) – At home use / Business-to-consumer (B2C) – Away-from-home (AfH) use.

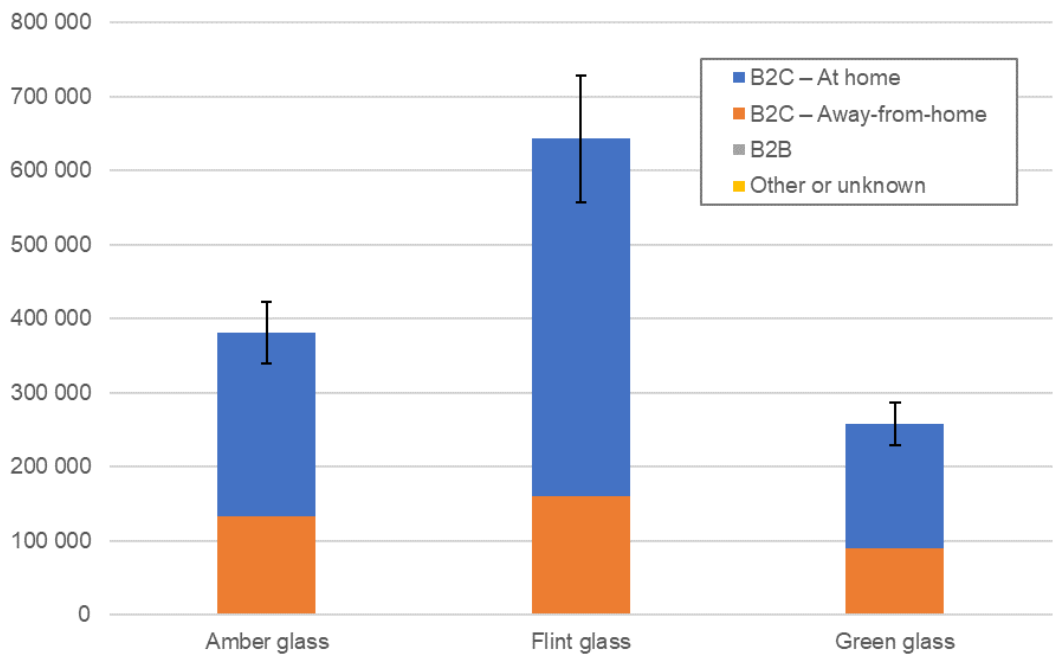


Figure 4. Glass packaging POM in 2018–19, by material type and sector of use (tonnes)

[1] Very small quantities of other glass colours are included in the data (e.g. blue glass).

Plastic packaging

Plastic packaging POM in Australia in 2018–19 is estimated at 1 million tonnes (±20%), which is 16.9% of all packaging POM. Estimates for plastic packaging POM by material type and sector of use are provided in **Table 8** and **Figure 5.**

Plastic packaging consumption is dominated by high-density polyethylene (HDPE) (31.6%), low-density polyethylene (LDPE) (23.3%), polypropylene (PP) (15.4%) and polyethylene terephthalate (PET) (15.4%). Around 87% of plastic packaging was used in the B2C sector, with another 13% used in the B2B sector (this is dominated by LDPE films and HPDE in rigid packaging applications).

Table 8. Plastic packaging POM in 2018–19, by material type and sector of use

Material type[a]	B2C – At home[b]	B2C – AfH[b]	B2B	Other or unknown	Total		Accuracy range
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
PET (1)	139 000	12 000	3 000	0	**154 000**	**15.4%**	19%
HDPE (2)	279 000	2 000	35 000	0	**316 000**	**31.6%**	18%
PVC (3)	12 000	0	3 000	0	**15 000**	**1.5%**	40%
LDPE (4)	167 000	1 000	65 000	0	**233 000**	**23.3%**	19%
PP (5)	128 000	16 000	11 000	0	**155 000**	**15.4%**	24%
PS (6)	10 000	1 000	0	0	**11 000**	**1.1%**	20%
EPS (6)	5 000	0	11 000	0	**16 000**	**1.6%**	20%
Bioplastic (7)	3 000	3 000	0	0	**6 000**	**0.6%**	29%
Other (7)	11 000	0	5 000	0	**16 000**	**1.5%**	13%
Unidentified	78 000	0	0	0	**78 000**	**7.8%**	20%
Total (tonnes)	**833 000**	**35 000**	**133 000**	**0**	**1 000 000**	**-**	**-**
Total (%)	**83.2%**	**3.5%**	**13.3%**	**0.0%**	**100.0%**	**100.0%**	**20%**

a) PET (1) – Polyethylene terephthalate (PIC 1)
HDPE (2) – High-density polyethylene (PIC 2)
PVC (3) – Polyvinyl chloride (PIC 3)
LDPE (4) – Low-density polyethylene (PIC 4)
PP (5) – Polypropylene (PIC 5)
PS (6) – Polystyrene (PIC 6)
EPS (6) – Expanded polystyrene (PIC 6)
Note: PIC is the plastic identification code. This can also be referred to as the resin identification code (RIC).

b) Business-to-consumer (B2C) – At home use / Business-to-consumer (B2C) – Away-from-home (AfH) use.

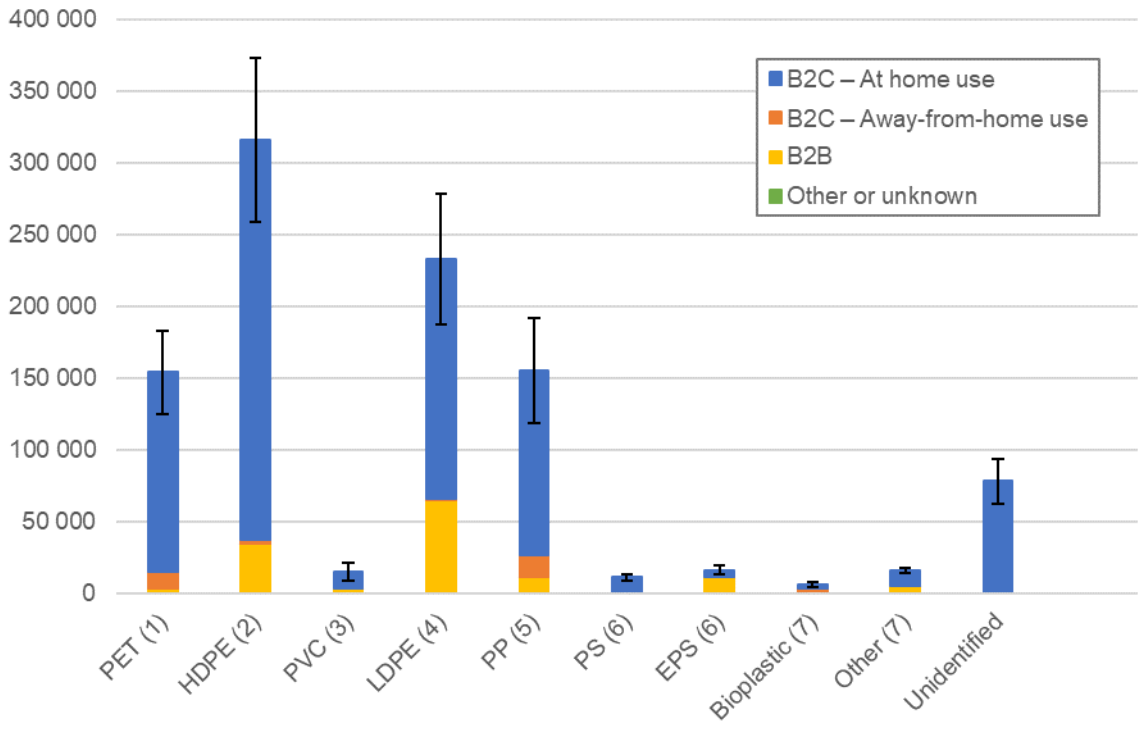


Figure 5. Plastic packaging POM in 2018–19, by material type and sector of use (tonnes)

Metal packaging

Metal packaging POM in Australia in 2018–19 is estimated at 246 000 tonnes (±17%), which was 4.2% of all packaging POM. Estimates for metal packaging POM by material type and sector of use are provided in **Table 9** and **Figure 6.**

Metal packaging consumption is dominated by tin-plate steel can (51.5%) and aluminium beverage can (34.8%) consumption. An estimated 82% of metal packaging was used in the B2C sector, with the other 18% used in the B2B sector.

Table 9. Metal packaging POM in 2018–19, by material type and sector of use

Material type	B2C – At home[a]	B2C – AfH[a]	B2B	Other or unknown	Total		Accuracy range
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Beverage aluminium	75 000	11 000	0	0	86 000	34.8%	9%
Non-beverage aluminium	14 000	0	0	0	14 000	5.8%	29%
Tin-plate steel	102 000	0	25 000	0	127 000	51.5%	20%
Mild steel	0	0	19 000	0	19 000	7.8%	20%
Total (tonnes)	**191 000**	**11 000**	**44 000**	**0**	**246 000**	**-**	**-**
Total (%)	**77.6%**	**4.4%**	**18.0%**	**0.0%**	**100.0%**	**100.0%**	**17%**

a) Business-to-consumer (B2C) – At home use / Business-to-consumer (B2C) – Away-from-home (AfH) use.

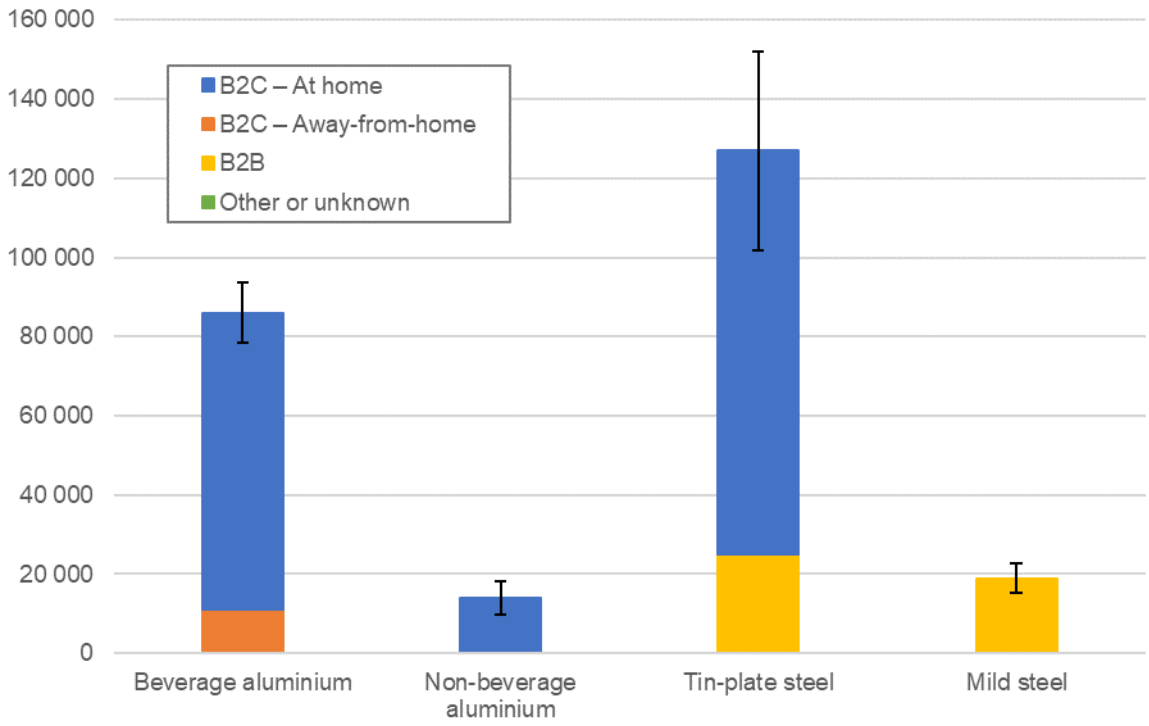


Figure 6. Metal packaging POM in 2018–19, by material type and sector of use (tonnes)

Wood packaging

This year, for the first time, the project scope was increased to include estimates of single-use wood-based packaging. The packaging components included are pallets, skids, crates and cable reels.

Data on reusable wood pallet flows is provided separately in **Section 6** of this report.

Single-use wood packaging POM in Australia in 2018–19 was estimated at 124 000 tonnes (±35%), which was 2.1% of all packaging POM. Estimates for single-use wood packaging POM by material type and sector of use are provided in **Table 10** and **Figure 7.**

Wood packaging consumption was dominated by softwood use (94.8%). More than 99% of wood packaging was used in the B2B sector.

Table 10. Wood packaging POM in 2018–19, by material type and sector of use

Material type	B2C – At home[a]	B2C – AfH[a]	B2B	Other or unknown	Total		Accuracy range
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Hardwood	0	0	6 000	0	6 000	5.2%	20%
Softwood	0	1 000	117 000	0	118 000	94.8%	36%
Total (tonnes)	**0**	**1 000**	**123 000**	**0**	**124 000**	**-**	**-**
Total (%)	**0.0%**	**0.6%**	**99.4%**	**0.0%**	**100.0%**	**100.0%**	**35%**

a) Business-to-consumer (B2C) – At home use / Business-to-consumer (B2C) – Away-from-home (AfH) use.

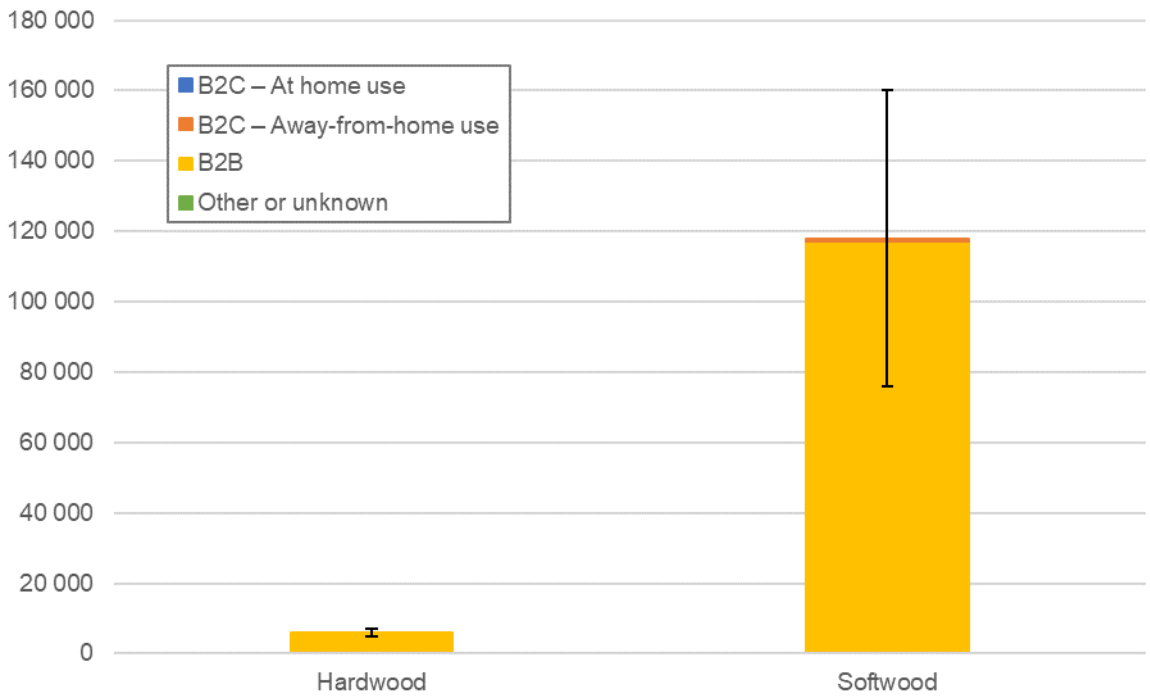


Figure 7. Wood packaging POM in 2018–19, by material type and sector of use (tonnes)

Single-use wood packaging is also commonly made from other composite wood-based materials such as plywood, oriented strand board (OSB) and medium-density fibreboard. The separate quantification of these composite wood-based materials is of interest as they are less recyclable than unmodified forms of wood. However, separate estimates of the flows of these material types were not available for the 2018–19 dataset, so these composite forms of wood are included under 'Softwood'. It is anticipated that detail on these composite forms of wood packaging will be available in future years as the related data collection develops.

2.3 Packaging component group

In this section of the report, estimates of packaging POM by packaging component group are presented. Information at the packaging component group level is useful as it is related to the recyclability of the material, and also supports the estimation of the quantities of rigid and flexible plastic packaging components onto the market (**Section 2.6**).

Estimates for packaging POM by material group and component group are provided in **Table 11** and **Figure 8.**

The major packaging component groups are cartons or boxes (49.7%), which are almost entirely paper & paperboard based, and bottles or jars (28.9%), which are split approximately 3:1 between glass and plastic containers POM on a weight basis.

Table 11. Packaging POM in 2018–19, by material group and component group

Material type	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Bag or pouch	90 000	0	181 000	0	0	271 000	4.6%
Barrel or drum	0	0	11 000	22 000	0	33 000	0.6%
Bottle or jar	0	1 283 000	425 000	0	0	1 708 000	28.9%
Can	0	0	0	221 000	0	221 000	3.7%
Carton or box	2 899 000	0	16 000	0	25 000	2 940 000	49.7%
Closure or label	0	0	13 000	0	0	13 000	0.2%
Pallet or bin	0	0	5 000	0	97 000	102 000	1.7%
Shopping bag	0	0	33 000	0	0	33 000	0.6%
Tableware	22 000	0	7 000	0	1 000	29 000	0.5%
Tub, tray or punnet	52 000	0	87 000	3 000	0	142 000	2.4%
Tube or cartridge	0	0	8 000	0	0	8 000	0.1%
Wrap	88 000	0	109 000	0	0	196 000	3.3%
Other	84 000	0	20 000	0	2 000	106 000	1.8%
Unknown	27 000	0	87 000	0	0	114 000	1.9%
Total	**3 262 000**	**1 283 000**	**1 000 000**	**246 000**	**124 000**	**5 916 000**	**100.0%**

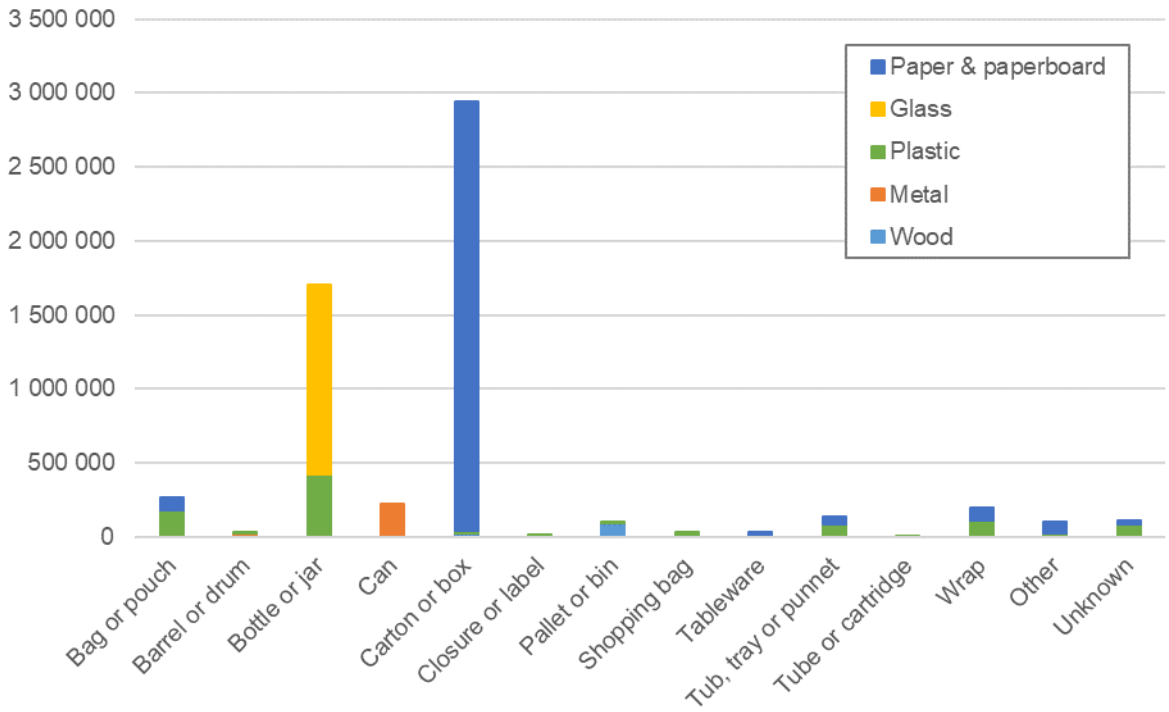


Figure 8. Packaging POM in 2018–19, by material group and component group (tonnes)

2.4 Packaging count

This year, the project includes estimates of the count (number of units) of packaging components POM by material group and packaging component group. This is based on the packaging component group weight data presented in **Section 2.3** and an extensive audit, undertaken as part of this project, of the unit weights of packaging components POM across both B2C and B2B packaging applications.

The packaging component weight audits involved the weighing of 2 537 packaging components across 1 495 packaging formats, an average of 1.7 components per format on average.

It is important to note that this average is indicative only and is not based on a sampling plan designed to statistically sample packaging format frequency POM. Instead, the sampling plan objective was to sample 5–10 packaging components POM in each of the 280 packaging component and material type combinations that were identified as POM in 2018–19.

Estimates for packaging counts POM by material group and component group, across all sectors of use (both B2C and B2B), are provided in **Table 12** and **Figure 9.**

Table 12. Packaging counts POM in 2018–19, by material group and component group – B2C and B2B

Material type	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	4 240	0	26 790	0	0	31 020	21.4%
Barrel or drum	0	0	2	2	0	4	0.0%
Bottle or jar	0	5 090	11 930	0	0	17 030	11.7%
Can	0	0	0	8 150	0	8 150	5.6%
Carton or box	17 400	0	0	0	2	17 400	12.0%
Closure or label	0	0	5 750	40	0	5 790	4.0%
Pallet or bin	0	0	0	0	3	3	0.0%
Shopping bag	0	0	3 010	0	0	3 010	2.1%
Tableware	1 820	0	1 720	0	0	3 550	2.4%
Tub, tray or punnet	1 760	0	4 950	570	0	7 270	5.0%
Tube or cartridge	0	0	440	0	0	440	0.3%
Wrap	31 250	0	11 960	0	0	43 210	29.7%
Other	8 020	0	400	0	0	8 420	5.8%
Total (million units)	**64 480**	**5 090**	**66 960**	**8 750**	**5**	**145 290**	**-**
Total (%)	**44.4%**	**3.5%**	**46.1%**	**6.0%**	**0.0%**	**100.0%**	**100.0%**

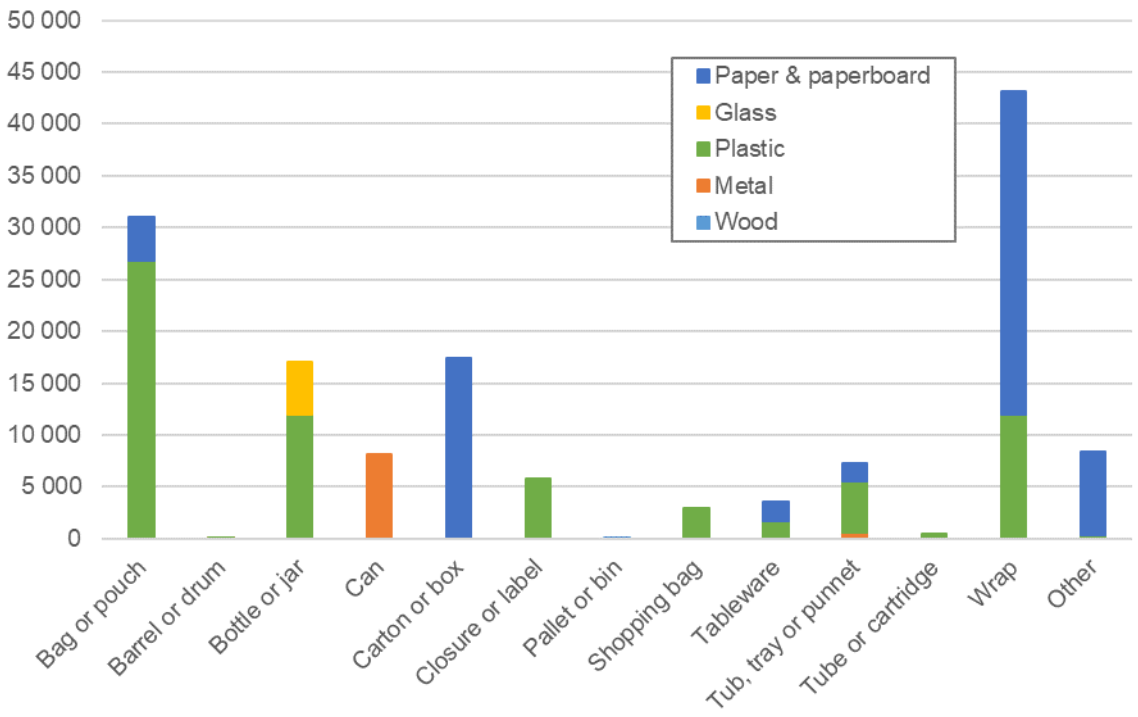


Figure 9. Packaging counts POM in 2018–19, by material group and component group – B2C and B2B (million units)

Estimates for packaging counts POM by material group and component group, for the B2C (at home) sector of use only, are provided in **Table 13** and **Figure 10.**

Table 13. Packaging counts POM in 2018–19, by material group and component group – B2C (at home)

Material type	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	1 260	0	21 120	0	0	22 380	26.9%
Barrel or drum	0	0	2	0	0	2	0.0%
Bottle or jar	0	3 560	10 450	0	0	14 000	16.8%
Can	0	0	0	7 050	0	7 050	8.5%
Carton or box	8 320	0	0	0	0	8 320	10.0%
Closure or label	0	0	4 770	30	0	4 790	5.8%
Pallet or bin	0	0	0	0	0	0	0.0%
Shopping bag	0	0	2 560	0	0	2 560	3.1%
Tableware	450	0	1 440	0	0	1 890	2.3%
Tub, tray or punnet	1 110	0	4 340	570	0	6 010	7.2%
Tube or cartridge	0	0	320	0	0	320	0.4%
Wrap	5 890	0	8 890	0	0	14 780	17.8%
Other	730	0	350	0	0	1 070	1.3%
Total (million units)	**17 760**	**3 560**	**54 240**	**7 650**	**0**	**83 200**	**-**
Total (%)	**21.3%**	**4.3%**	**65.2%**	**9.2%**	**0.0%**	**100.0%**	**21.1%**

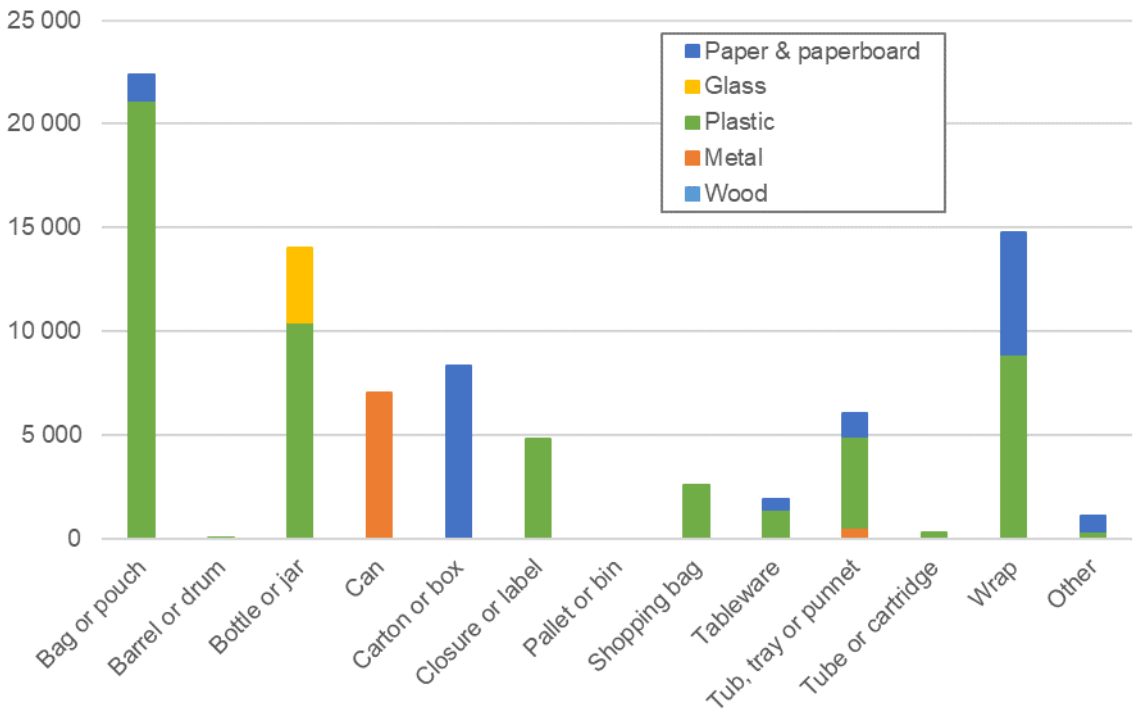


Figure 10. Packaging counts POM in 2018–19, by material group and component group – B2C (at home) (million units)

The Australian population was estimated at 25.4 million at June 2019 (ABS, 2020a), and the household number at 9.71 million households, also at June 2019 (ABS, 2019b), giving an average of 2.61 persons/household. From this and the data in **Table 13,** the following B2C (at home) packaging count POM estimates can be calculated for 2018–19:

- There were 3 300 packaging components per person used in the B2C (at home) sector, or 9.0 packaging components per person per day.
- There were 1 900 packaging formats per person used in the B2C (at home) sector, or 5.3 packaging formats per person per day.
- There were 5 000 packaging formats per household used in the B2C (at home) sector, or 13.8 packaging formats per household per day.

Estimates for packaging counts POM by material group and component group, for the B2C (away-from-home) sector of use only, are provided in **Table 14** and **Figure 11.**

Table 14. Packaging counts POM in 2018–19, by material group and component group – B2C (away-from-home)

Material type	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	370	0	870	0	0	1 230	13.3%
Barrel or drum	0	0	0	0	0	0	0.0%
Bottle or jar	0	1 540	490	0	0	2 030	21.8%
Can	0	0	0	720	0	720	7.7%
Carton or box	460	0	0	0	0	460	5.0%
Closure or label	0	0	180	0	0	180	2.0%
Pallet or bin	0	0	0	0	0	0	0.0%
Shopping bag	0	0	20	0	0	20	0.3%
Tableware	1 050	0	180	0	0	1 230	13.2%
Tub, tray or punnet	150	0	380	0	0	530	5.7%
Tube or cartridge	0	0	0	0	0	0	0.0%
Wrap	2 240	0	140	0	0	2 380	25.6%
Other	470	0	20	0	0	490	5.3%
Total (million units)	**4 740**	**1 540**	**2 290**	**720**	**0**	**9 280**	**100.0%**
Total (%)	**51.1%**	**16.6%**	**24.6%**	**7.7%**	**0.0%**	**100.0%**	**51.1%**

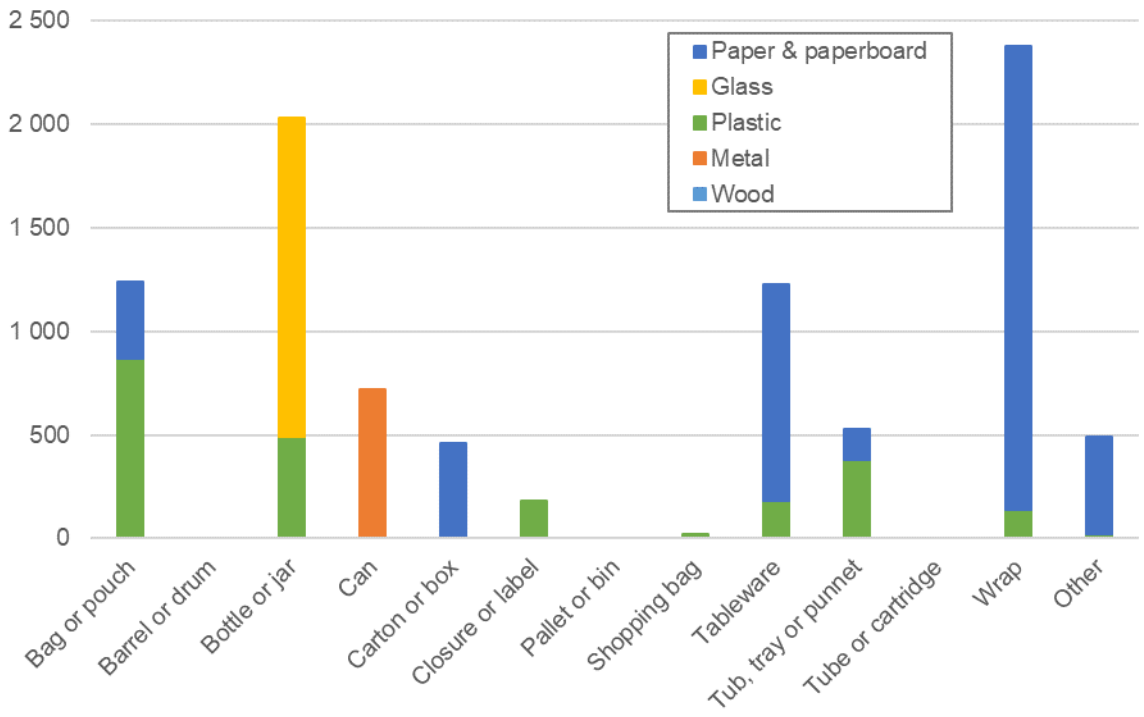


Figure 11. Packaging counts POM in 2018–19, by material group and component group – B2C (away-from-home) (million units)

From this, the following B2C (away-from-home) packaging count POM estimates can be calculated for 2018–19:

- There were 370 packaging components per person used in the B2C (away-from-home) sector, or 1.0 packaging components per person per day.
- There were 210 packaging formats per person used in the B2C (away-from-home) sector, or 0.6 packaging formats per person per day.

Across both the B2C sectors of use (at home and away-from-home) the following packaging count POM estimates can be calculated for 2018–19:

- There were 3 670 packaging components per person used in the B2C sector, or 10.1 packaging components per person a day.
- There were 2 110 packaging formats per person used in the B2C sector, or 5.8 packaging formats per person a day.

Estimates for packaging counts POM by material group and component group, for the B2B sector of use only, are provided in **Table 15** and **Figure 12.**

Table 15. Packaging counts POM in 2018–19, by material group and component group – B2B

Material type	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	2 540	0	4 800	0	0	7 340	14.6%
Barrel or drum	0	0	0	2	0	2	0.0%
Bottle or jar	0	0	990	0	0	990	2.0%
Can	0	0	0	380	0	380	0.8%
Carton or box	8 050	0	0	0	0	8 050	16.0%
Closure or label	0	0	810	10	0	810	1.6%
Pallet or bin	0	0	0	0	3	3	0.0%
Shopping bag	0	0	420	0	0	420	0.8%
Tableware	240	0	110	0	0	350	0.7%
Tub, tray or punnet	470	0	230	0	0	700	1.4%
Tube or cartridge	0	0	110	0	0	110	0.2%
Wrap	21 880	0	2 930	0	0	24 810	49.3%
Other	6 340	0	30	0	0	6 370	12.7%
Total (million units)	**39 510**	**0**	**10 440**	**390**	**10**	**50 340**	**100.0%**
Total (%)	**78.5%**	**0.0%**	**20.7%**	**0.8%**	**0.0%**	**100.0%**	**78.2%**

Note that the large number of paper & paperboard wraps is driven by reasonably significant quantities reported by the related manufacturers of kraft paper into wrap related packaging component types. However, the average kraft paper wrap weight is based on B2C packaging forms only (which are generally a relatively light form of packaging), and it appears likely that this is a significant understatement of the average B2B wrap weight, resulting in an overstatement of the number of B2B paper & paperboard wraps POM. As stated, the estimates in this section of the report are indicative only.

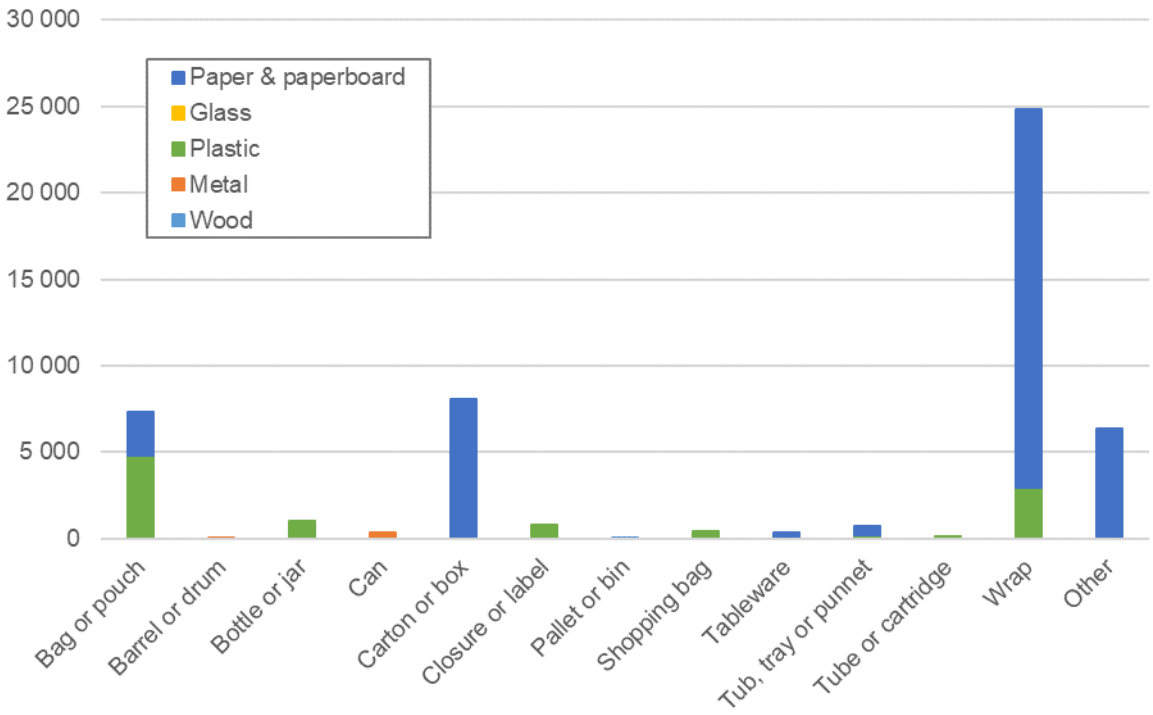


Figure 12. Packaging counts POM in 2018–19, by material group and component group – B2B (million units)

2.5 Packaging material source location

Information on the packaging material source (local or overseas) is useful as it informs the evaluation of the capacity of local end-markets to absorb recovered packaging materials back into packaging. For example, to be made into new packaging or products post-use, imported packaging materials must be either remanufactured into packaging locally, remanufactured into non-packaging products locally, or exported for use overseas. If imported packaging is large relative to local packaging manufacturing (and thus local packaging material demand) then it may highlight a structural mass balance 'imbalance' to be considered.

Estimates of the location of packaging material source, by local or overseas origin, are provided in **Table 16** and **Figure 13**. In 2018–19, around 57% of packaging was manufactured locally and 43% was imported.

The manufacturing of paper & paperboard and glass-based packaging is dominated by locally sourced materials (including recycled packaging inputs). The manufacturing of plastic and metal-based packaging is dominated by imported materials, which includes imported filled or unfilled packaging and semi-finished packaging material for local forming and filling.

Table 16. Packaging POM in 2018–19, by material group, location of material source and manufacturing.

Material group	Locally manufactured packaging		Overseas manuf. packaging	Total
	Local source	Overseas source	Overseas source	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	1 598 000	119 000	1 546 000	3 262 000
Glass	900 000	1 000	382 000	1 283 000
Plastic	188 000	320 000	492 000	1 000 000
Metal	13 000	187 000	46 000	246 000
Wood	63 000	1 000	61 000	124 000
Total (tonnes)	**2 762 000**	**628 000**	**2 527 000**	**5 916 000**
Total (%)	**46.7%**	**10.6%**	**42.7%**	**100.0%**

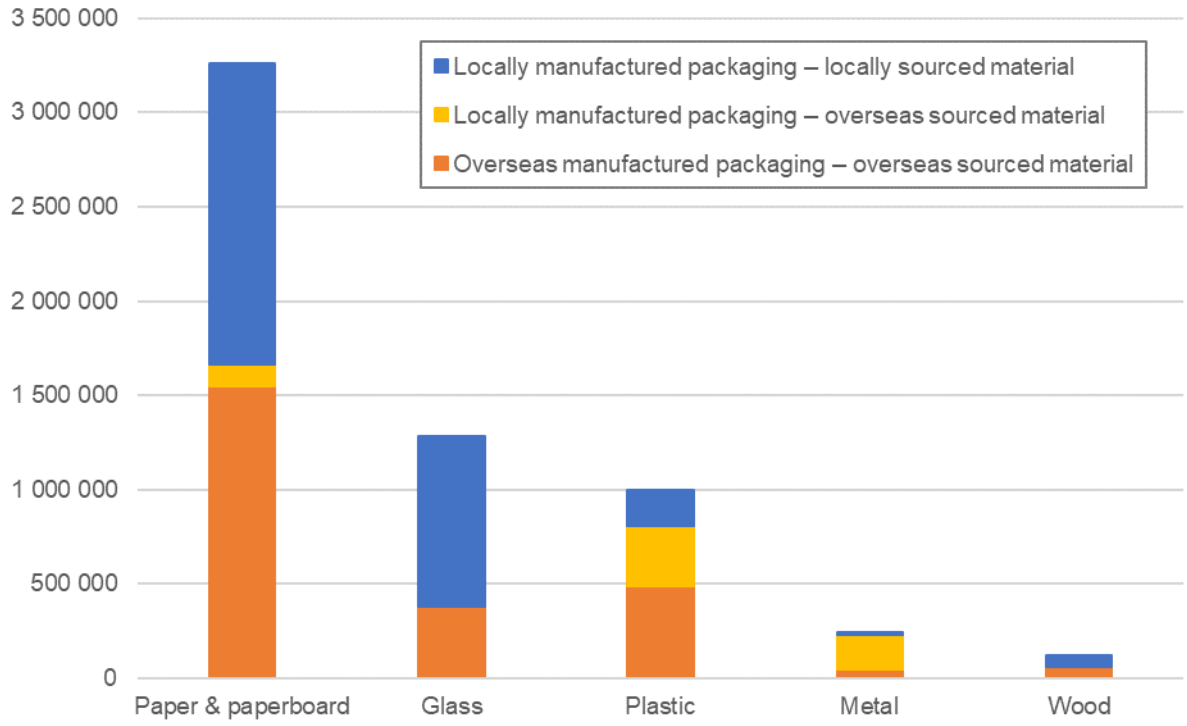


Figure 13. Packaging POM in 2018–19, by material group and location of material source (tonnes)

2.6 Rigid/flexible plastic packaging

In this section of the report, estimates of plastic packaging POM by rigid/flexible classification are presented. Information on the rigidity of plastic packaging is useful as it is related to the recyclability and value of the material. Estimates for packaging POM by plastic material type and rigid/flexible classification are provided in **Table 17** and **Figure 14.**

The definitions of rigid and flexible plastic packaging adopted for this study are:

- Rigid plastic packaging is packaging such as bottles and tubs, which are (generally) moulded and hold their shape.
- Flexible (soft) plastic is packaging that can be scrunched into a ball.

Of the 1 million tonnes of plastic packaging used in 2018–19 an estimated 586 000 tonnes (59%) were identified as rigid plastic packaging, and 328 000 tonnes (33%) as flexible plastics. The format of the other 87 000 tonnes (9%) could not be identified in sufficient detail to classify this material as either rigid or flexible.

Table 17. Plastic packaging POM in 2018–19, by material type and rigid/flexible classification

Format	Rigid	Flexible	Unknown	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
PET (1)	133 000	22 000	0	154 000
HDPE (2)	286 000	30 000	0	316 000
PVC (3)	NR	NR	0	15 000
LDPE (4)	10 000	222 000	0	233 000
PP (5)	116 000	39 000	0	155 000
PS (6)	11 000	0	0	11 000
EPS (6)	16 000	0	0	16 000
Bioplastic (7)	5 000	1 000	0	6 000
Other (7)	NR	NR	NR	16 000
Unidentified	0	0	78 000	78 000
Total (tonnes)	**586 000**	**328 000**	**87 000**	**1 000 000**
Total (%)	**58.6%**	**32.7%**	**8.7%**	**100.0%**

NR – Not reported due to confidentiality considerations.

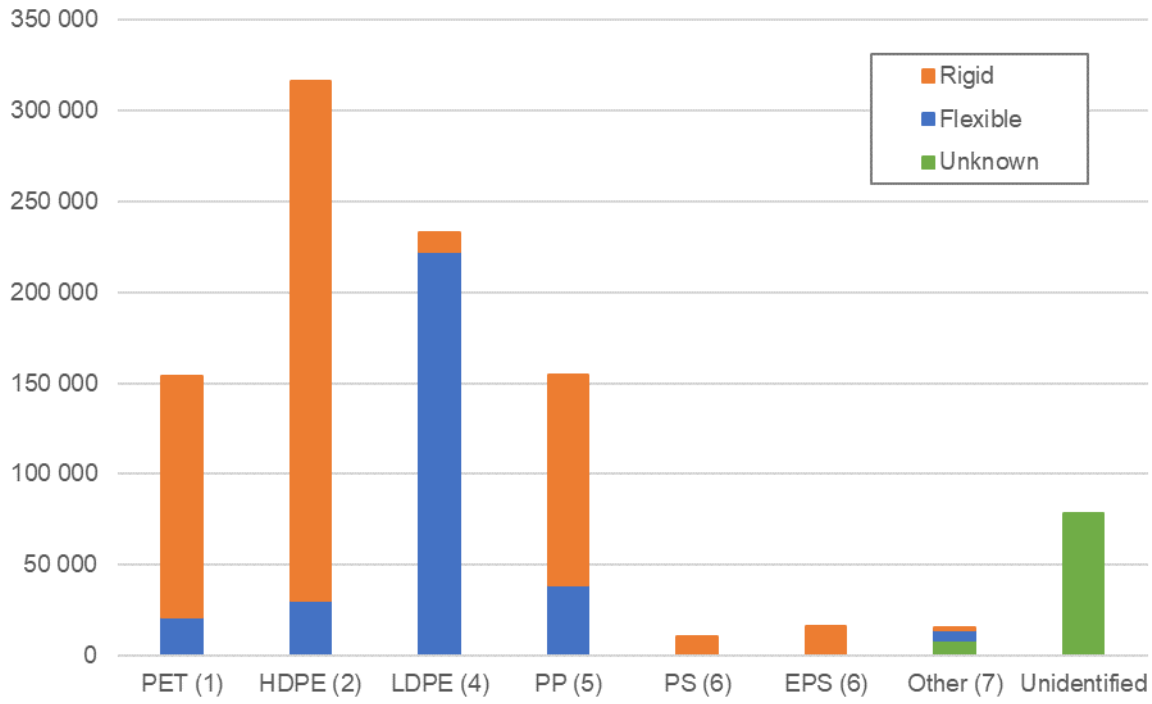


Figure 14. Plastic packaging POM in 2018–19, by material type and rigid/flexible classification (tonnes)

2.7 Degradability rating

Estimates of packaging POM by degradability rating are provided in **Table 18** and **Figure 15.**

Due to the extensive use of wood-fibre based packaging, 2.8 million tonnes of packaging POM in 2018–19 (56.2% of packaging) is rated as certified compostable or non-certified but potentially biodegradable. Around 2.6 million tonnes (43.8%) was not considered degradable.

Table 18. Packaging POM in 2018–19, by material group and degradability rating

Material group	Not considered degradable	Certified compostable plastics or fibre	Non-certified biodegradable fibre-based	Oxo or photo-degradable plastics	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	71 000	4 000	3 187 000	0	3 262 000
Glass	1 283 000	0	0	0	1 283 000
Plastic	993 000	6 000	0	1 000	1 000 000
Metal	246 000	0	0		246 000
Wood	0	0	124 000	0	124 000
Total	**2 593 000**	**11 000**	**3 311 000**	**1 000**	**5 916 000**

a) The ‘Not considered degradable’ paper & paperboard packaging formats are almost entirely PCPB material types.

There were around 1 000 tonnes of fragmentable (oxo-degradable or photo-degradable) packaging POM in 2018–19. This estimate is indicative only. This packaging group is typically HDPE or LDPE film with a degradant additive blended into the film at a rate of around 2–3% by weight. All the identified oxo-degradable and photo-degradable packaging was imported, with no local manufacturer identified.

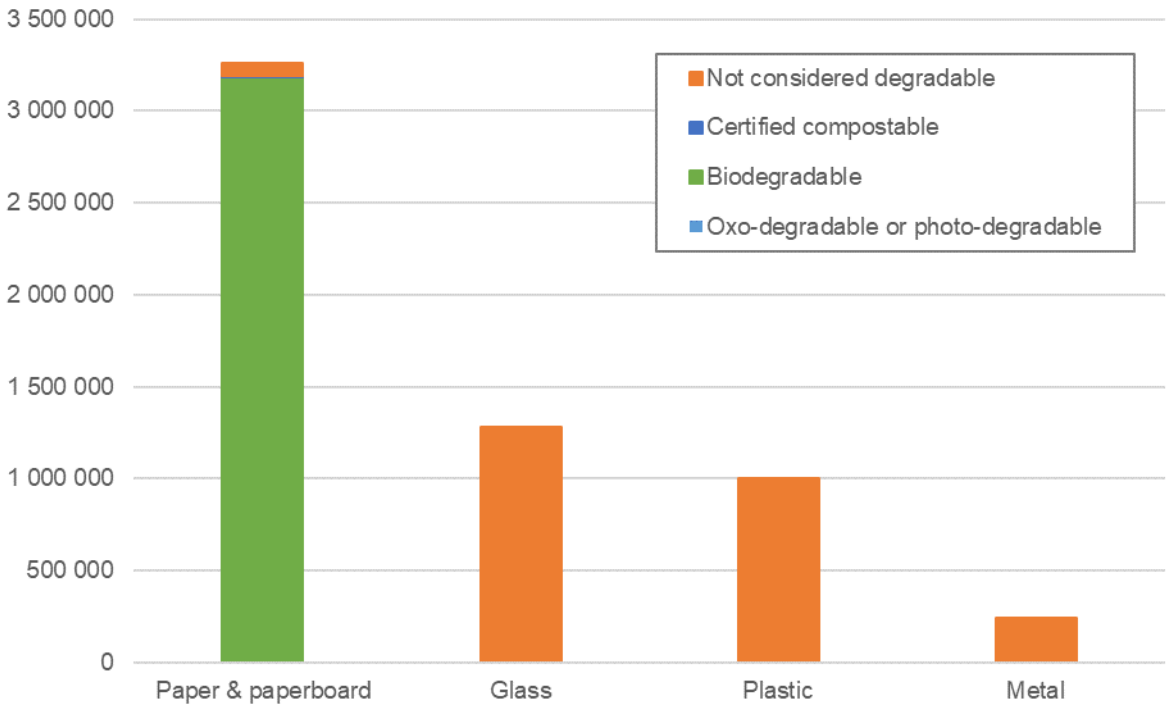


Figure 15. Packaging POM in 2018–19, by material group and degradability rating (tonnes)

2.8 Recycled content

Material group

Estimates of the recycled content incorporated into packaging POM in 2018–19, by material group, are provided in **Table 19** and **Figure 16.** The post-consumer recycled (PCR) content across all packaging was 2.2 million tonnes, or 38% of total packaging POM; the pre-consumer recycled content was 0.7 million tonnes (12%); and nearly 3.0 million tonnes (50%) was sourced from virgin (primary) feedstocks.

Table 19. Packaging POM in 2018–19, by material group and recycled content

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Paper & paperboard	1 667 000	51%	554 000	17%	1 041 000	32%	3 262 000
Glass	474 000	37%	84 000	7%	724 000	56%	1 283 000
Plastic	37 000	4%	29 000	3%	934 000	93%	1 000 000
Metal	59 000	24%	73 000	30%	114 000	46%	246 000
Wood	0	0%	0	0%	124 000	100%	124 000
Total	**2 237 000**	**38%**	**741 000**	**12%**	**2 939 000**	**50%**	**5 916 000**

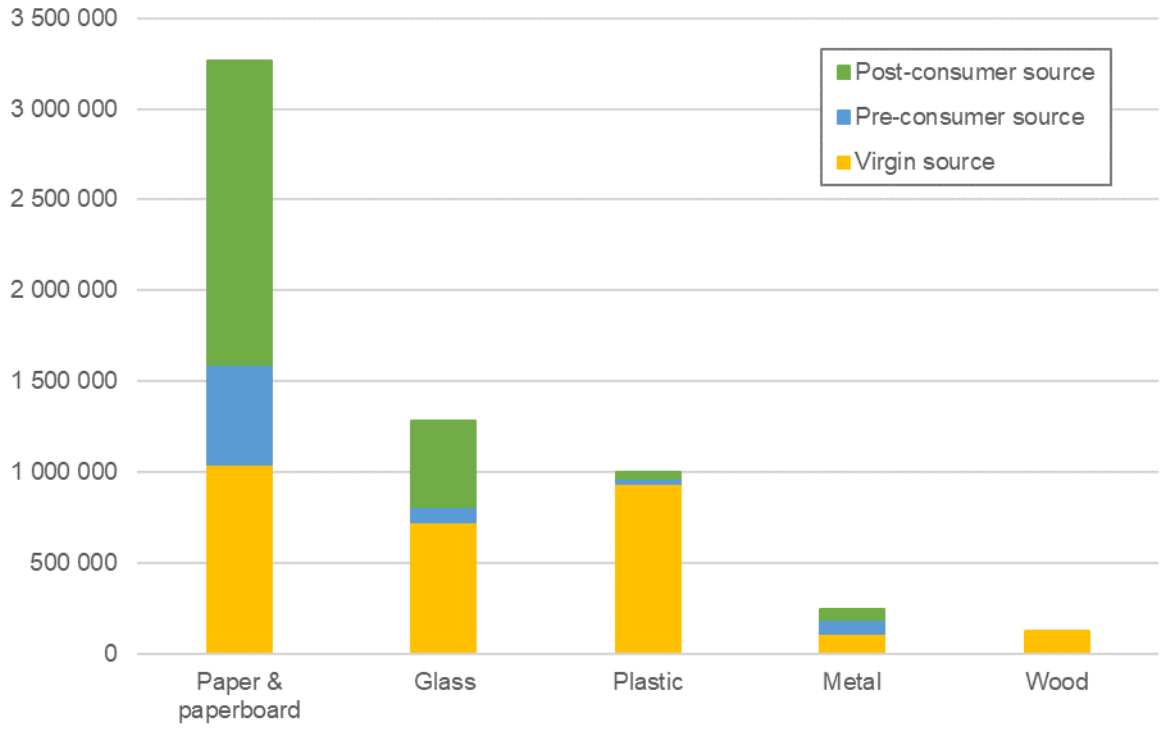


Figure 16. Recycled content in packaging POM by material group (tonnes)

Table 20 and **Figure 17** compare the PCR content of packaging by material group for 2017–18 and 2018–19.

Table 20. Packaging PCR content in 2017–18 and 2018–19, by material group

Material group	2017–18		2018–19	
	(tonnes)	(% of POM)	(tonnes)	(% of POM)
Paper & paperboard	1 421 000	49%	1 667 000	51%
Glass	407 000	32%	474 000	37%
Plastic	23 000	2%	37 000	4%
Metal	64 000	30%	59 000	24%
Wood	NR	NR	0	0%
Total	**1 915 000**	**35%**	**2 237 000**	**38%**

NR – Not reported.

There was a modest increase reported in PCR content of paper & paperboard packaging between 2017–18 and 2018–19, but a more significant increase in the PCR content of glass, possibly underpinned by improved quantity and quality of supply following the implementation and growing maturity of the container deposit schemes in the ACT, NSW and Queensland.

In relation to plastics, there was some new reprocessing capacity commissioned in 2018–19 for reprocessing post-consumer plastic packaging back into packaging. In addition, there was an increased quantity of PCR resins reported as imported into Australia by plastic packaging manufacturers, attributed to a lack of local supply of suitable quality PCR resin to meet local demand.

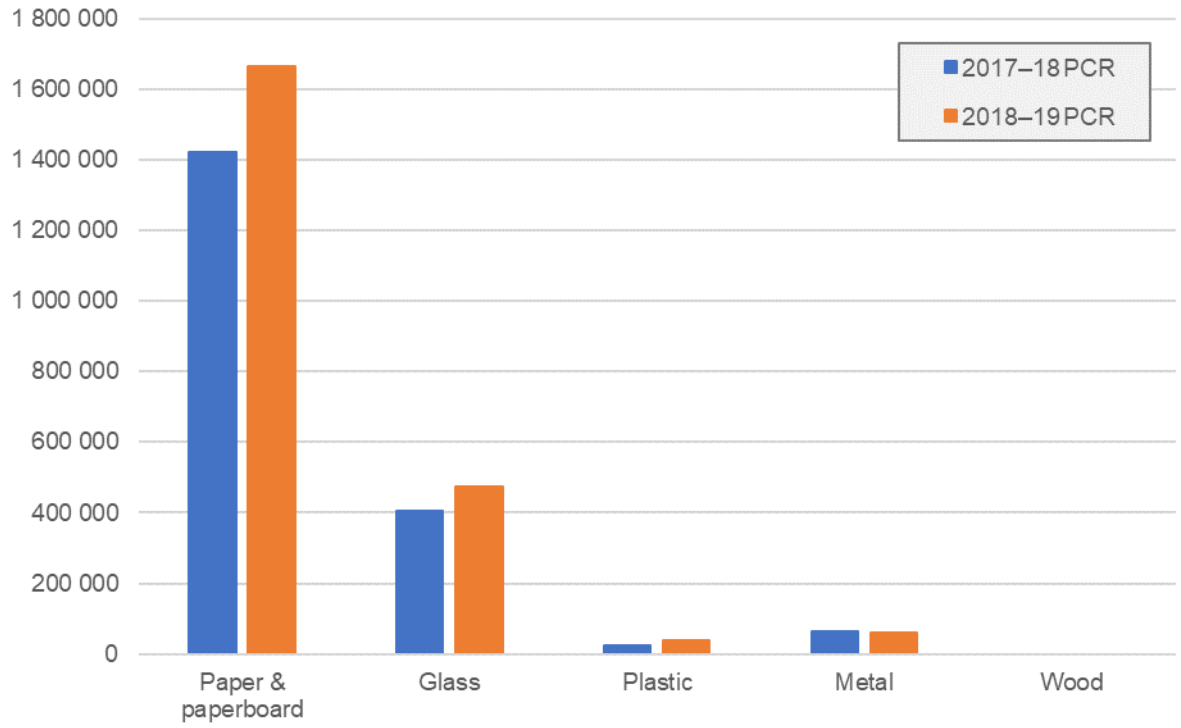


Figure 17. Packaging POM in 2017–18 and 2018–19, by material group (tonnes)

Paper & paperboard packaging

Estimates of the recycled content incorporated into paper & paperboard packaging POM in 2018–19 and by material type are provided in **Table 21** and **Figure 18**. The PCR content of paper & paperboard packaging was 1.7 million tonnes, or 51% of total paper & paperboard packaging POM; the pre-consumer recycled content was 0.6 million tonnes (17%); and a little over 1.0 million tonnes (32%) was sourced from virgin (primary) feedstocks.

Table 21. Paper & paperboard packaging POM in 2018–19, by material type and recycled content source

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Boxboard/Cartonboard	157 000	55%	65 000	23%	65 000	23%	288 000
Corrugated cardboard	1 439 000	57%	473 000	19%	632 000	25%	2 544 000
HWS carrierboard	0	0%	2 000	10%	18 000	90%	20 000
Kraft paper	0	0%	2 000	1%	194 000	99%	195 000
Moulded fibreboard	47 000	91%	0	0%	4 000	9%	51 000
PCPB – Aseptic	0	0%	0	0%	38 000	100%	38 000
PCPB – Gable top	0	0%	0	0%	12 000	100%	12 000
PCPB – Cold cup	0	0%	1 000	10%	5 000	90%	6 000
PCPB – Hot cup	0	0%	1 000	10%	11 000	90%	12 000
PCPB – Other	0	1%	0	1%	3 000	99%	4 000
Other fibre packaging	25 000	26%	11 000	11%	59 000	63%	94 000
Total	**1 667 000**	**51%**	**554 000**	**17%**	**1 041 000**	**32%**	**3 262 000**

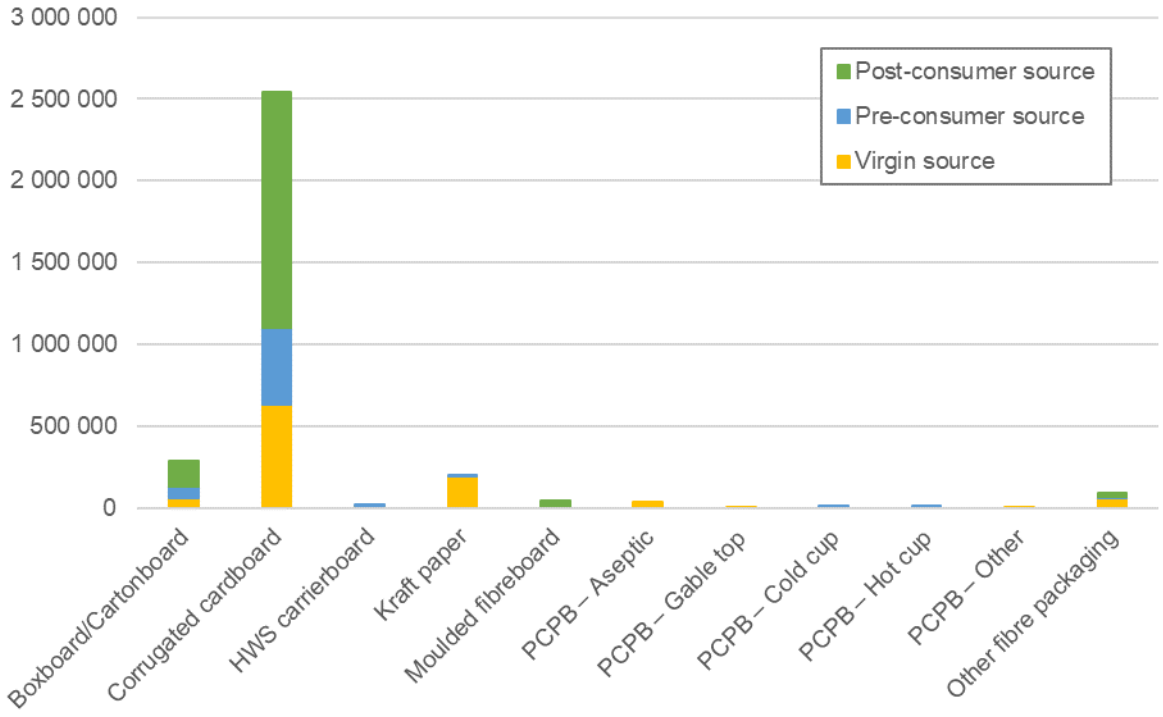


Figure 18. Paper & paperboard packaging POM in 2018–19, by material type and recycled content (tonnes)

Glass packaging

Estimates of the recycled content incorporated into glass packaging POM in 2018–19 and by material type are provided in **Table 22** and **Figure 19.**

The PCR content of glass packaging was 0.5 million tonnes, or 37% of total glass packaging POM; the pre-consumer recycled content was 0.10 million tonnes (7%); and a little over 0.7 million tonnes (56%) was sourced from virgin (primary) feedstocks.

Table 22. Glass packaging POM in 2018–19, by material type and recycled content source

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Amber glass	158 000	42%	18 000	5%	204 000	54%	381 000
Flint glass	220 000	34%	44 000	7%	379 000	59%	643 000
Green glass	95 000	37%	22 000	8%	141 000	55%	258 000
Total	**474 000**	**37%**	**84 000**	**7%**	**724 000**	**56%**	**1 283 000**

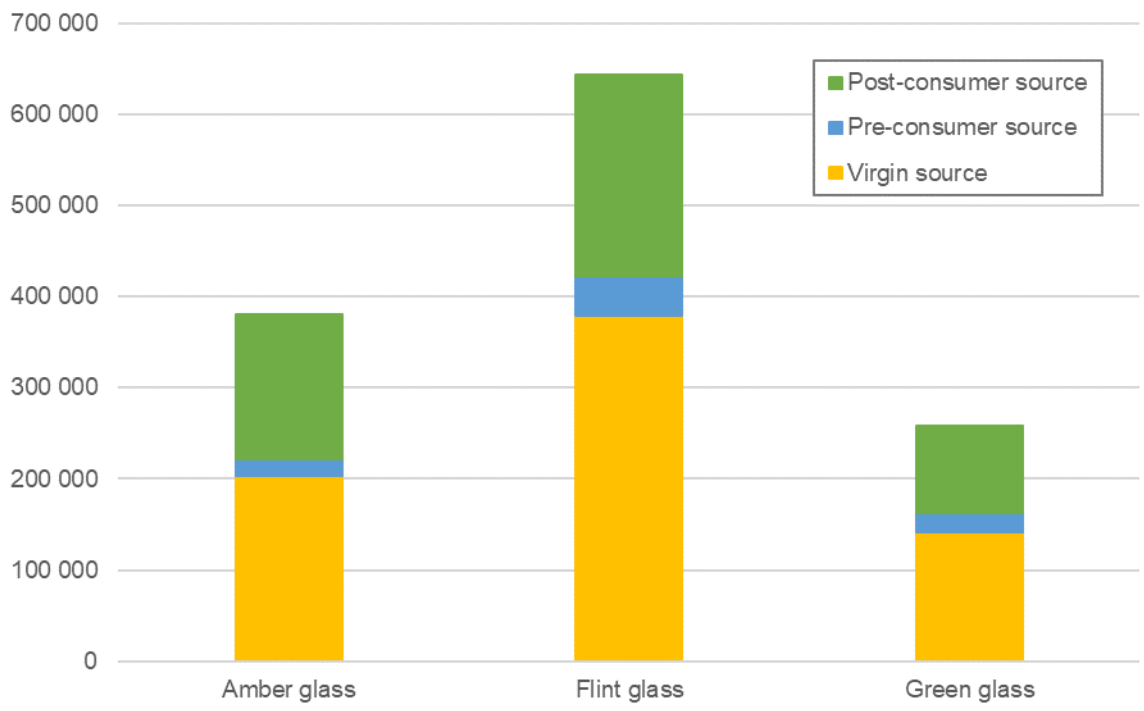


Figure 19. Glass packaging POM in 2018–19, by material type and recycled content (tonnes)

Plastic packaging

Estimates of the recycled content incorporated into plastic packaging POM in 2018–19 and by material type are provided in **Table 23** and **Figure 20**.

The PCR content of plastic packaging was 37 000 tonnes, or 4% of total plastic packaging POM; the pre-consumer recycled content was 29 000 tonnes (3%), and virgin (primary) resin feedstock dominated supply at over 0.9 million tonnes or 93% of source material.

Table 23. Plastic packaging POM in 2018–19, by material type and recycled content source

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
PET (1)	22 000	14%	3 000	2%	129 000	84%	154 000
HDPE (2)	11 000	3%	12 000	4%	294 000	93%	316 000
PVC (3)	0	0%	<500	3%	15 000	97%	15 000
LDPE (4)	0	0%	8 000	3%	225 000	97%	233 000
PP (5)	4 000	2%	6 000	4%	145 000	94%	155 000
PS (6)	<500	1%	0	0%	11 000	99%	11 000
EPS (6)	0	0%	0	0%	16 000	100%	16 000
Bioplastic (7)	0	0%	1 000	12%	6 000	88%	6 000
Other (7)	0	0%	0	0%	16 000	100%	16 000
Unidentified	0	0%	0	0%	78 000	100%	78 000
Total	**37 000**	**4%**	**29 000**	**3%**	**934 000**	**93%**	**1 000 000**

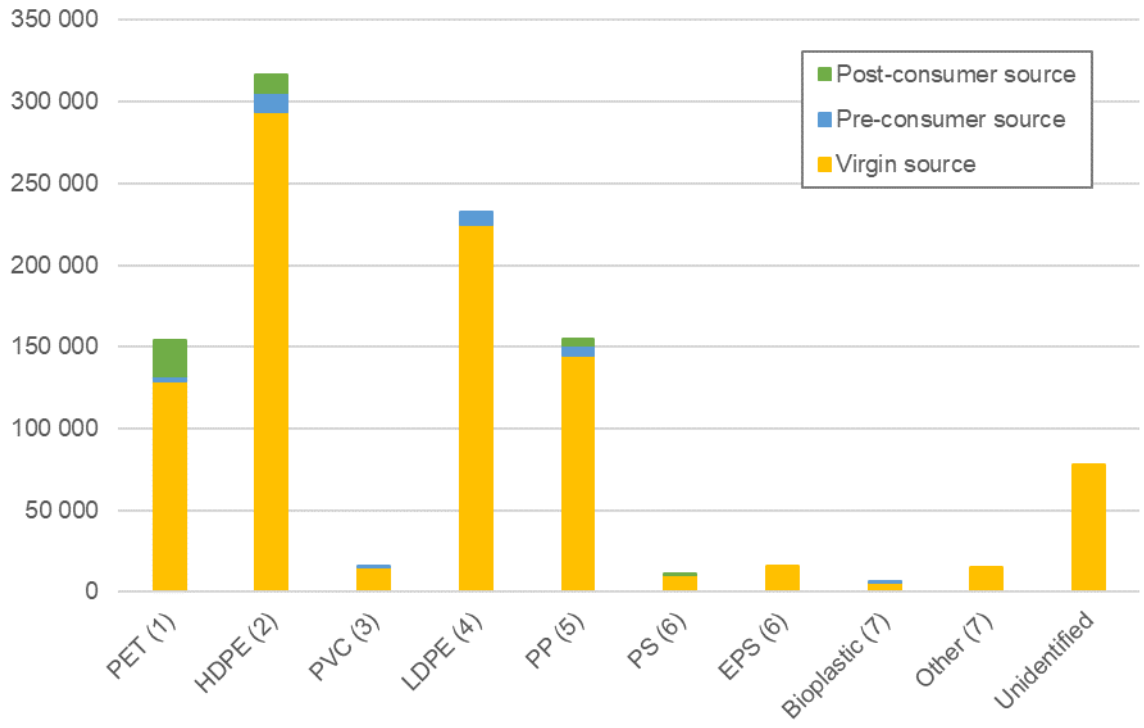


Figure 20. Plastic packaging POM in 2018–19, by material type and recycled content (tonnes)

Metal packaging

Estimates of the recycled content incorporated into metal packaging POM in 2018–19 and by material type are provided in **Table 24** and **Figure 21.**

The PCR content of metal packaging was 59 000 tonnes, or 24% of total metal packaging POM; the pre-consumer recycled content was 73 000 tonnes (30%); and 114 000 tonnes (46%) was sourced from virgin (primary) feedstocks.

Table 24. Metal packaging POM in 2018–19, by material type and recycled content source

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Beverage aluminium	12 000	14%	40 000	47%	34 000	40%	86 000
Non-beverage aluminium	2 000	15%	7 000	50%	5 000	35%	14 000
Tin-plate steel	40 000	31%	25 000	20%	62 000	49%	127 000
Mild steel	5 000	28%	1 000	7%	13 000	66%	19 000
Total	**59 000**	**24%**	**73 000**	**30%**	**114 000**	**46%**	**246 000**

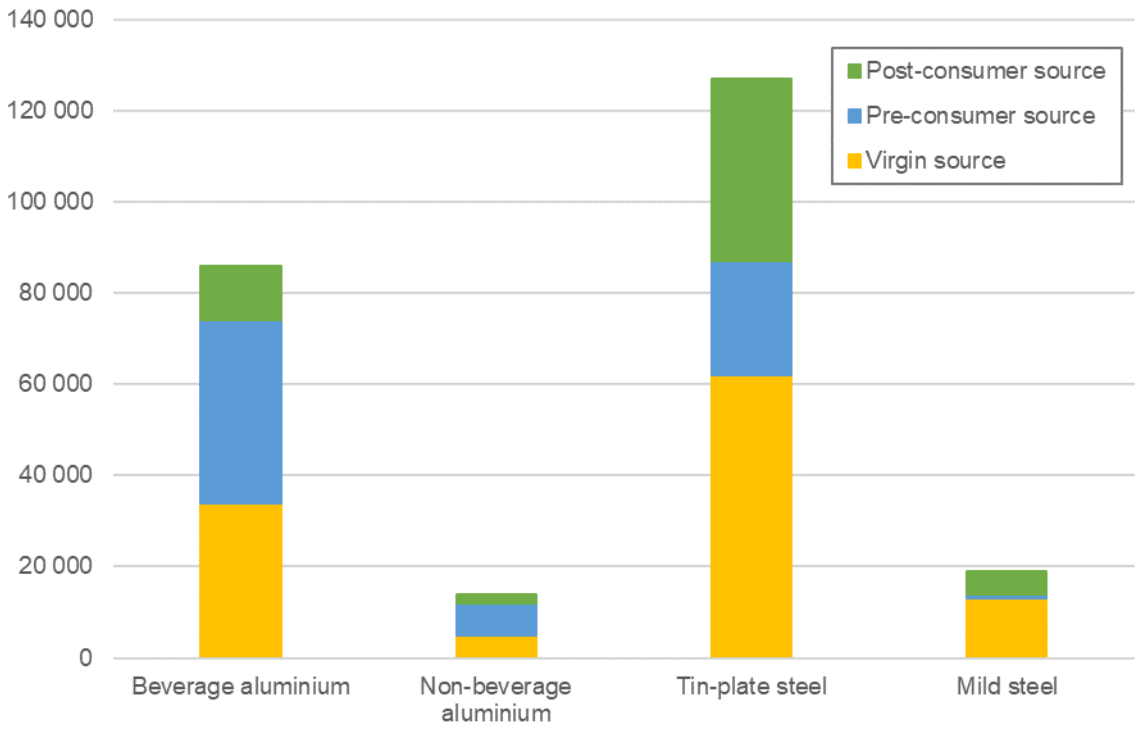


Figure 21. Metal packaging POM in 2018–19, by material type and recycled content (tonnes)

The proportion of pre-consumer recycled content in aluminium based packaging is relatively high compared to other packaging material types due to the nature of aluminium goods manufacturing, which typically involves relatively large quantities of pre-consumer scrap generation.

Wood packaging

There was no post-consumer or pre-consumer recycled content identified as going into wood packaging, which was made from 100% virgin (primary) feedstocks.

2.9 ANZSIC division

This year the project scope was expanded to collect data on packaging POM (this section) and recovery data (see **Section 3.6)** through sectors of the economy. This is based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) industry divisions. The reported ANZSIC division is the sector in which the packaging was used and subsequently disposed.

Table 25 and **Figure 22** provide packaging POM by material group and ANZSIC division. Nearly 2.6 million tonnes (43%) of packaging was used by the Other services' division, into which packaging used by households has been allocated. This was followed by 'Wholesale trade' at 1.7 million tonnes (29%), 'Accommodation and food services' division at 0.6 million tonnes (11%) and 'Manufacturing' at 0.5 million tonnes (8%).

Table 25. Packaging POM in 2018–19, by material group and ANZSIC division

ANZSIC division	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
A – Agriculture, forestry and fishing	0	0	45 000	3 000	37 000	85 000	1.4%
B – Mining	0	0	0	0	0	0	0.0%
C – Manufacturing	346 000	0	78 000	21 000	26 000	470 000	7.9%
D – Electricity, gas, water and waste services	0	0	0	0	0	0	0.0%
E – Construction	0	0	5 000	0	16 000	21 000	0.4%
F – Wholesale trade	1 658 000	0	56 000	3 000	0	1 717 000	29.0%
G – Retail trade	284 000	0	43 000	0	1 000	329 000	5.6%
H – Accommodation and food services	255 000	385 000	1 000	1 000	0	643 000	10.9%
I – Transport, postal and warehousing	18 000	0	0	10 000	44 000	72 000	1.2%
J – Information media and telecommunications	0	0	0	0	0	0	0.0%
K – Financial and insurance services	0	0	0	0	0	0	0.0%
L – Rental, hiring and real estate services	0	0	0	0	0	0	0.0%
M – Professional, scientific and technical services	0	0	0	0	0	0	0.0%
N – Administrative and support services	0	0	0	0	0	0	0.0%
O – Public administration and safety (private)	0	0	0	0	0	0	0.0%
P – Education and training (private)	0	0	0	0	0	0	0.0%
Q – Health care and social assistance (private)	5 000	0	0	0	0	5 000	0.1%
R – Arts and recreation services	0	0	0	0	0	0	0.0%
S – Other services	677 000	898 000	772 000	208 000	0	2 555 000	43.2%
X – Unknown	19 000	0	0	0	0	19 000	0.3%
Total	**3 262 000**	**1 283 000**	**1 000 000**	**240 000**	**124 000**	**5 910 000**	**100.0%**

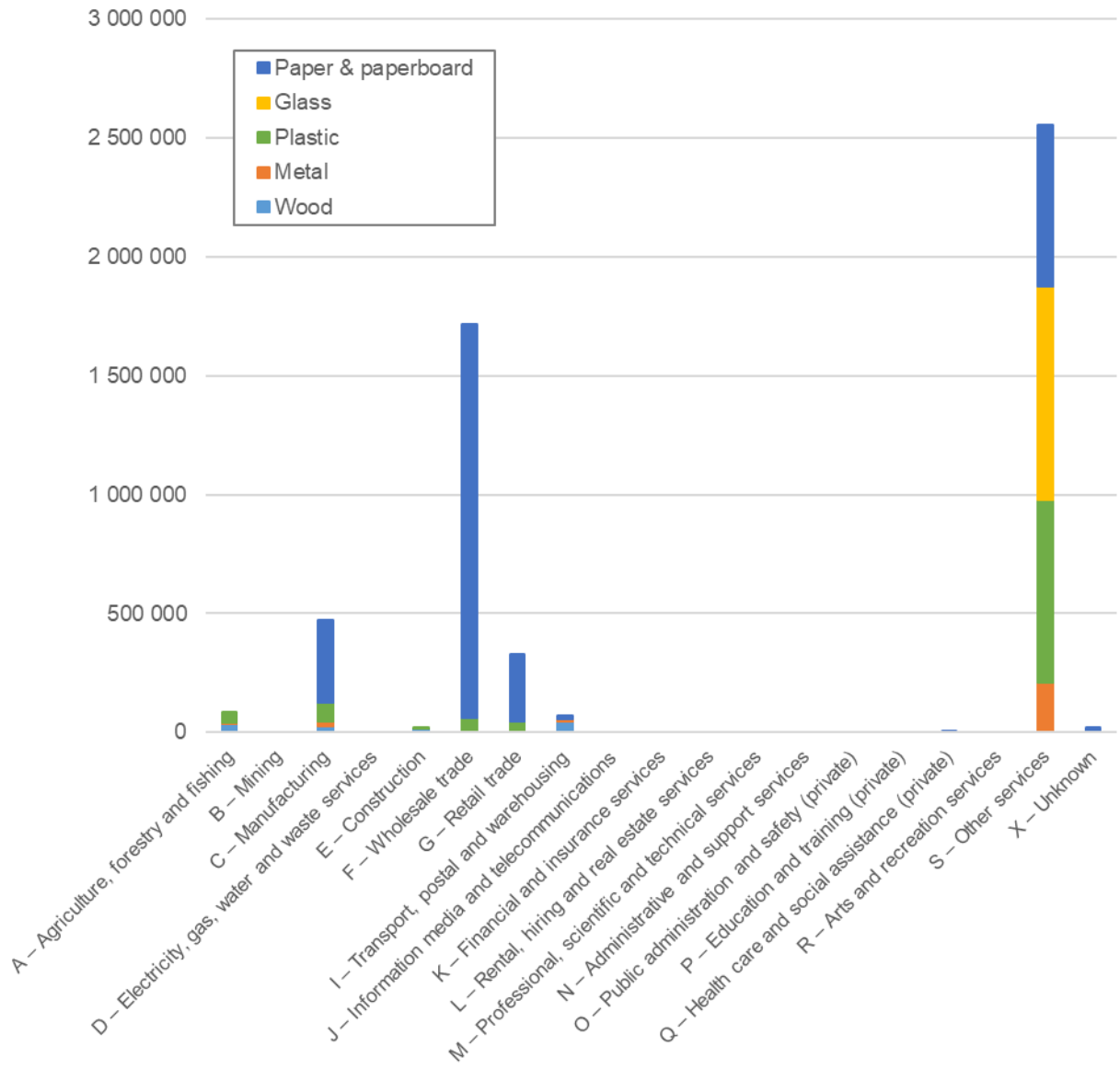


Figure 22. Packaging POM in 2018–19, by material group and ANZSIC division (tonnes)

2.10 Problematic and unnecessary single use plastics

APCO has identified a number of packaging materials or items as problematic and unnecessary single-use plastics (APCO, 2020b). **Table 26** compares the available data for five of these priority items.

Table 26. Priority single-use plastic packaging POM in 2016–17 to 2018–19

Priority item	2016–17	2017–18	2018–19	% change
	(tonnes)	(tonnes)	(tonnes)	
Single-use HDPE shopping bags[a]	30 700	-	7 000	-77%
PS[b]	-	11 400	10 900	-5%
EPS[b]	-	22 000	16 400	-26%
PVC[b,c]	-	20 400	15 300	-25%
Oxo-degradable plastics[b]	-	1 500	1 100	-24%

a) Includes single-use HDPE bags (supermarket type) only. Single-use HDPE produce bags and single-use LDPE bags (boutique type) are not included. 2017–18 data not available for plastic bags. Source is Envisage (2020).

b) These estimates are subject to a relatively large accuracy range and significant changes in year-on-year reporting.

c) The priority at this stage is to phase out rigid PVC only, but this data cannot be reported for confidentiality reasons

Single-use HDPE shopping bag consumption has fallen by 77% since 2016–17, driven by the WA and QLD bans from 1 July 2018, and Coles and Woolworths phasing out free plastic shopping bags from their stores nationally from July 2018.

3 PACKAGING RECOVERY IN 2018–19

This section of the report provides estimates of post-consumer packaging recovery in Australia in 2018–19, measured at the out-going gate of the secondary processing facility for the used packaging.

Examples of secondary processing facilities include paper mills, glass beneficiation facilities, plastics flaking and washing facilities, and metal smelting facilities.

Recovery data is reported at the following levels:

- Material group
- Material type
- Recovered material use application (packaging/non-packaging)
- Recovered material use destination (local/overseas)
- Rigid/flexible plastic packaging
- ANZSIC division
- Recovery rates by material group
- Recovery rates by material type
- Packaging recyclability.

A summary of the data for each state and territory is provided in **Appendix C.**

3.1 Material group

Total Australian post-consumer packaging recovery in 2018–19 is estimated at 2.98 million tonnes (±14%).

Of the packaging recovered in 2018–19, over two thirds was paper & paperboard packaging (68.6%), followed by glass packaging (19.2%), plastic packaging (6.1%), metal packaging (4.6%), and wood packaging (1.5%).

Estimates for post-consumer packaging recovery by material group are provided in **Table 27** and **Figure 23.** The aggregated accuracy range estimates for each of the material groups are also provided.

The estimates include post-consumer packaging collected through municipal, C&I and CDS collection services, and are presented by collection service in **Table 28** and **Figure 24.**

Table 27. Post-consumer packaging recovery in 2018–19, by material group

Material group	Recovery		Accuracy range
	(tonnes)	(%)[a]	(±%)
Paper & paperboard	2 045 000	68.6%	13%
Glass	574 000	19.2%	16%
Plastic	182 000	6.1%	14%
Metal	137 000	4.6%	12%
Wood	44 000	1.5%	50%
Total	**2 982 000**	**100.0%**	**14%**

a) Percent contribution to the total amount of packaging recovered; not the recovery rate.

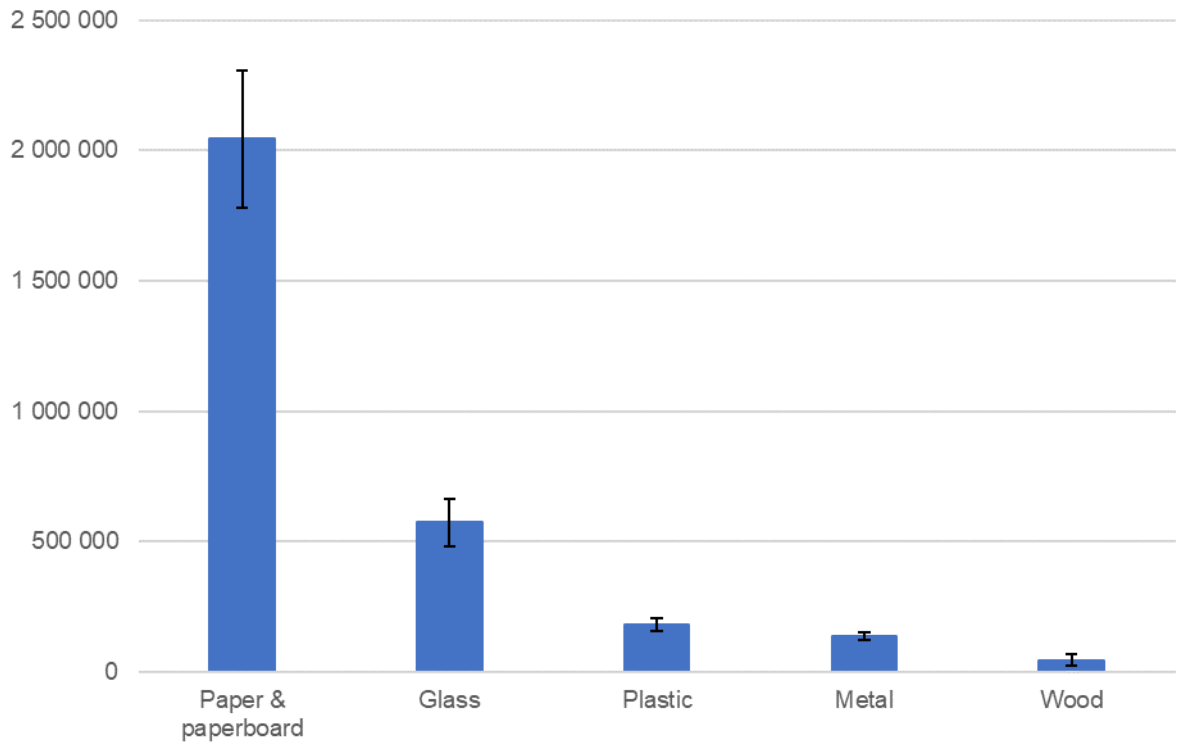


Figure 23. Post-consumer packaging recovery by material group in 2018–19 (tonnes)

Table 28. Post-consumer packaging recovery in 2018–19, by material group and collection service

Material type	Collection service					Total
	MSW[a]	C&I[a]	C&D[a]	CDS[a]	Other	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	793 000	1 239 000	0	1 000	12 000	2 045 000
Glass	408 000	2 000	0	132 000	32 000	574 000
Plastic	119 000	39 000	2 000	20 000	2 000	182 000
Metal	102 000	17 000	0	18 000	0	137 000
Wood	0	44 000	0	0	0	44 000
Total (tonnes)	**1 422 000**	**1 342 000**	**2 000**	**171 000**	**46 000**	**2 982 000**
Total (%)	**47.7%**	**45.0%**	**0.1%**	**5.7%**	**1.5%**	**100.0%**

a) MSW – municipal solid waste / C&I – commercial and industrial / C&D – construction and demolition / CDS – container deposit scheme.

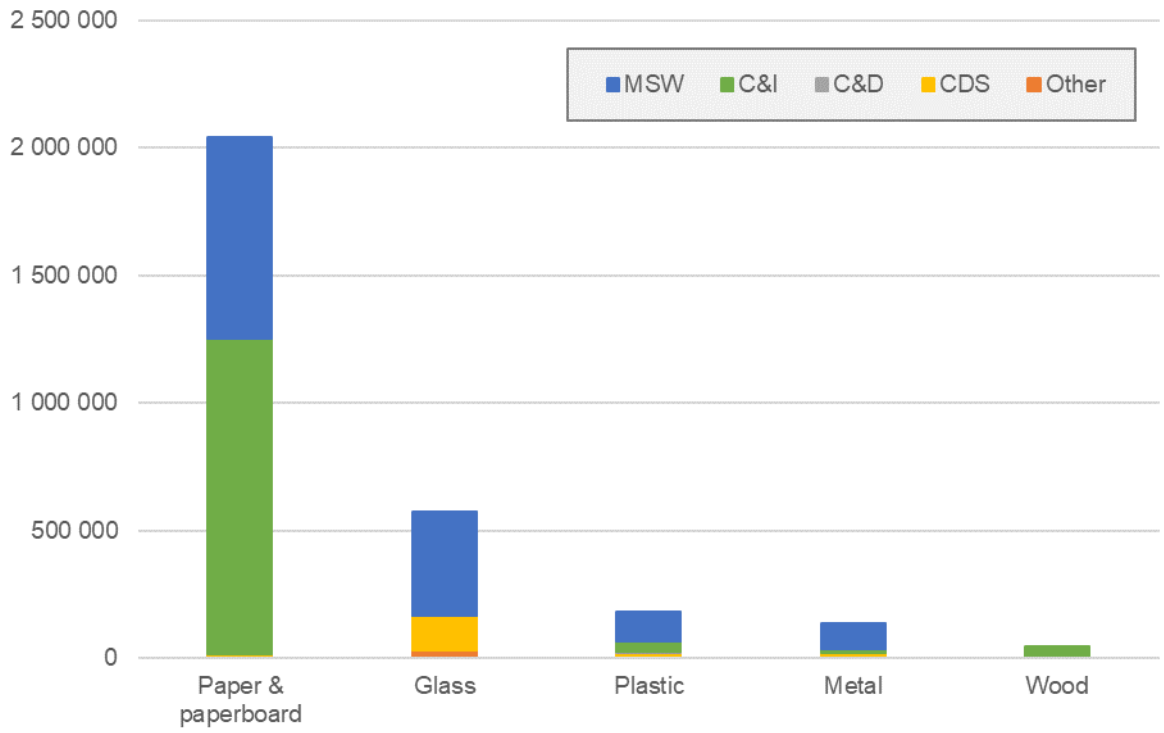


Figure 24. Post-consumer packaging recovery in 2018–19, by material group and collection service (tonnes)

Table 29 and **Figure 25** compare recovery data by material group for 2017–18 and 2018–19.

This year, for the first time, single-use wood packaging recovery is included in the scope of the dataset (44 kt), along with some additional types of B2B steel packaging (17 kt). Excluding these quantities, packaging recovery was 2.92 million tonnes, which was a 9.3% increase on the 2017–18 packaging POM estimate of 2.67 million tonnes.

Table 29. Post-consumer packaging recovery in 2017–18 and 2018–19, by material group

Material group	2017–18 recovery (tonnes)	2018–19 recovery (tonnes)	Change (%)
Paper & paperboard	1 817 000	2 045 000	13%
Glass	582 000	574 000	-1%
Plastic	173 000	182 000	5%
Metal	102 000	137 000	35%
Wood	NR[a]	44 000	NR[a]
Total	**2 673 000**	**2 982 000**	**12%**

a) NR – Not reported.

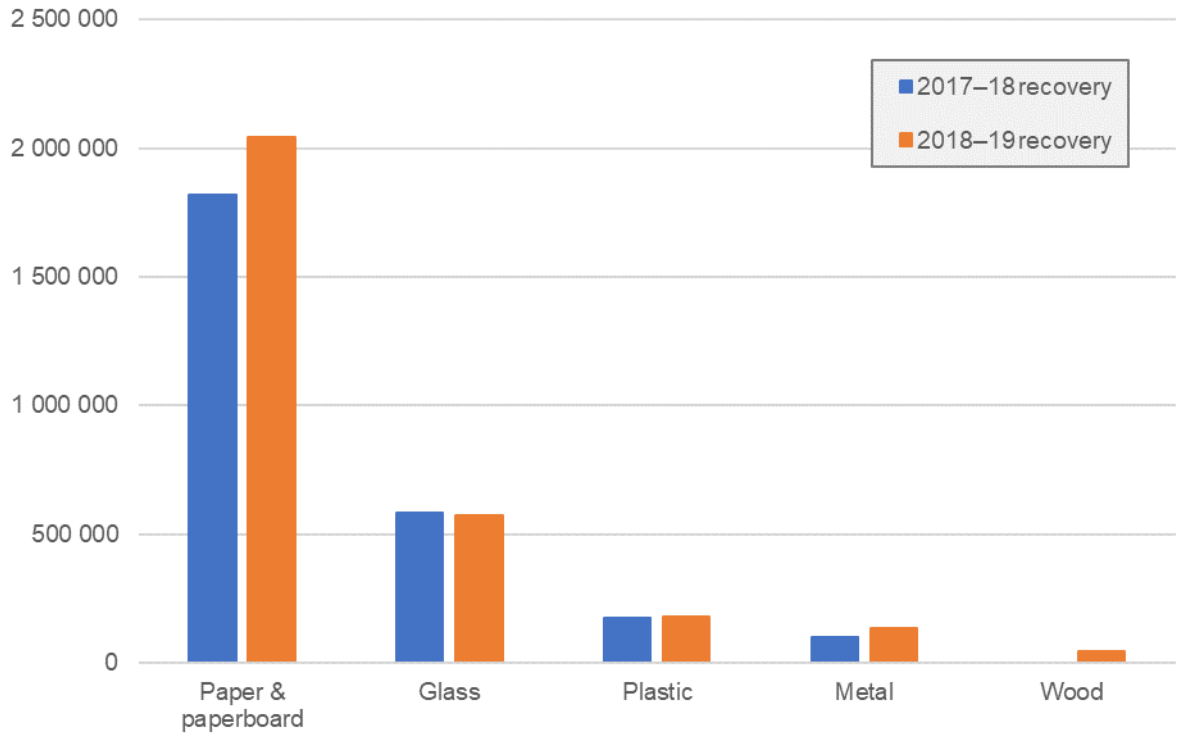


Figure 25. Post-consumer packaging recovery in 2017–18 and 2018–19, by material group (tonnes)

As outlined in **Section 2.1** there was a significant increase in paper & paperboard packaging POM between 2017–18 and 2018–19 due to numerous factors, including above average increase in corrugated cardboard into the B2C sector, and a significant increase in the use of kraft paper as void fill within boxes for freighting goods. Both these paper & paperboard packaging types also have relatively high levels of recovery, resulting in a noteworthy jump in paper & paperboard recovery in 2018–19.

3.2 Material type

Paper & paperboard packaging

Post-consumer paper & paperboard packaging recovery in Australia in 2018–19 is estimated at 2.0 million tonnes (±13%), which is 68.6% of all post-consumer packaging recovery. Estimates for paper & paperboard packaging recovery, by material type and collection service, are provided in **Table 30** and **Figure 26.**

Over 1.8 million tonnes (90%) of recovered paper & paperboard packaging was corrugated cardboard. It is estimated that around 1.2 million tonnes (64%) of this corrugated cardboard recovery was from commercial and industrial (C&I) collections, and nearly 0.7 million tonnes (35%) from municipal collections.

Table 30. Paper & paperboard packaging recovery in 2018–19, by material type and collection service

Material type	Collection service				Total		Accuracy range
	MSW	C&I	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Boxboard/Cartonboard	109 000	21 000	0	0	131 000	6.4%	23%
Corrugated cardboard	651 000	1 186 000	0	11 000	1 849 000	90.4%	12%
PCPB[a]	4 000	0	1 000	0	5 000	0.2%	46%
Other fibre packaging	29 000	31 000	0	0	60 000	2.9%	22%
Total (tonnes)	**793 000**	**1 239 000**	**1 000**	**12 000**	**2 045 000**	**-**	**-**
Total (%)	**38.8%**	**60.6%**	**0.1%**	**0.6%**	**100.0%**	**100.0%**	**13%**

a) PCPB – Polymer coated paperboard.

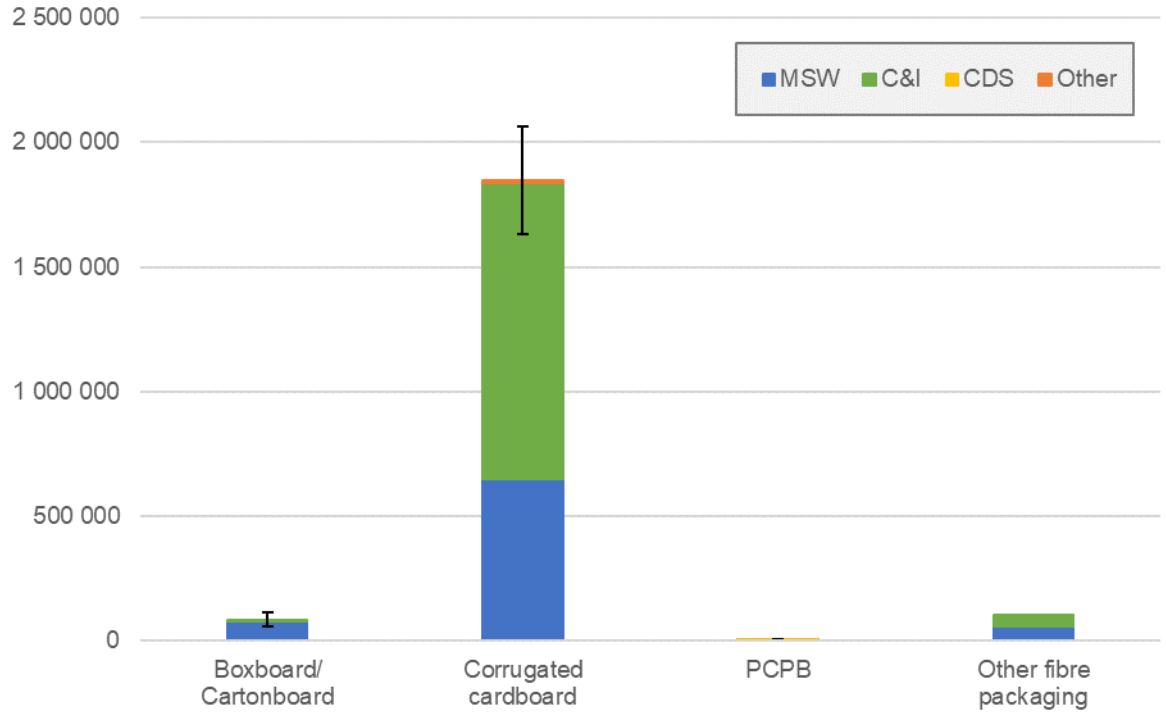


Figure 26. Paper & paperboard packaging recovery in 2018–19, by material type and collection service (tonnes)

Glass packaging

Post-consumer glass packaging recovery in Australia in 2018–19 is estimated at around 0.57 million tonnes (±16%), which was 19.2% of all post-consumer packaging recovery. Estimates for glass packaging recovery, by material type and collection service, are provided in **Table 31** and **Figure 27.**

A significant proportion of recovered glass is not recycled back into packaging but is diverted into other applications, mainly in road construction. See **Section 3.3** for estimates of recovered packaging materials use applications.

An estimated 408 000 tonnes (71.1%) of glass packaging was recovered through kerbside collections, with another 132 000 tonnes (23.1%) recovered through CDS collections. Less than 1% was reported as recovered through C&I related collections.

Table 31. Glass packaging recovery in 2018–19, by material type and collection service

Material type	Collection service				Total		Accuracy range
	MSW	C&I	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Amber glass	114 000	0	50 000	10 000	174 000	30.4%	16%
Flint glass	218 000	1 000	48 000	16 000	283 000	49.3%	16%
Green glass	76 000	0	34 000	6 000	117 000	20.4%	16%
Total (tonnes)	**408 000**	**2 000**	**132 000**	**32 000**	**574 000**	**-**	**-**
Total (%)	**71.1%**	**0.3%**	**23.1%**	**5.6%**	**100.0%**	**100.0%**	**16%**

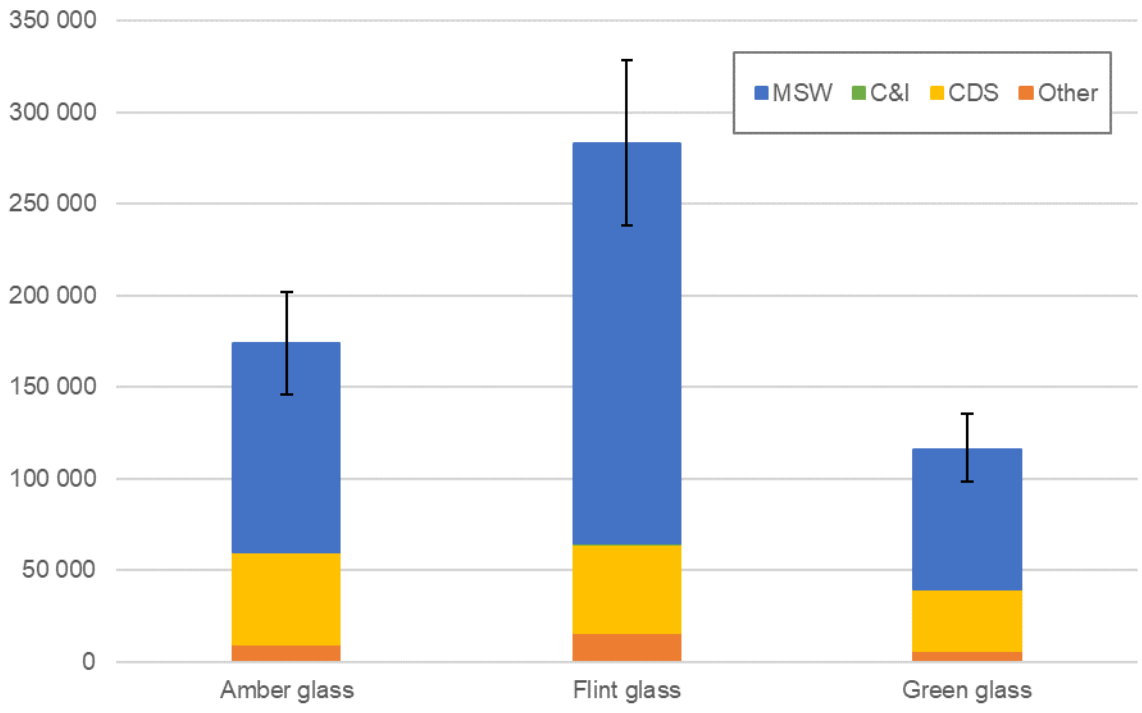


Figure 27. Glass packaging recovery in 2018–19, by material type and collection service (tonnes)

Plastic packaging

Post-consumer plastic packaging recovery in Australia in 2018–19 is estimated at 182 000 tonnes (±14%), which was 6.1% of all post-consumer packaging recovery. Estimates for plastic packaging recovery, by material type and collection service, are provided in **Table 32** and **Figure 28.**

Around 119 000 tonnes (65%) of plastic packaging was recovered through kerbside collections, with another 39 000 tonnes (22%) recovered through C&I collections and 20 000 tonnes (11%) recovered through CDS related collections.

Table 32. Plastic packaging recovery in 2018–19, by material type and collection service

Material type	Collection service					Total		Accuracy range
	MSW	C&I	C&D	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
PET (1)	35 000	0	1 000	19 000	0	55 000	30.3%	13%
HDPE (2)	58 000	13 000	1 000	1 000	1 000	73 000	40.3%	15%
PVC (3)	1 000	0	0	0	0	1 000	0.6%	14%
LDPE (4)	1 000	20 000	0	0	0	22 000	11.8%	13%
PP (5)	19 000	2 000	0	0	0	21 000	11.3%	14%
PS (6)	2 000	0	0	0	0	3 000	1.5%	11%
EPS (6)	0	4 000	0	0	0	4 000	2.4%	17%
Bioplastic (7)	0	0	0	0	0	0	0.0%	0%
Other (7)	0	0	0	0	0	0	0.0%	4%
Unidentified	3 000	0	0	0	0	3 000	1.8%	20%
Total (tonnes)	**119 000**	**39 000**	**2 000**	**20 000**	**2 000**	**182 000**	-	-
Total (%)	**65.4%**	**21.7%**	**0.9%**	**10.9%**	**1.0%**	**100.0%**	**100.0%**	**14%**

Collections of packaging film, both from B2B related collections and householder drop-off of flexible plastic packaging at supermarkets, are included under the C&I collection service in the table above.

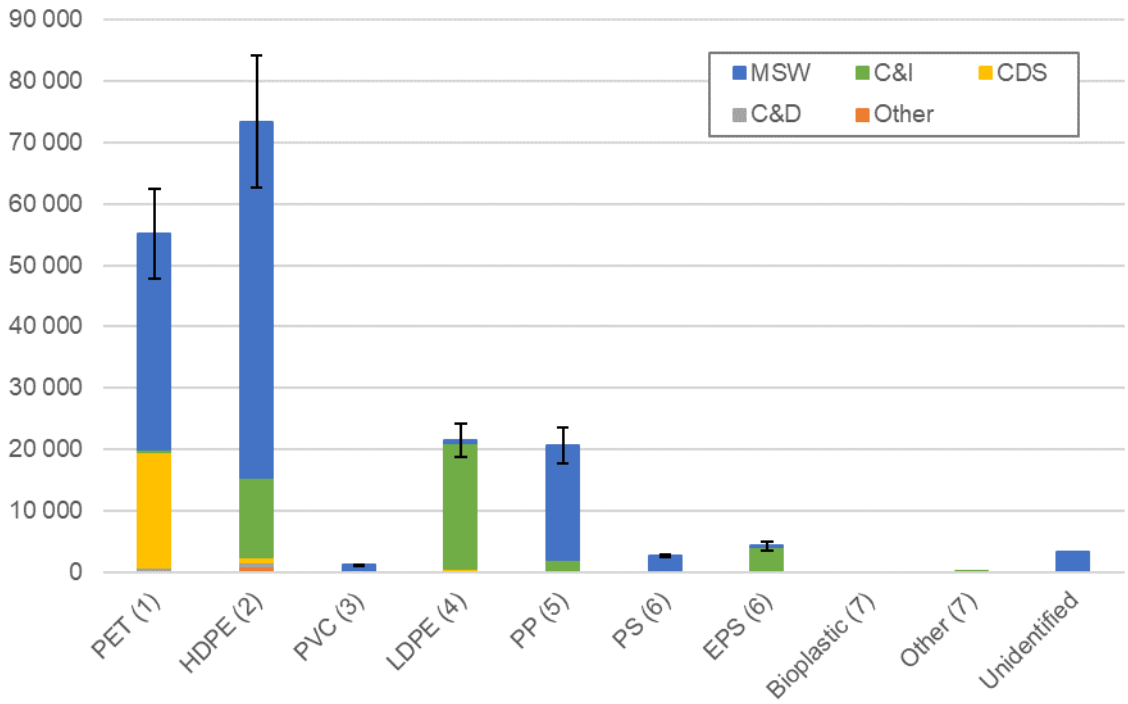


Figure 28. Plastic packaging recovery in 2018–19, by material type and collection service (tonnes)

Metal packaging

Post-consumer metal packaging recovery in Australia in 2018–19 is estimated at around 137 000 tonnes (±12%), which was 4.6% of all post-consumer packaging recovery. Estimates for metal packaging recovery, by material type and collection service, are provided in **Table 33** and **Figure 29.**

Around 102 000 tonnes (74.6%) of metal packaging is recovered through kerbside collections, with another 17 000 tonnes (12.6%) recovered through C&I collections, and 18 000 tonnes (12.8%) recovered through CDS related collections. This year is the first year that recovery of steel packaging formats >20 litres has been included in packaging quantifications. This has added 17 kt to metal packaging recovery in 2018–19.

Table 33. Metal packaging recovery in 2018–19, by material type and collection service

Material type	Collection service				Total		Accuracy range
	MSW	C&I	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Beverage aluminium	47 000	0	18 000	0	65 000	47.2%	5%
Non-beverage aluminium	3 000	0	0	0	3 000	1.9%	20%
Tin-plate steel	52 000	0	0	0	52 000	38.2%	8%
Mild steel	0	17 000[a]	0	0	17 000	12.6%	50%
Total (tonnes)	**102 000**	**17 000**	**18 000**	**0**	**137 000**	-	-
Total (%)	**74.6%**	**12.6%**	**12.8%**	**0.0%**	**100.0%**	**100.0%**	**12%**

a) 2018–19 is the first year that steel packaging >20 litres recovery has been included in packaging quantifications.

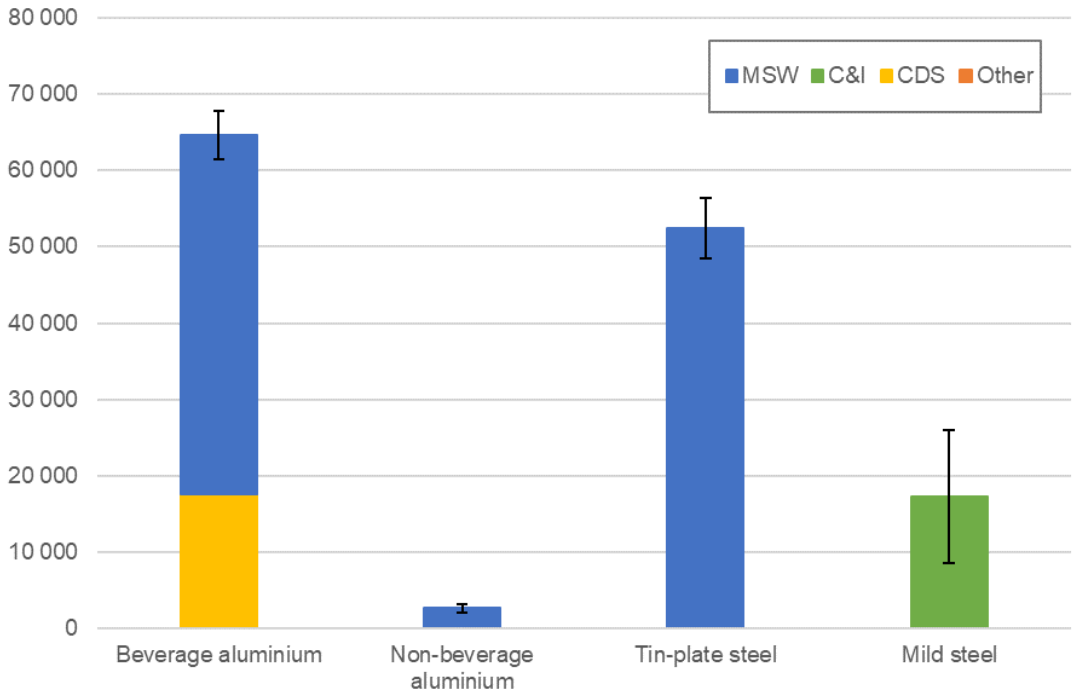


Figure 29. Metal packaging recovery in 2018–19, by material type and collection service (tonnes)

Wood packaging

Post-consumer wood packaging recovery in Australia in 2018–19 is estimated at around 44 000 tonnes (±50%), which was 1.5% of all post-consumer packaging recovery.

Estimates for wood packaging recovery, by material type and collection service, are provided in **Table 34** and **Figure 30**. All identified recovery of wood packaging was through C&I collections.

Table 34. Wood packaging recovery in 2018–19, by material type and collection service

Material type	Collection service				Total		Accuracy range
	MSW	C&I	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Hardwood	0	2 000	0	0	2 000	5.3%	50%
Softwood	0	42 000	0	0	42 000	94.7%	50%
Total (tonnes)	**0**	**44 000**	**0**	**0**	**44 000**	-	-
Total (%)	**0.0%**	**100.0%**	**0**	**0**	**100%**	**100.0%**	**50%**

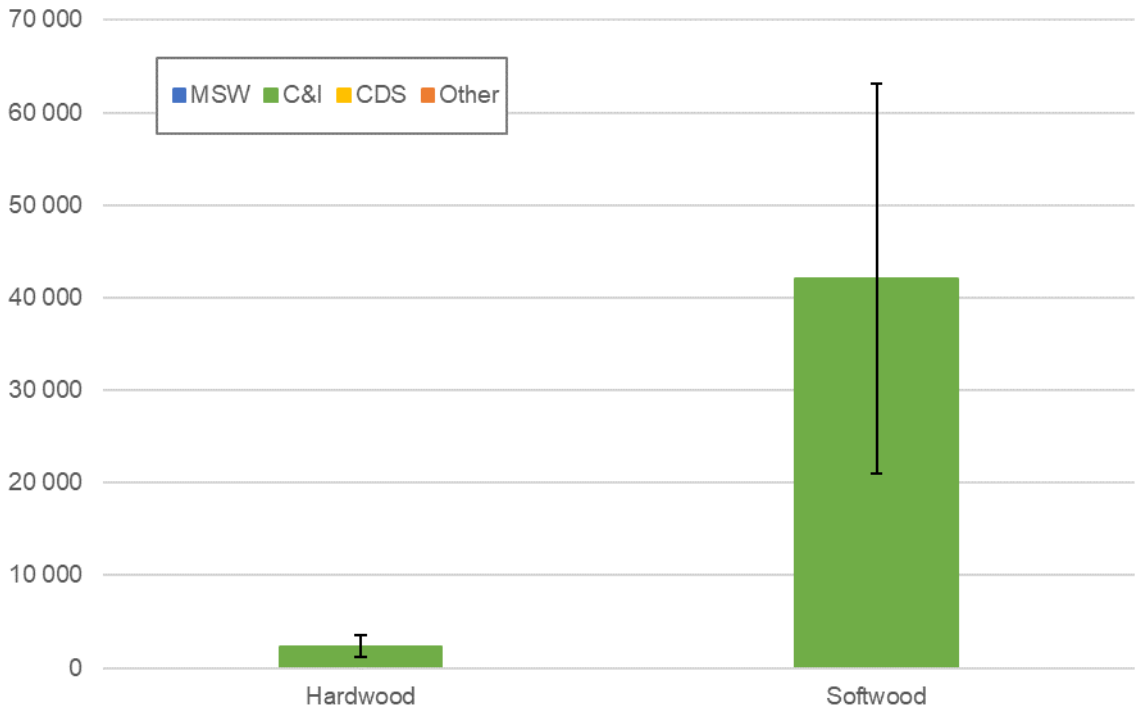


Figure 30. Wood packaging recovery in 2018–19, by material type and collection service (tonnes)

3.3 Material use application

Estimates of recovered post-consumer packaging material use in 2018–19, by packaging or non-packaging end-use application, are provided in **Table 35** and **Figure 31.**

An estimated 1.56 million tonnes (52.5%) were used to manufacture new packaging, compared to 1.26 million tonnes (47.3%) in 2017–18.

Table 35. Packaging recovery in 2018–19, by material group and material use application

Material group	Packaging applications	Non-packaging applications	Unknown applications	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	1 183 000	0	861 000	2 045 000
Glass	350 000	198 000	25 000	574 000
Plastic	21 000	154 000	8 000	182 000
Metal	10 000	107 000	20 000	137 000
Wood	0	44 000	0	44 000
Total (tonnes)	**1 564 000**	**503 000**	**914 000**	**2 982 000**
Total (%)	**52.5%**	**16.9%**	**30.6%**	**100.0%**

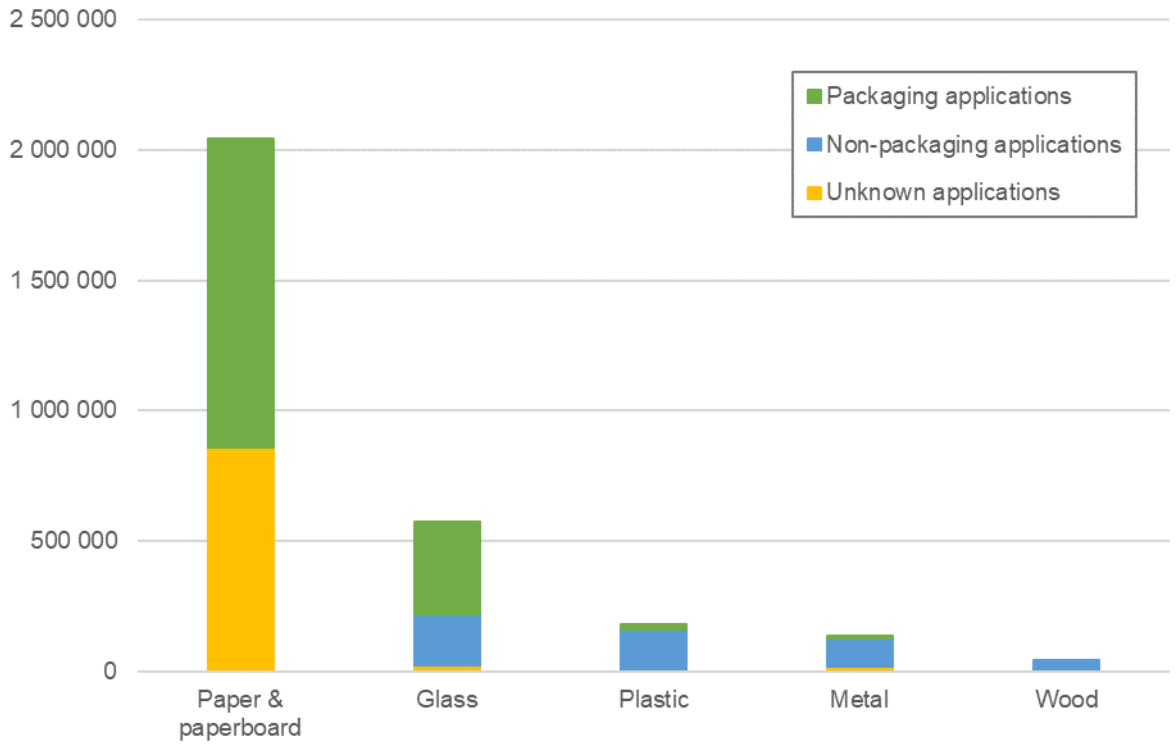


Figure 31. Packaging recovery in 2018–19, by material group and material use application (tonnes)

Recovered paper & paperboard is largely used in packaging applications. The application of much of the exported scrap paper & paperboard could not be determined with any certainty (accounting for the large 'Unknown' quantity), however, much of this would be used as an input into packaging manufacture overseas, and corrugated cartons in particular.

The use of recovered glass packaging is mostly back into packaging, however, large quantities of packaging glass are also crushed and used in civil construction. The major application is use as substitutes for virgin sand or aggregate in road construction; typically blended with virgin sand and aggregate and then mixed with cement to manufacture road-base products. Crushed glass sand and aggregate are also regularly used in non-structural concrete mixes.

The use of recovered plastic packaging is dominated by non-packaging applications, with relatively little utilised back into packaging. Many of the typical applications are summarised in **Table 36.**

Table 36. Typical uses of recycled plastics in Australia

Polymer	Major uses of recycled polymer	Minor uses of recycled polymer
PET	Beverage bottles	Timber substitutes, geo-textiles, pallets and fence posts.
HDPE	Films, pallets, wheelie bins, irrigation hose and pipes	Cable covers, extruded sheet, moulded products, shopping and garbage bags, slip sheets, drip sheets for water, wood substitutes and mixed plastics products (e.g. fence posts, bollards, kerbing, marine structures and outdoor furniture), materials handling and roto-moulded water tanks.
PVC	Pipe, floor coverings	Hose applications and fittings, pipes including foam core pipes, profiles and electrical conduit, general extrusion and injection moulding, clothing, fashion bags and shoes.

Polymer	Major uses of recycled polymer	Minor uses of recycled polymer
LDPE / LLDPE	Film (incl. builders' and agricultural film, concrete lining, freight packaging, garbage bags, shopping bags), agricultural piping	Binder additive to asphalt, Trickle products, vineyard cover, pallets, shrink wrap, roto-moulding, slip sheets, irrigation tube, timber substitutes, cable covers, builders' film, garbage bags, carry bags, and other building industry applications.
PP	Crates, boxes and plant pots	Electrical cable covers, building panels and concrete reinforcement stools (bar chairs and shims), furniture, irrigation fittings, agricultural and garden pipe, drainage products (such as drain gates) and tanks, builders' film, kerbing, bollards, concrete reinforcing and a wide variety of injection moulded products.
PS	Bar chairs and industrial spools	Office accessories, coat hangers, glasses, building components, industrial packing trays, wire spools and a range of extrusion products.
EPS	Waffle pods for under slab construction of buildings	Synthetic timber applications (including photo frames, decorative architraves, fence posts), XPS (extruded polystyrene) insulation sheeting, and lightweight concrete.

Only around 9% of recovered metal packaging is known to be utilised back into packaging applications. This is a consequence of the large international markets for aluminium and steel scrap, and the relatively small contribution of scrap metal packaging to these scrap metal markets.

The major identified applications for end-of-life wood packaging were wood chip products, mulches and soil conditioners. It is also understood that some recovered wood packaging was used in the manufacture of particle board products and animal bedding products.

Packaging recovery through energy recovery

An increasing amount of post-consumer plastic packaging is being sent to energy recovery. This is estimated to have been 16 000 tonnes in 2018–19, compared with 2 000–4 000 tonnes in 2017–18.

Packaging recovery through composting

As stated above, the major identified applications for end-of-life wood packaging were wood chip products, mulches and soil conditioners. Wood chip products and mulches usually compost in-situ during use, and soil conditioners are a blend of well-composted and finely ground organic materials.

It was estimated by Blue Environment (2019) through a survey of composting facilities nationally that approximately 1 500 tonnes of compostable packaging, other than wood-based packaging, was composted in 2017–18. This included both fibre-based and compostable plastic-based packaging types. Based on limited follow-up consultation for the 2018–19 period it is likely that a similar amount of packaging was composted in 2018–19. Most of this was fibre-based packaging disposed of into organics collections.

3.4 Material use destination

Estimates of recovered post-consumer packaging material use in 2018–19, by local or overseas destination, are provided in **Table 37** and **Figure 32.**

The use of recovered paper & paperboard is almost evenly split between local manufacturers (46%) and export (54%). Recovered glass packaging is almost entirely used locally, with only 5% exported overseas during 2018–19. Recovered plastic packaging was largely exported in 2018–19, with 79% sent offshore. Aluminium beverage and tin-plate steel metal packaging was almost entirely exported, with local reprocessing mostly consisting of mild-steel drums from the B2B sector.

Table 37. Packaging recovery in 2018–19, by material group and location of material use

Material group	Local	Overseas	Total
	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	945 000	1 100 000	2 045 000
Glass	548 000	26 000	574 000
Plastic	39 000	143 000	182 000
Metal	21 000	116 000	137 000
Wood	44 000	0	44 000
Total (tonnes)	**1 597 000**	**1 385 000**	**2 982 000**
Total (%)	**53.5%**	**46.5%**	**100.0%**

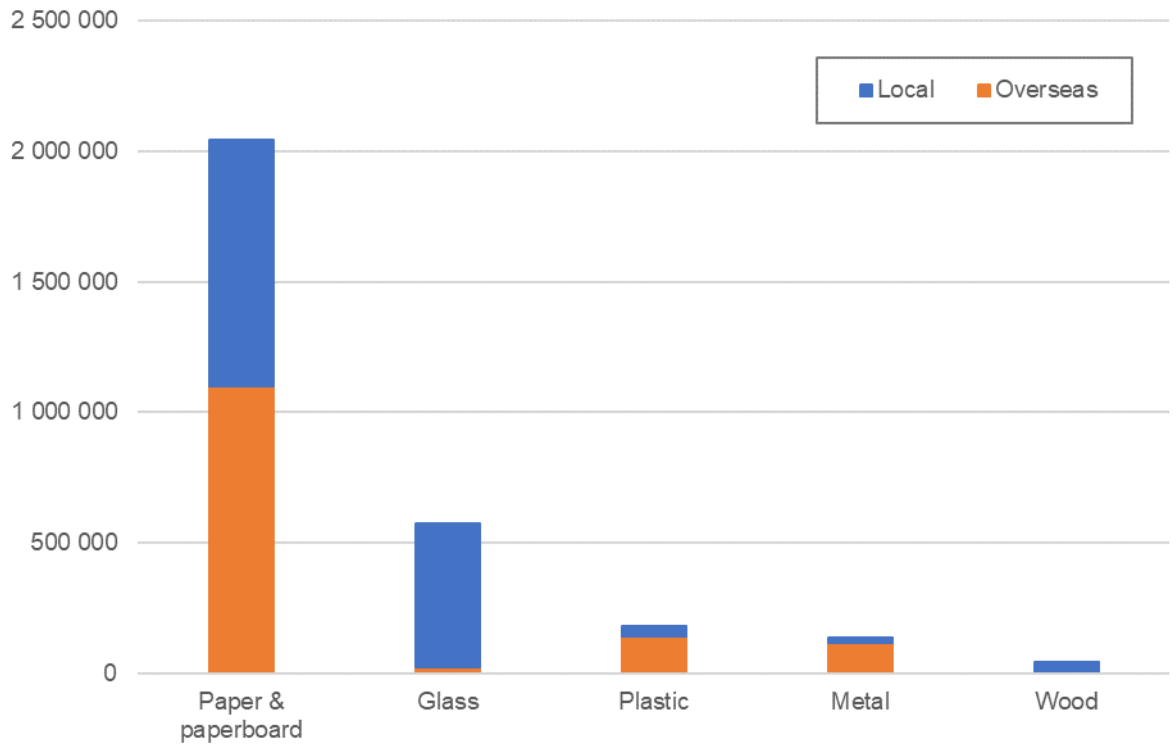


Figure 32. Packaging recovery in 2018–19, by material group and location of material use (tonnes)

3.5 Rigid/flexible plastic packaging

Estimates of plastic packaging post-consumer recovery by rigid/flexible format are provided in **Table 38** and **Figure 33.**

The definitions of rigid and flexible plastic packaging adopted for this study are:

- Rigid plastic packaging is packaging such as bottles and tubs, which are (generally) moulded and hold their shape.
- Flexible (soft) plastics is packaging that can be scrunched into a ball.

Of the 182 000 tonnes of plastic packaging recovered in 2018–19, around 163 000 tonnes (89%) were rigid and 19 000 tonnes (11%) were flexible. Recovery of flexible plastic packaging is dominated by LDPE film recovery from B2B applications.

The estimate for 2018–19 flexible plastic packaging recovery is a significant fall on the 29 000 tonnes reported for 2017–18. One of the main reasons for the notable fall appears to be the introduction of the Chinese import restrictions at the beginning of 2018, which had a particularly large impact on forms of scrap packaging with higher levels of contamination, such as post-consumer flexible plastic packaging.

Table 38. Plastic packaging recovery in 2018–19, by material type and rigid/flexible classification

Material type	Rigid	Flexible	Total
	(tonnes)	(tonnes)	(tonnes)
PET (1)	55 000	0	55 000
HDPE (2)	72 000	1 000	73 000
PVC (3)	1 000	0	1 000
LDPE (4)	4 000	18 000	22 000
PP (5)	20 000	<500	21 000
PS (6)	3 000	0	3 000
EPS (6)	4 000	0	4 000
Bioplastic (7)	0	0	0
Other (7)	0	0	0
Unidentified	3 000	0	3 000
Total (tonnes)	**163 000**	**19 000**	**182 000**
Total (%)	**89.3%**	**10.7%**	**100.0%**

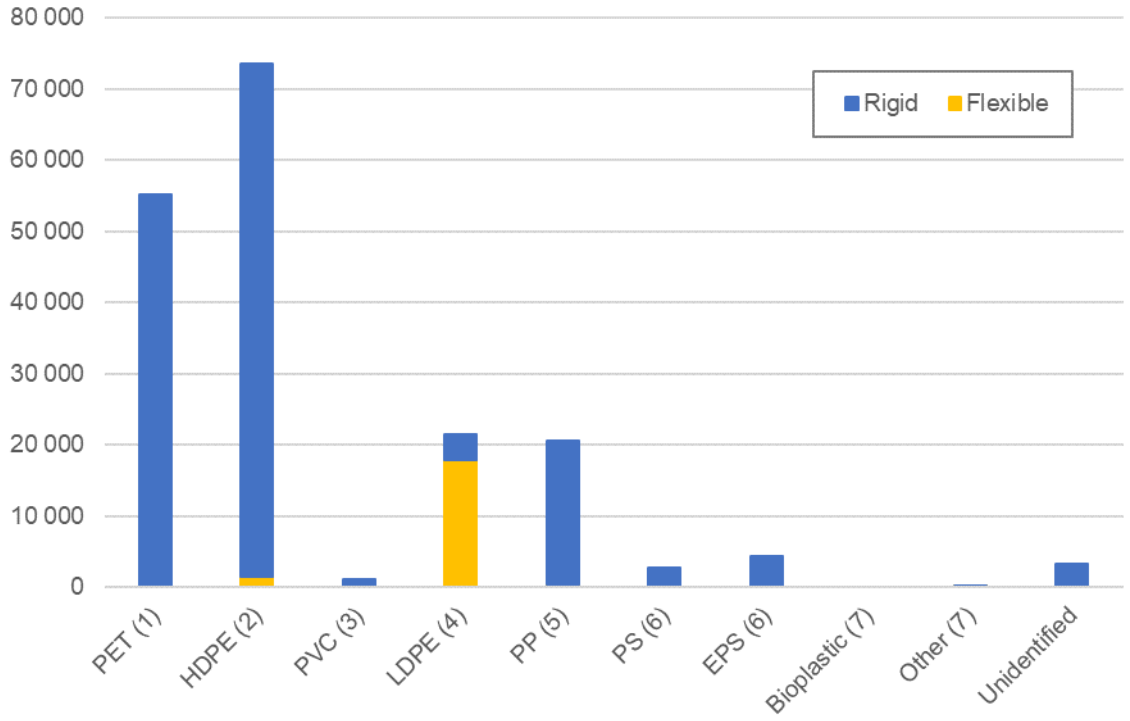


Figure 33. Plastic packaging recovery in 2018–19, by material type and rigid/flexible classification (tonnes)

3.6 ANZSIC division

Table 39 and **Figure 34** present post-consumer packaging recovery by material group and ANZSIC division.

Nearly 1.2 million tonnes (39%) of used packaging was recovered from the 'Other services' division, into which packaging recovered from households has been allocated. This was followed by 'Wholesale trade' at 0.6 million tonnes (19%), 'Retail trade' at 0.5 million tonnes (18%), 'Manufacturing' at 0.5 million tonnes (17%), and the 'Accommodation and food services' division at 0.2 million tonnes (6%).

Table 39. Packaging recovery in 2018–19, by material group and ANZSIC division

ANZSIC division	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
A – Agriculture, forestry and fishing	0	0	1 000	2 000	0	3 000	0.1%
B – Mining	0	0	0	0	0	0	0.0%
C – Manufacturing	462 000	0	18 000	10 000	13 000	502 000	16.8%
D – Electricity, gas, water and waste services	0	0	0	0	0	0	0.0%
E – Construction	0	0	0	0	4 000	5 000	0.2%
F – Wholesale trade	536 000	0	9 000	6 000	0	550 000	18.5%
G – Retail trade	532 000	0	12 000	0	0	544 000	18.2%
H – Accommodation and food services	38 000	145 000	0	0	0	183 000	6.1%
I – Transport, postal and warehousing	0	0	0	0	16 000	16 000	0.5%
J – Information media and telecommunications	0	0	0	0	0	0	0.0%
K – Financial and insurance services	0	0	0	0	0	0	0.0%
L – Rental, hiring and real estate services	0	0	0	0	0	0	0.0%
M – Professional, scientific and technical services	0	0	0	0	0	0	0.0%
N – Administrative and support services	0	0	0	0	0	0	0.0%
O – Public administration and safety (private)	0	0	0	0	0	0	0.0%
P – Education and training (private)	0	0	0	0	0	0	0.0%
Q – Health care and social assistance (private)	0	0	0	0	0	0	0.0%
R – Arts and recreation services	0	0	0	0	0	0	0.0%
S – Other services	477 000	429 000	141 000	120 000	0	1 166 000	39.1%
X – Unknown	0	0	0	0	11 000	11 000	0.4%
Total	**2 045 000**	**574 000**	**182 000**	**137 000**	**44 000**	**2 982 000**	**100.0%**

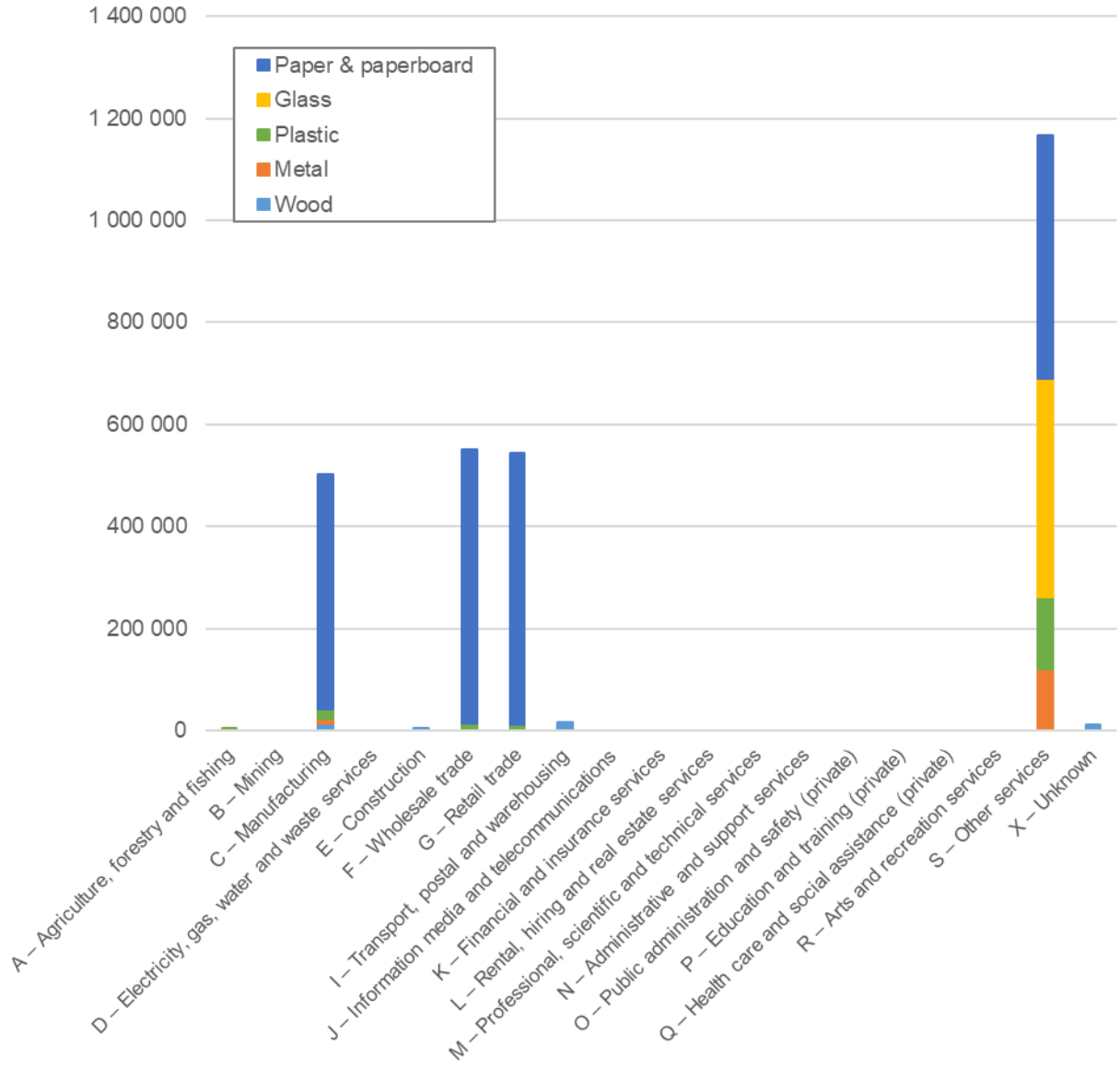


Figure 34. Packaging recovery in 2018–19, by material group and ANZSIC division (tonnes)

3.7 Recovery rates by material group

Estimates for post-consumer packaging recovery rates by material group are provided in **Table 40** and **Figure 35.**

The post-consumer packaging recovery rate in 2018–19 is estimated to be 50%. This is based on the packaging POM by material group, and recovery as measured at the out-going gate of the secondary processing facility for the used packaging.

Paper & paperboard had the highest recovery rate at 63%, followed by metal packaging (56%), glass packaging (45%), wood packaging (36%), and plastic packaging (18%).

It is worth noting that the 2018–19 recovery rate is unchanged at 50% if the new material scope inclusions for 2018–19 (plastic and steel containers of >20 L, and wood-based packaging) are excluded from the recovery rate calculation.

Table 40. Post-consumer packaging recovery rates in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	3 262 000	2 045 000	63%
Glass	1 283 000	574 000	45%
Plastic	1 000 000	182 000	18%
Metal	246 000	137 000	56%
Wood	124 000	44 000	36%
Total	**5 916 000**	**2 982 000**	**50%**

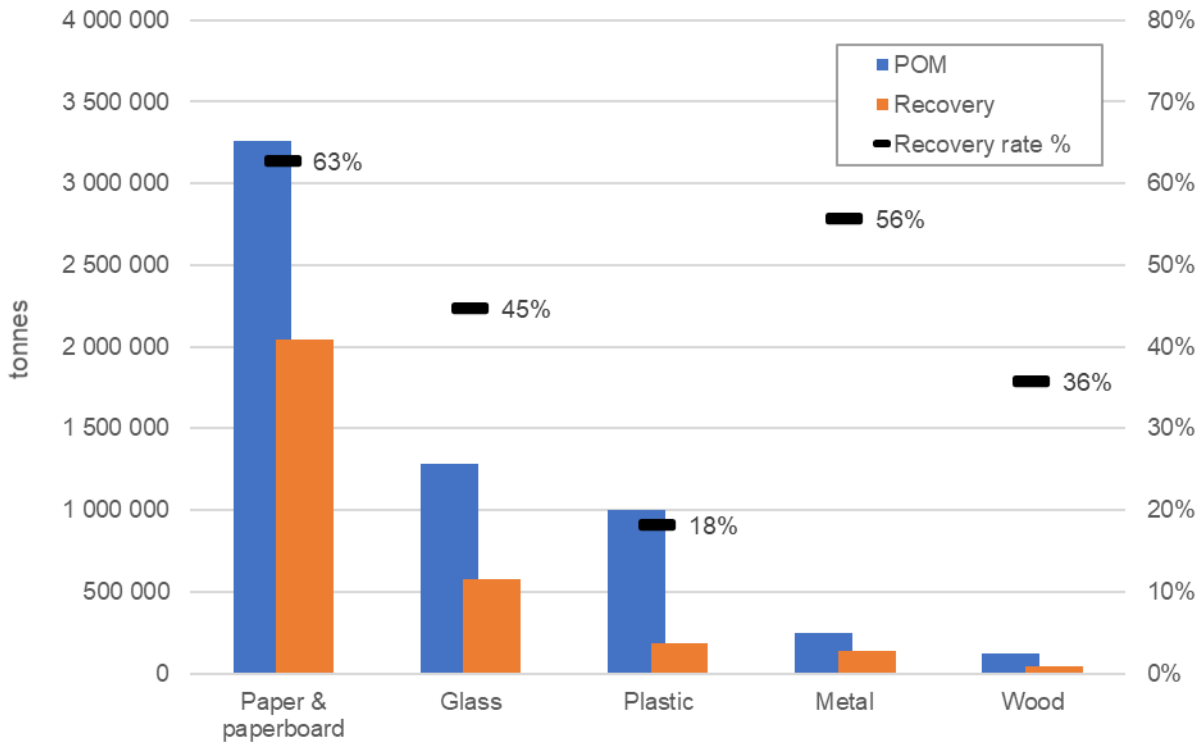


Figure 35. Post-consumer packaging recovery rates in 2018–19, by material group

Table 41 and **Figure 36** compare recovery rates by material group for 2017–18 and 2018–19.

There was a marked increase in the metal packaging recovery rate, underpinned by increasing aluminium beverage recovery due to expansion of container deposit schemes in NSW and Queensland in 2018–19. The glass recovery rate was steady. While CDS glass recovery increased in NSW and Queensland, there was significant stockpiling of glass in Victoria by one operator, which was mostly sent to landfill when that operator folded in 2019–20.

Table 41. Comparison of post-consumer packaging recovery rates in 2017–18 and 2018–19, by material group

Material group	2017–18 recovery rate	2018–19 recovery rate
	(%)	(%)
Paper & paperboard	63%	63%
Glass	46%	45%
Plastic	16%	18%
Metal	48%	56%
Wood	NR	36%
Total	**49%**	**50%**

NR – Not reported.

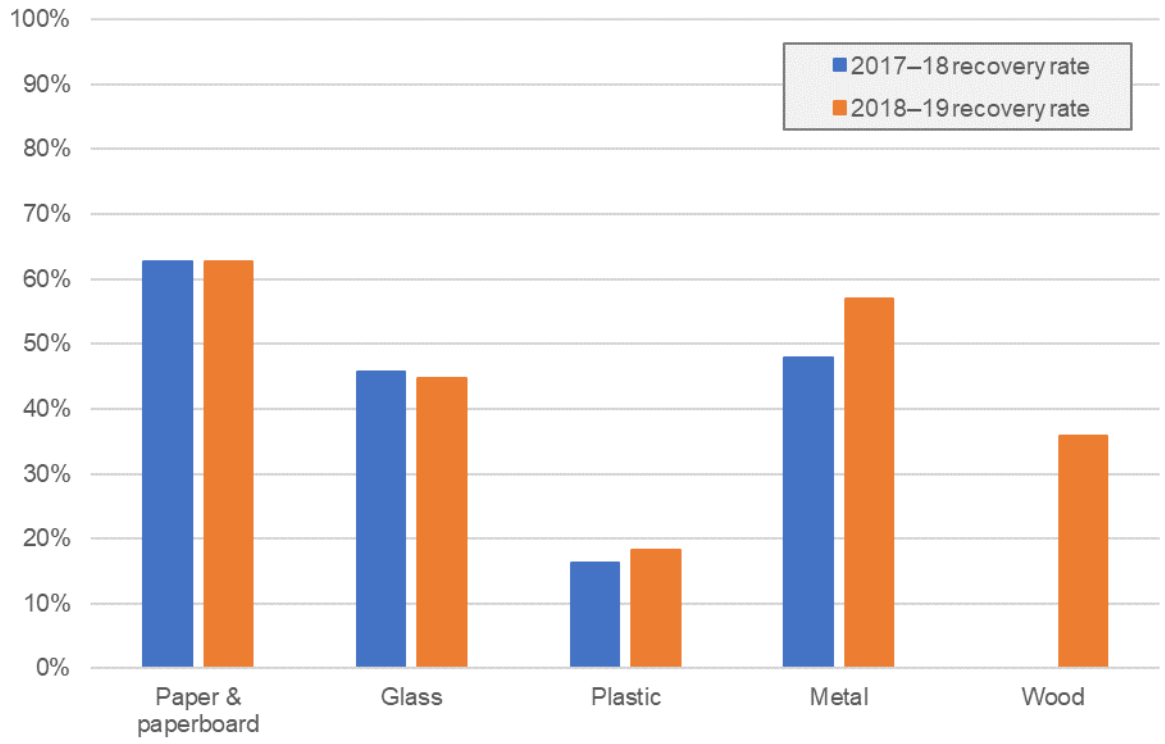


Figure 36. Comparison of post-consumer packaging recovery rates in 2017–18 and 2018–19, by material group

3.8 Recovery rates by material type

Paper & paperboard packaging

Estimates for post-consumer paper & paperboard packaging recovery rates in 2018–19, by material type, are provided in **Table 42** and **Figure 37.**

The relatively high post-consumer paper & paperboard packaging recovery rate of 63% is underpinned by the recovery of corrugated cardboard (73% recovery rate), of which two thirds is B2B material collected through C&I collections.

Table 42. Post-consumer paper & paperboard packaging recovery rates in 2018–19, by material type

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Boxboard/Cartonboard	288 000	131 000	45%
Corrugated cardboard	2 544 000	1 849 000	73%
Polymer coated paperboard	71 000	5 000	7%
Other fibre packaging	360 000	60 000	17%
Total	**3 262 000**	**2 045 000**	**63%**

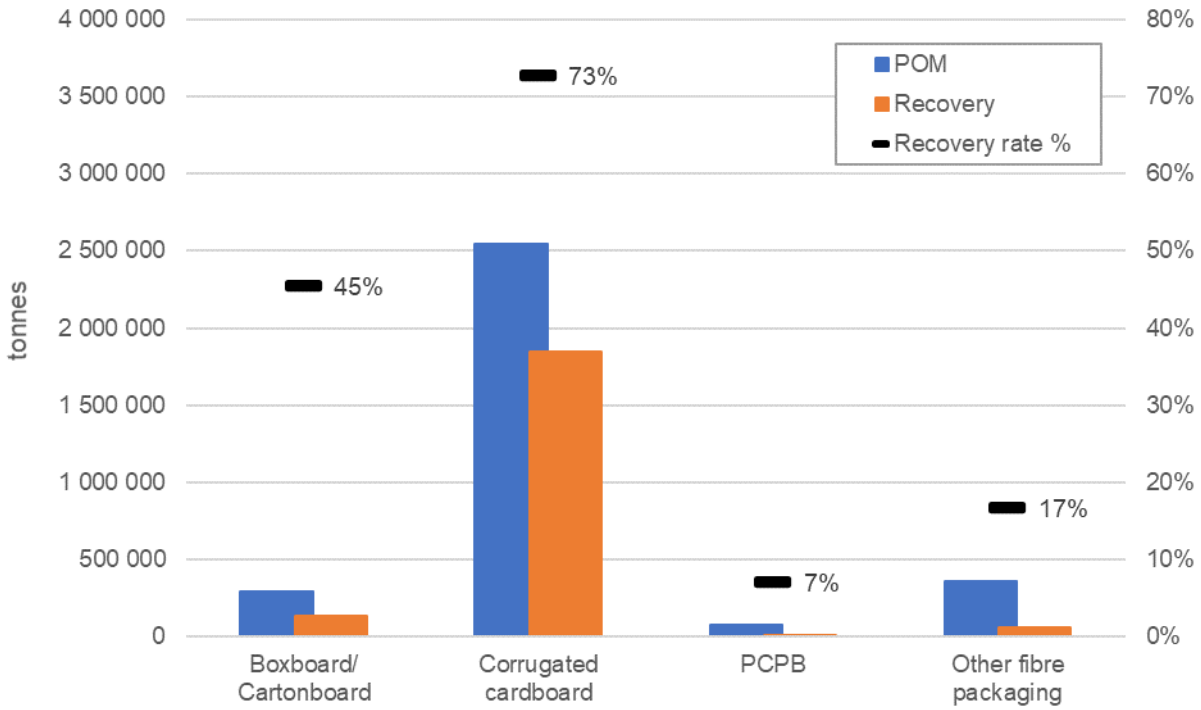


Figure 37. Post-consumer paper & paperboard packaging recovery rates in 2018–19, by material type

Glass packaging

Estimates for post-consumer glass packaging recovery rates in 2018–19, by material type, are provided in **Table 43** and **Figure 38**. The average recovery rate for glass is 45%.

Recovery rates are similar for all glass colours. Rates for amber and green glass are slightly higher, possibly due to good coverage of amber glass under container deposit schemes nationally, and green being more sought after for wine bottle production to, in part, service the significant wine export market.

Approximately a third of recovered glass is processed into sand and aggregate substitutes for use in the construction sector.

Table 43. Post-consumer glass packaging recovery rates in 2018–19, by material type

Material group	POM (tonnes)	Recovery (tonnes)	Recovery rate (%)
Amber glass	381 000	174 000	46%
Flint glass	643 000	283 000	44%
Green glass	258 000	117 000	45%
Total	**1 283 000**	**574 000**	**45%**

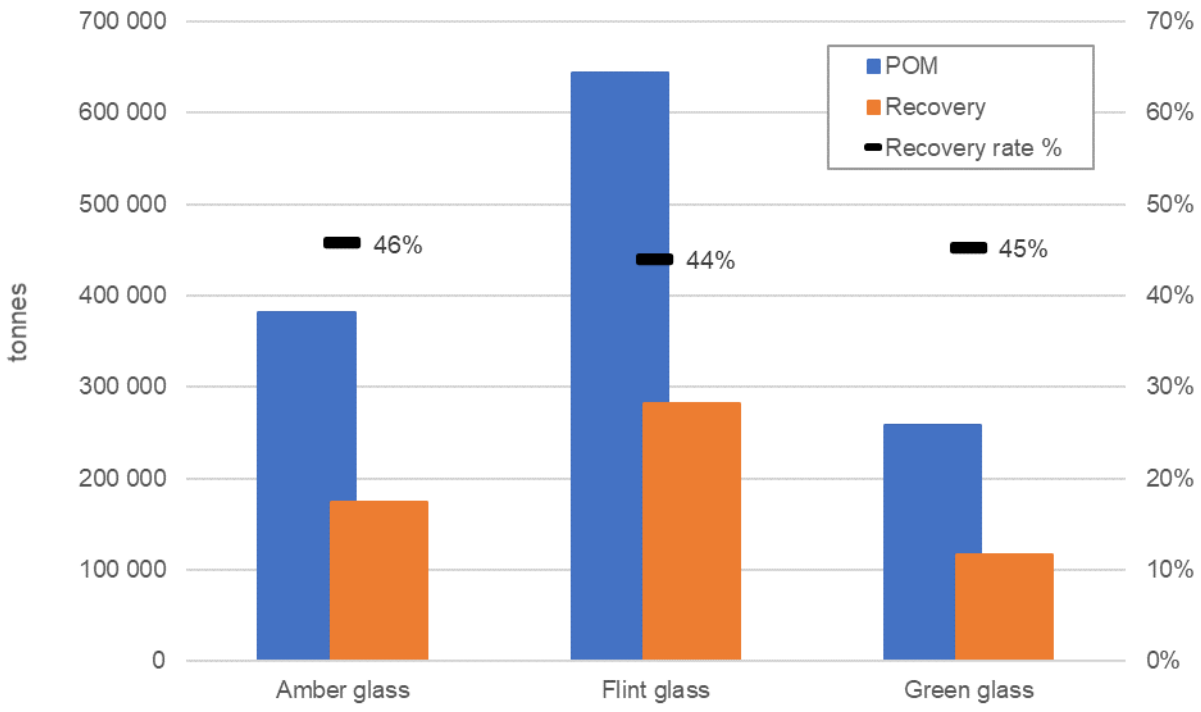


Figure 38. Post-consumer glass packaging recovery rates in 2018–19, by material type

Plastic packaging

Estimates for post-consumer plastic packaging recovery rates in 2018–19, by material type, are provided in **Table 44** and **Figure 39.** The packaging material group recovery rate is estimated at 18%.

The post-consumer PET packaging recovery rate is the highest by a large margin, reflecting the concentration of use in beverage packaging that has high levels of recovery both through kerbside and CDS collection systems. However, significant quantities of PET are also used in flexible packaging formats and non-beverage rigid packaging, both of which have significantly lower recovery rates than rigid PET beverage bottles.

The HDPE packaging recovery rate is underpinned by the kerbside collection of milk bottles. However, its diverse range of packaging formats, including flexible formats, results in a relatively low recovery rate.

Table 44. Post-consumer plastic packaging recovery rates in 2018–19, by material type

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
PET (1)	154 000	55 000	36%
HDPE (2)	316 000	73 000	23%
PVC (3)	15 000	1 000	7%
LDPE (4)	233 000	22 000	9%
PP (5)	155 000	21 000	13%
PS (6)	11 000	3 000	24%
EPS (6)	16 000	4 000	26%
Bioplastic (7)	6 000	0	0%
Other (7)	16 000	0	0%
Unidentified	78 000	3 000	4%
Total	**1 000 000**	**182 000**	**18%**

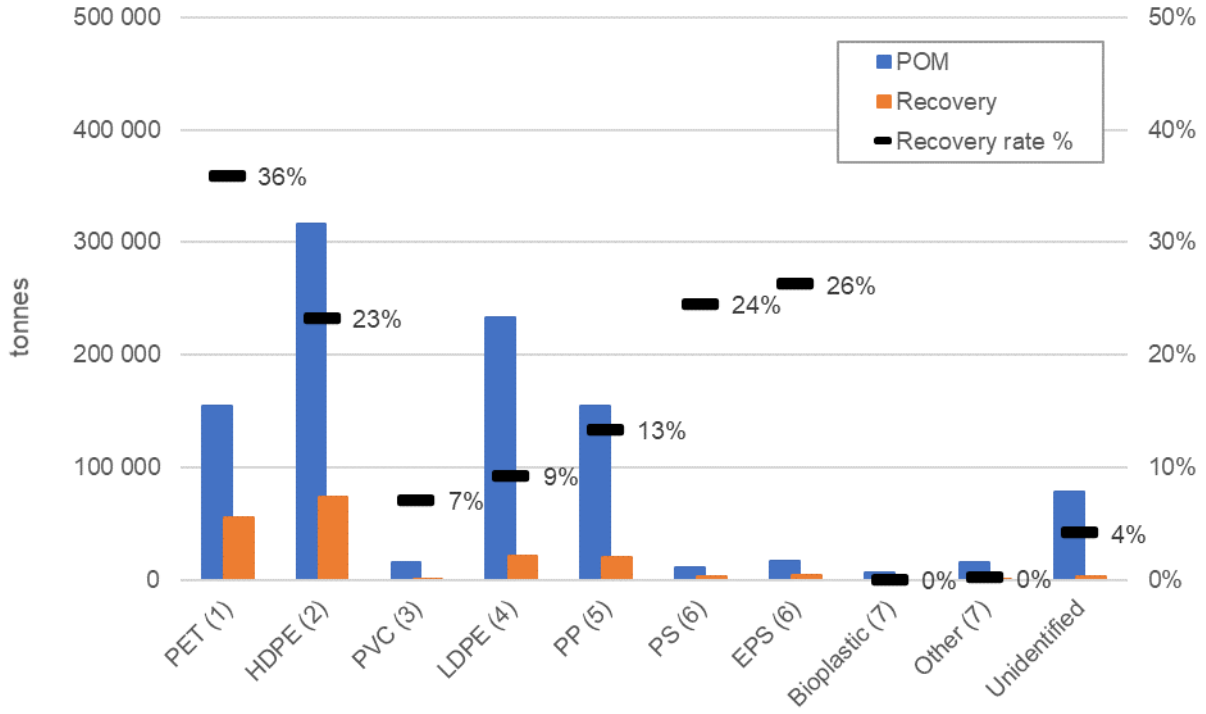


Figure 39. Post-consumer plastic packaging recovery rates in 2018–19, by material type

Table 45 provides more detailed data on the recovery of plastic packaging at the rigid/ flexible classification level.

An estimated 42% (55 000 tonnes) of rigid PET packaging was recovered in 2018–19, followed most significantly by rigid HDPE packaging at 25% (72 000 tonnes). The overall rigid plastic packaging recovery rate is estimated at 26%.

The flexible plastic packaging recycling rate is estimated at only 5% across both the consumer and B2B sectors. Flexible plastic packaging recovery was dominated by LDPE recovery from the B2B sector (e.g. pallet wrap).

Table 45. Post-consumer plastic packaging recovery rates in 2018–19, by material type and rigid/flexible classification (tonnes)

Material group	Rigid plastics			Flexible plastics		
	POM	Recovery	Recovery rate	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)			
PET (1)	133 000	55 000	42%	22 000	0	0%
HDPE (2)	286 000	72 000	25%	30 000	1 000	4%
PVC (3)	NR	NR	31%	NR	NR	0%
LDPE (4)	10 000	4 000	36%	222 000	18 000	8%
PP (5)	116 000	20 000	17%	39 000	0	1%
PS (6)	11 000	3 000	24%	0	0	0%
EPS (6)	16 000	4 000	26%	0	0	0%
Bioplastic (7)	5 000	0	0%	1 000	0	0%
Other (7)	NR	NR	1%	NR	NR	0%
Unidentified	50 000	3 000	6%	28 000	0	0%
Total	**635 000**	**163 000**	**26%**	**366 000**	**19 000**	**5%**

NR – Not reported due to confidentiality considerations.

Metal packaging

Estimates for post-consumer metal packaging recovery rates in 2018–19, by material type, are provided in **Table 46** and **Figure 40**. The packaging material group recovery rate is 56%.

Larger (mild) steel drums have the highest reported recovery rate, reflecting the reasonably concentrated generation of this form of packaging at manufacturing and other commercial and industrial facilities nationally, along with well-developed B2B collection systems for steel, and the relatively high value of each drum.

The post-consumer aluminium beverage can recovery rate is the highest by a large margin, reflecting its high material value, and the concentration of use in beverage packaging that has high levels of recovery both through kerbside and CDS collection systems. The tin-plate steel can recovery rate is relatively low, even though this material is highly recyclable and easily separated from kerbside commingled recyclables.

Table 46. Post-consumer metal packaging recovery rates in 2018–19, by material type

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Beverage aluminium	86 000	65 000	75%
Non-beverage aluminium	14 000	3 000	19%
Tin-plate steel	127 000	52 000	41%
Mild steel	19 000	17 000	90%
Total	**246 000**	**137 000**	**56%**

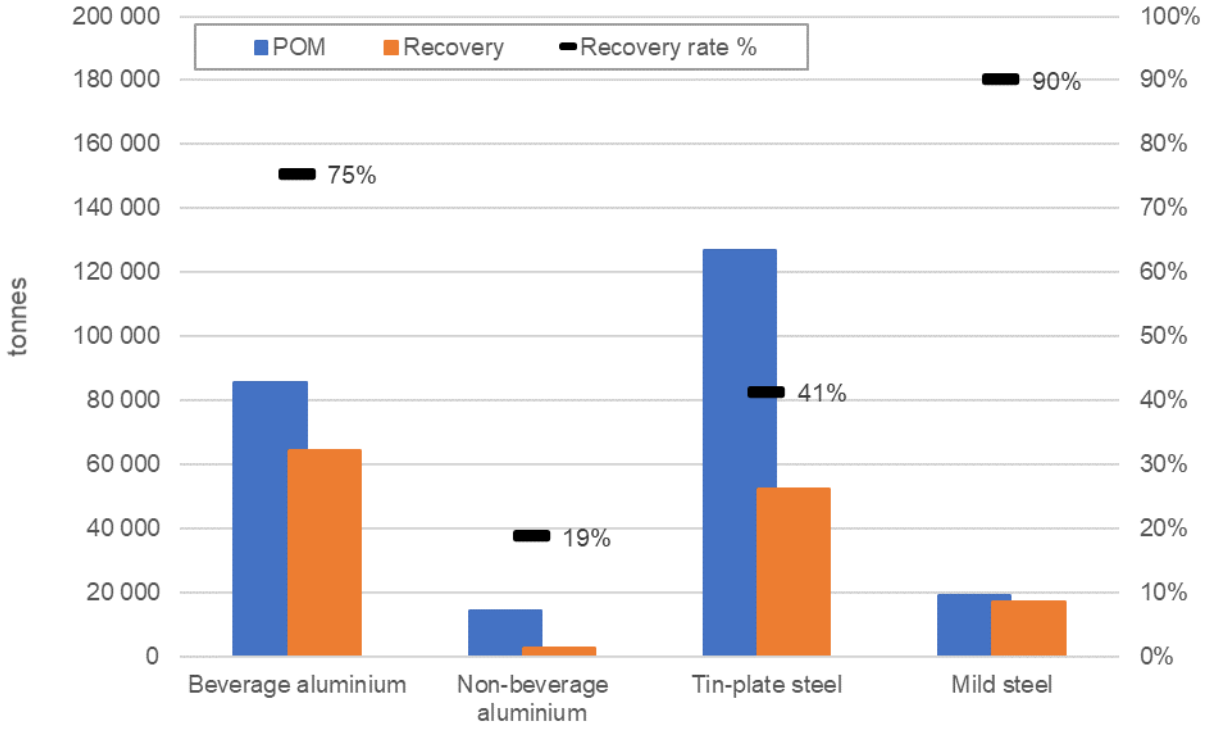


Figure 40. Post-consumer metal packaging recovery rates in 2018–19, by material type

Wood packaging

Estimates for post-consumer single-use wood packaging recovery rates in 2018–19, by material type, are provided in **Table 47** and **Figure 41.** The packaging material group recovery rate is 36%. This excludes reusable wood packaging systems, such as reusable wood pallets (see **Section 6** for details on reusable wood pallet flows).

The major identified end-markets for end-of-life wood packaging were wood chip products, mulches and soil conditioners. It is also understood that some recovered wood packaging was used in the manufacture of particle board products and animal bedding products.

Table 47. Post-consumer wood packaging recovery rates in 2018–19, by material type

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Hardwood	6 000	2 000	36%
Softwood	118 000	42 000	36%
Total	**124 000**	**44 000**	**36%**

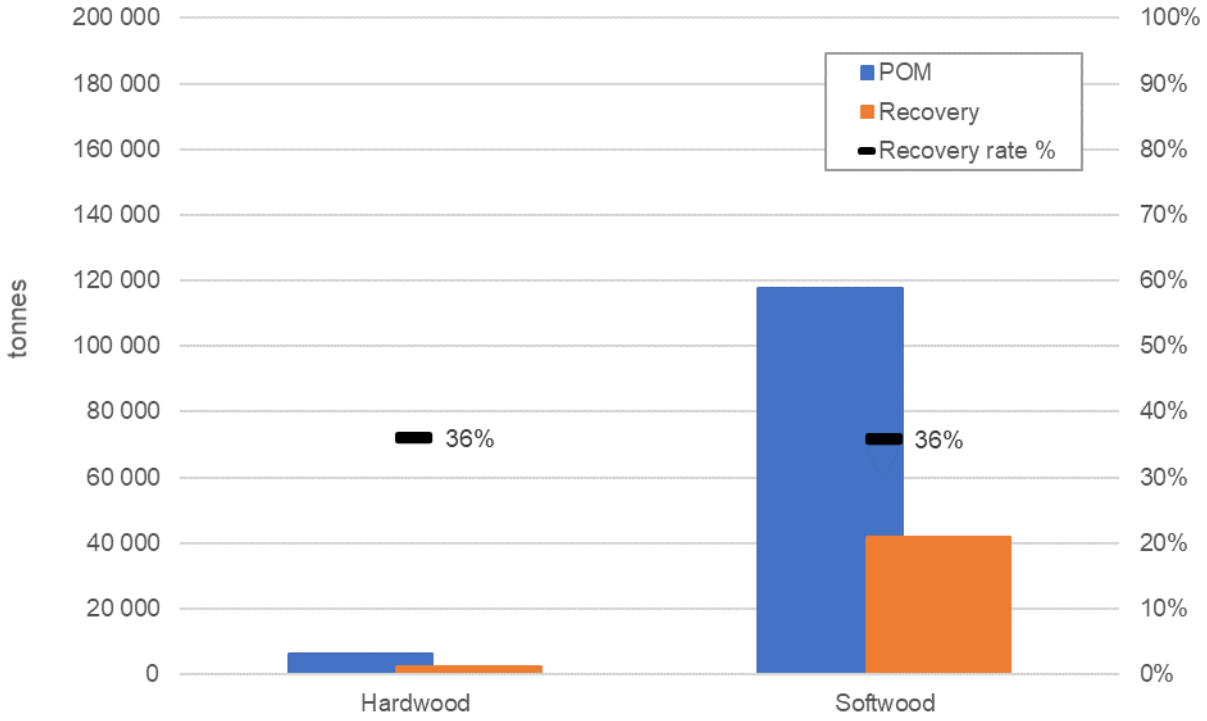


Figure 41. Post-consumer wood packaging recovery rates in 2018–19, by material type

3.9 Recovery rates by ANZSIC division

Estimates for post-consumer packaging recovery rates by ANZSIC division are provided in **Table 48** and **Figure 42.** This year was the first year for which this data was collected, and it should be considered as indicative only. This 'indicative' qualification is mainly due to the challenges for packaging manufacturers and reprocessors accurately estimating the destination or source divisions (respectively) of packaging and doing so with a consistent interpretation of the coverage of each division.

'Manufacturing', 'Wholesale trade' and 'Retail trade' divisions all had relatively high recovery rates, underpinned by high recovery levels of segregated corrugated cardboard collections out of these sectors. 'Other services', which includes municipal collections, had a recovery rate just below the overall national post-consumer packaging of 50%.

Table 48. Post-consumer packaging recovery rates in 2018–19, by ANZSIC division

ANZSIC division	POM (tonnes)	Recovery (tonnes)	Recovery rate (%)
A – Agriculture, forestry and fishing	85 000	3 000	4%
B – Mining	0	0	0%
C – Manufacturing	429 000	367 000	85%
D – Electricity, gas, water and waste services	0	0	0%
E – Construction	21 000	5 000	23%
F – Wholesale trade	1 026 000	601 000	59%
G – Retail trade	790 000	597 000	76%
H – Accommodation and food services	914 000	183 000	20%
I – Transport, postal and warehousing	72 000	16 000	22%
J – Information media and telecommunications	0	0	0%
K – Financial and insurance services	0	0	0%
L – Rental, hiring and real estate services	0	0	0%
M – Professional, scientific and technical services	0	0	0%
N – Administrative and support services	0	0	0%
O – Public administration and safety (private)	0	0	0%
P – Education and training (private)	0	0	0%
Q – Health care and social assistance (private)	5 000	0	4%
R – Arts and recreation services	0	0	0%
S – Other services	2 558 000	1 198 000	47%
X – Unknown	0	0	0%
Total	**5 916 000**	**2 982 000**	**50%**

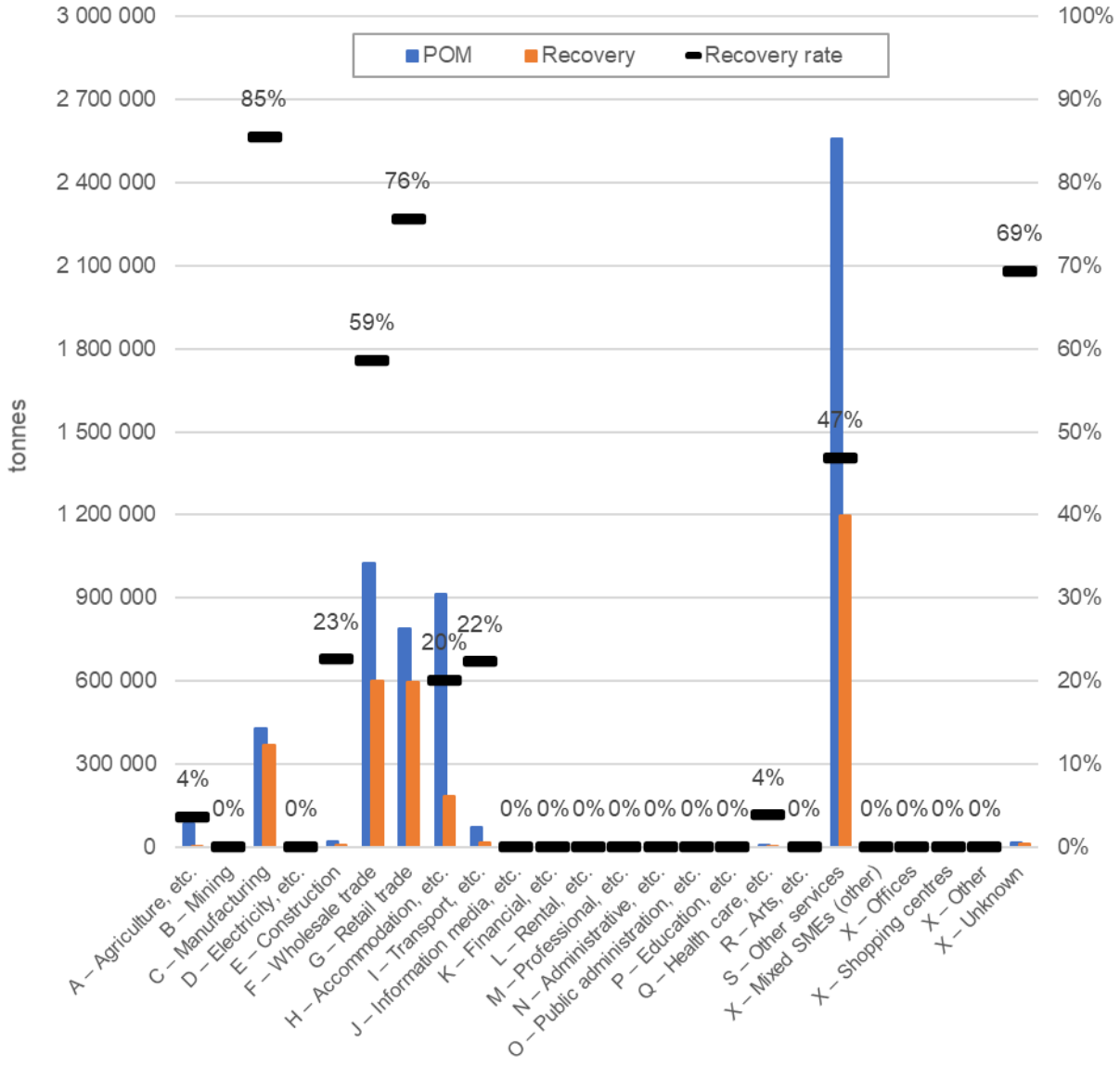


Figure 42. Post-consumer packaging recovery rates in 2018–19, by ANZSIC division

3.10 Packaging recyclability

In this section of the report, packaging placed on market (POM) in 2018–19 is classified according to recyclability. The detailed method for determining recyclability is outlined in **Section 1.2**. Throughout the report the term 'packaging recyclability' is used as an umbrella term for recyclable or compostable packaging.

Packaging recyclability by material group is provided in **Table 49** and **Figure 43**.

It is estimated that 5.3 million tonnes (89%) of packaging POM in 2018–19 had good recyclability. This was dominated by paper & paperboard (of which 91% had good recyclability) and glass (of which 100% had good recyclability). Almost all (99%) of metal packaging was classified as having good recyclability, but only 66% of plastic packaging was classified as having good recyclability.

Around 0.5 million tonnes (9%) of packaging was classified as having poor recyclability or not being recyclable. Around half of this was plastic packaging, and the other half was mostly paper & paperboard packaging.

The 'unknown' classification includes packaging for which the packaging material or format are unknown, which makes it difficult to determine recyclability.

Table 49. Recyclable packaging in 2018–19, by recyclability classification

Material group	Good recyclability	Poor recyclability	Not recyclable	Unknown	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	2 962 000	232 000	42 000	27 000	**3 262 000**
Glass	1 283 000	0	0	0	**1 283 000**
Plastic	663 000	196 000	55 000	87 000	**1 000 000**
Metal	243 000	3 000	0	0	**246 000**
Wood	121 000	0	1 000	2 000	**124 000**
Total (tonnes)	**5 273 000**	**431 000**	**97 000**	**116 000**	**5 916 000**
Total (%)	**89%**	**7%**	**2%**	**2%**	**100.0%**

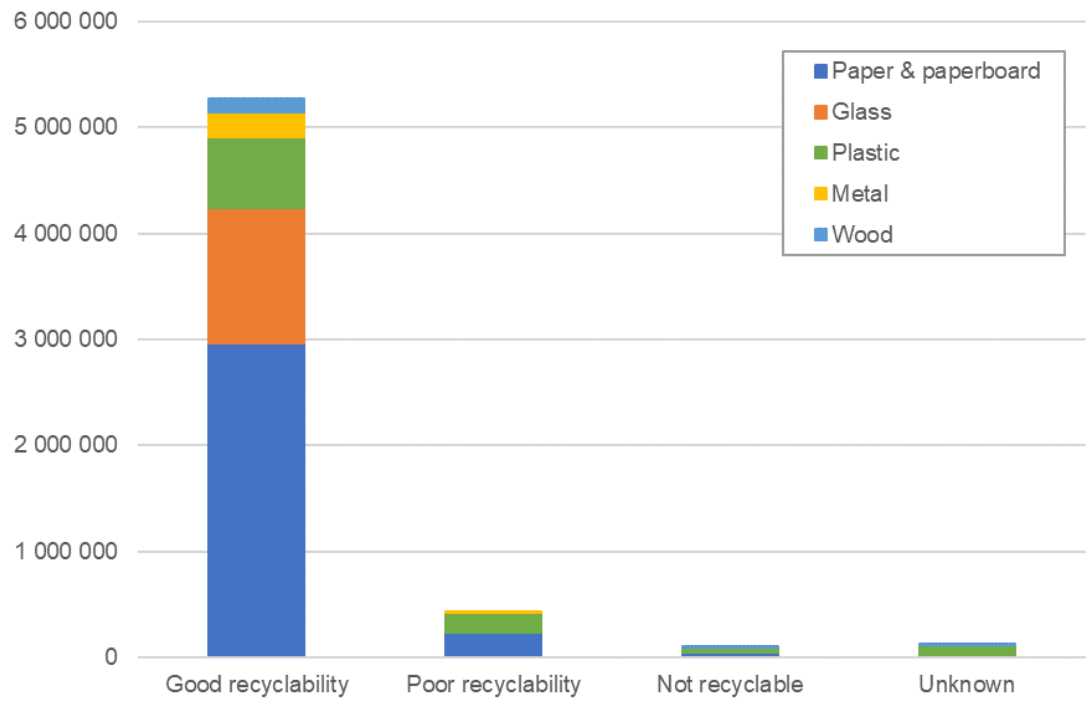


Figure 43. Recyclable packaging POM in 2018–19 (tonnes)

Table 50 and **Figure 44** compare the 2017–18 and 2018–19 quantities of packaging with a 'Good recyclability' classification.

Table 50. Packaging with a 'Good recyclability' classification in 2017–18 and 2018–19, by material group

Material group	2017–18		2018–19	
	(tonnes)	(%)	(tonnes)	(%)
Paper & paperboard	2 682 000	92%	2 962 000	91%
Glass	1 273 000	100%	1 283 000	100%
Plastic	627 000	59%	663 000	66%
Metal	201 000	95%	243 000	99%
Wood	NR	NR	121 000	98%
Total	**4 783 000**	**88%**	**5 273 000**	**89%**

NR – Not reported.

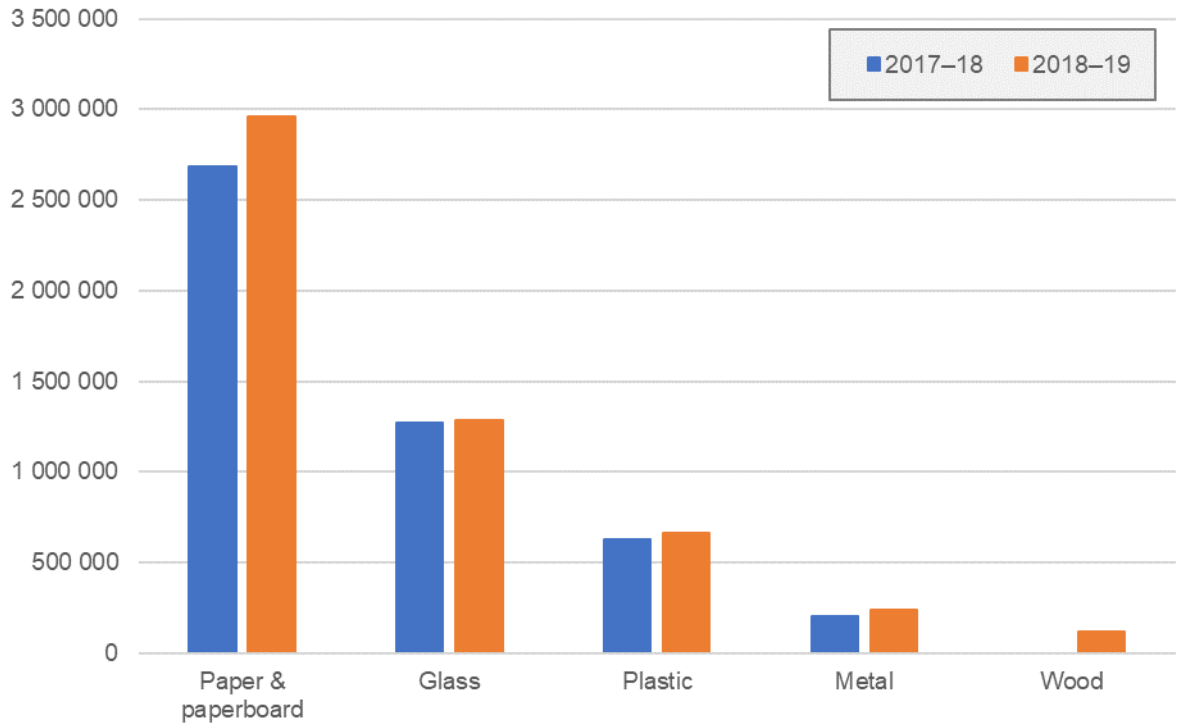


Figure 44. Packaging with a 'Good recyclability' classification in 2017–18 and 2018–19, by material group (tonnes)

There is evidence that improvements in packaging design and materials selection are having an impact on the proportions of plastics packaging receiving a good recyclability classification. This is consistent with the reported reductions in the quantities of EPS and PVC based packaging and increased quantity of PET POM in 2018-19.

4 PACKAGING LOSSES AND IMPACTS IN 2018–19

4.1 Packaging losses to landfill

Estimates of post-consumer packaging to landfill by material group are provided in **Table 51** and **Figure 45**. In total there were 2.9 million tonnes of post-consumer packaging disposed to landfill, which was 50% of the packaging POM.

This packaging to landfill consisted of 1.2 million tonnes (42%) paper & paperboard based packaging, 0.8 million tonnes of plastic packaging (28%), 0.7 million tonnes of glass packaging (24%), 0.1 million tonnes of metal packaging (4%) and a little under 0.1 million tonnes of wood-based single-use packaging (3%).

Table 51. Post-consumer packaging to landfill in 2018–19, by material group

Material group	POM	Landfill		Landfill rate
	(tonnes)	(tonnes)	(%)	(%)
Paper & paperboard	3 262 000	1 218 000	42%	37%
Glass	1 283 000	709 000	24%	55%
Plastic	1 000 000	818 000	28%	82%
Metal	246 000	109 000	4%	44%
Wood	124 000	80 000	3%	64%
Total	**5 916 000**	**2 934 000**	**100%**	**50%**

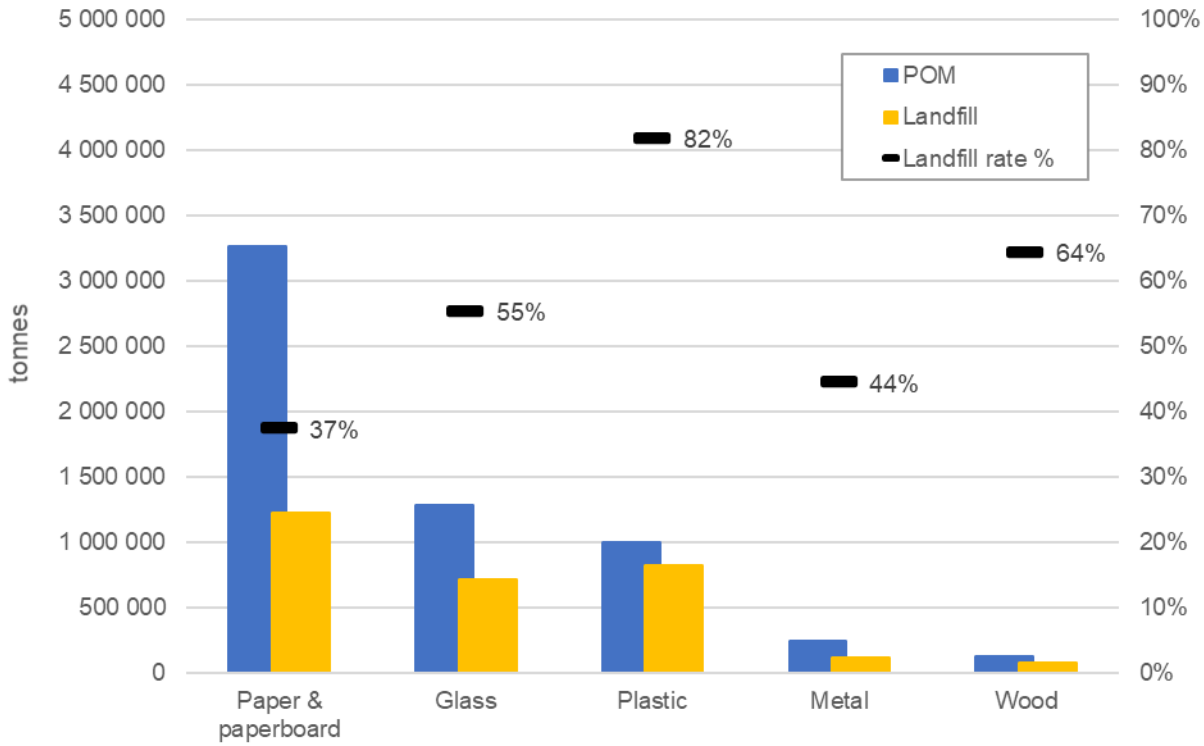


Figure 45. Post-consumer packaging to landfill in 2018–19, by material group (tonnes)

4.2 Lost value of landfilled packaging

This section provides indicative estimates of the value (AUD) of packaging material sent to landfill in 2018–19. These are theoretical estimates that are based on the following attributes and assumptions:

- Commodity values have been estimated at 30 June 2019.
- Value was based on packaging being sorted into the most common saleable commodity grade for the packaging material type but was otherwise unprocessed.
- Packaging materials that are not currently sorted into discrete commodity grades have still been allocated an existing commodity price that is considered the best proxy price for the theoretical sorted value. This was usually a low price.

  As packaging design, sorting/processing technologies and end-markets improve, the quantities of unsortable (whether that be for technical or economic reasons) and/or unsaleable sorted packaging should decrease, and the average value of used packaging should also increase. For this reason, allocating all packaging a value, even if low, better reflects the theoretical value of used packaging diverted from landfill at some future time.
- Packaging commodity values are typically estimated at a municipal or C&I MRF out-going gate value. The main exception to this is glass packaging, which is assigned commodity values assuming that half was recovered through MRFs and half via source segregated collections.
- Packaging to composting is allocated a value of $0 /tonne.
- Transport costs are excluded. Note that transport costs are typically somewhat higher for packaging materials that are sent to recovery, relative to packaging to landfill.
- MRF processing costs, additional post-MRF sorting processing, or the costs associated with operating source separation-based systems (e.g. dedicated CDS collections) are excluded.
- Avoided landfill gate fees are excluded. It is worth noting that landfill gate fees and MRF processing costs (dot point above) can vary widely but are of a similar magnitude. A November 2019 Sustainability Victoria report estimated a typical Victorian landfill cost of $130 /tonne (SV, 2019b, p. 7), and MRF sorting costs in the range of $100–$150 /tonne of material sorted (SV, 2019b, p. 15).
- It is an implicit assumption with the use of fixed commodity prices by material type that end-market demand for the sorted packaging is not restricted.

Table 52 presents the indicative estimates of the lost value (AUD) of packaging landfilled in 2018–19. The national sorted value is estimated at $520 million, at a weighted average value of $176 /tonne.

Table 52. Quantity and lost value of landfilled packaging in 2018–19, by material group

Material group	Landfill	Value of landfilled packaging	
	(tonnes)	(AUD/tonne)	(AUD million)
Paper & paperboard	1 218 000	$153	$190
Glass	709 000	$45	$30
Plastic	818 000	$305	$250
Metal	109 000	$434	$50
Wood	80 000	$0	$0
Total	**2 934 000**	**$176**	**$520**

4.3 Climate change impact of packaging to landfill

This section estimates the climate change impact (in terms of tonnes $CO_{2\text{-}e}$ emissions) of packaging disposal to landfill. This is used to determine the reduction in greenhouse gas (GHG) emissions that could be achieved nationally if packaging that is currently landfilled was recycled.

An extensive body of life cycle assessment (LCA) literature going back to the 1970s has established that reusing packaging or recycling single-use packaging almost invariably reduces greenhouse gas emissions when compared to landfilling single-use packaging. This is due to the following:

- Reusable packaging typically requires far lower manufacturing related energy inputs per cycle, compared with single-use packaging that is either recycled or disposed to landfill.
- Recycled single-use packaging very often requires less manufacturing energy inputs, compared with single-use packaging that is disposed to landfill.
- Methane emissions from landfills from the decomposition of biodegradable packaging materials (e.g. paper & paperboard).

Reviews of recent LCA studies and other literature sources were undertaken to identify the required emission factors. The two main sources drawn on for the emission factors used in this report were:

- LCA of Kerbside Recycling in Victoria (RMIT, 2015, p. 7).
- South Australia's Recycling Activity Survey 2017–18 Report (Green Industries SA, 2019, p. 108).

Table 53 presents the indicative estimates of the reduction in greenhouse gas emissions if all landfilled packaging had been recycled in 2018–19.

The national reduction that could have been achieved is estimated at nearly 2 million tonnes of CO_2 emissions, at a weighted average of 0.7 tonnes CO_2 /tonne of packaging diverted from landfill to recycling. This would be equivalent to removing 470 000 cars from the road.

Table 53. Indicative GHG emissions that could be reduced through diverting landfilled packaging in 2018–19 to recycling, by material group

Material group	Landfill	Emission factor	Avoided emissions
	(tonnes)	(t CO2-e /t)	(t CO2-e)
Paper & paperboard	1 218 000	0.169	205 790
Glass	709 000	0.528	374 470
Plastic	818 000	0.704	576 380
Metal	109 000	6.281	686 300
Wood	80 000	1.350	107 560
Total	**2 934 000**	**0.665**	**1 950 490**

5 PACKAGING REUSE IN 2018–19

5.1 Introduction

This year, for the first time, flows of five reusable packaging systems have been quantified. This is a pilot exercise to begin incorporating reusable packaging flows into the core consumption and recovery dataset, along with appropriate metrics to measure use of reusable packaging systems.

This quantification has been framed by the following ISO standard:

- **ISO 18603:2013 Packaging and the environment – Reuse (ISO, 2013c).**

In ISO (2013c, p. 1) reusable packaging is defined as:

> *Packaging or packaging component which has been designed to accomplish or proves its ability to accomplish a minimum number of trips or rotations in a system for reuse.*

ISO (2013c, p. 3) requires that the following conditions are met in order for a claim of 'reusable' to be appropriate:

a) *that the design of the packaging enables the principal components to accomplish a number of trips or rotations in normally predictable conditions of use;*

b) *that the packaging is capable of being successfully reconditioned in accordance with the requirements of Annex B (including removal/replacement of damaged components, appropriate cleaning or washing, inspection and inspection of fitness-for-purpose, and re-entry into the reuse system);*

c) *that a system, necessary to support reuse, is available in markets in which the packaging is placed, as appropriate.*

The established Australian reusable packaging systems that fit the criteria above (with some minor exceptions) and have been selected for this pilot quantification are:

- **Kegs** – Beer kegs only.
- **Pallets** – Reusable timber and plastic pallets only, including display pallets; single use pallets are excluded.
- **Milk crates** – Non-collapsible plastic crates. Limited to dairy product applications only.
- **Returnable plastic crates (RPCs)** – Collapsible plastic crates. Limited to major supermarket systems only (i.e. ALDI, Coles and Woolworths).
- **Reusable shopping bags** – Reusable non-woven PP (NWPP) bags, and reusable LDPE bags (supermarket type).

It is noted that beer kegs, RPCs and reusable shopping bags have well-established single-use packaging alternatives. Pallets and milk crates are less exposed to single-use packaging competition.

This quantification of reusable packaging systems is complementary to the expanded B2B packaging coverage that has also been incorporated into the project scope this year.

Due to circular flows and often long lifespans, quantification of reusable packaging systems requires metrics that measure mass flows, the same as single-use packaging flow quantifications, but extended to measure the service delivered by reusable packaging per cycle.

Strictly speaking single-use packaging systems should also require this determination of the service delivered per (single-use) cycle, to enable the monitoring of changes in packaging system product to packaging ratio efficiencies (e.g. quantify the impact of single-use packaging light-weighting). It has not been considered necessary to track this metric in the past.

However, this changes once it is of interest to quantify and track single-use and reusable packaging systems flows in an integrated manner. The common denominator becomes the service provided by packaging systems, which then supports the following mass-based comparisons:

- Service performance between single-use and reusable packaging systems based on mass flows of packaging standardised to product flows.
- Single-use and reusable packaging system inputs and outputs, standardised to product flows.
- Service performance efficiency changes for packaging systems, standardised to product flows, between different time periods.

A purpose of this pilot quantification of five reusable packaging systems was to advance the consideration of this system performance measurement aspect.

5.2 Method

The data collection plan adopted for the reusable packaging quantifications is outlined in **Table 54.**

Table 54. Data plan for packaging reuse quantification (2018–19 target year)

Data requirement	Data purposes	Data sources
General reusable packaging system description.	General overview of the system.	Surveys of major pool operators and/or users, including: Major breweries (2). Major supermarkets (3). Major dairy-processing related organisations (3). Major pool operators (4). Major reusable plastic bag suppliers (3).
Quantity of new reusable packaging POM in 2018–19.	Reusable packaging pool inputs in 2018–19.	
Quantity of reusable packaging leaving the reusable packaging pool (stocks) to end-of-life (EoL) fate in 2018–19.	Reusable packaging pool outputs in 2018–19 and fate.	
Average lifespan of reusable packaging.	Support estimation of pool size and service delivered by packaging.	
Average number of reuse cycles prior to reaching EoL or otherwise leaving the pool.	Support estimation of pool size and service delivered by packaging.	
Reusable packaging cycle time.	Support estimation of pool size and service delivered by packaging.	
Total pool size in 2018–19.	Support estimation of pool size.	
Other details.	Reusable packaging materials, packaging weights, and product weights. Competing single-use packaging types. System reconditioning descriptions including; removal/replacement of damaged components, appropriate cleaning or washing, inspection of fitness-for-purpose, and re-entry into the reuse system.	

The metrics that have been quantified in this section of the report are:

- Pool (stocks) size in 2018–19 (tonnes and number).
- New reusable packaging entering service (inputs) in 2018–19 (tonnes and number).
- Old reusable packaging exiting service (outputs) in 2018–19 (tonnes and number) and fate.
- Reusable packaging cycle time, cycle number and average service life.
- Indicative estimates of avoided single-use packaging consumption through use of the assessed reusable packaging systems.

5.3 Reusable packaging system flows

Estimates of reusable packaging system flows in 2018–19 are provided in **Table 55** and **Figure 46.** Reusable timber and plastic pallets dominated the material flows for the quantified systems, across inputs (new pallets into use), pool size and outputs (end-of-life pallets leaving the pool).

After pallets, beer kegs had the largest pool size, followed by reusable PP bags and dairy crates.

Table 55. Reusable packaging system flows in 2018–19

Packaging system	Input flow		Pool size[a]		Output flow	
	(tonnes)	('000 units)	(tonnes)	('000 units)	(tonnes)	('000 units)
Beer kegs	500	40	15 400	1 100	500	40
Reusable timber pallets	102 900	2 940	1 028 500	29 390	51 400	1 470
Reusable plastic pallets	8 600	240	85 700	2 450	4 300	120
Dairy crates	1 200	1 040	12 300	10 420	1 200	1 040
RPCs	900	600	8 900	5 950	300	180
Reusable LDPE bags	14 700	505 160	900	29 140	14 700	505 160
Reusable PP bags	7 200	74 210	14 500	148 410	7 200	74 210
Total	**136 000**	**584 230**	**1 166 200**	**226 860**	**79 600**	**582 220**

a) Estimated pool size at 30 June 2019.

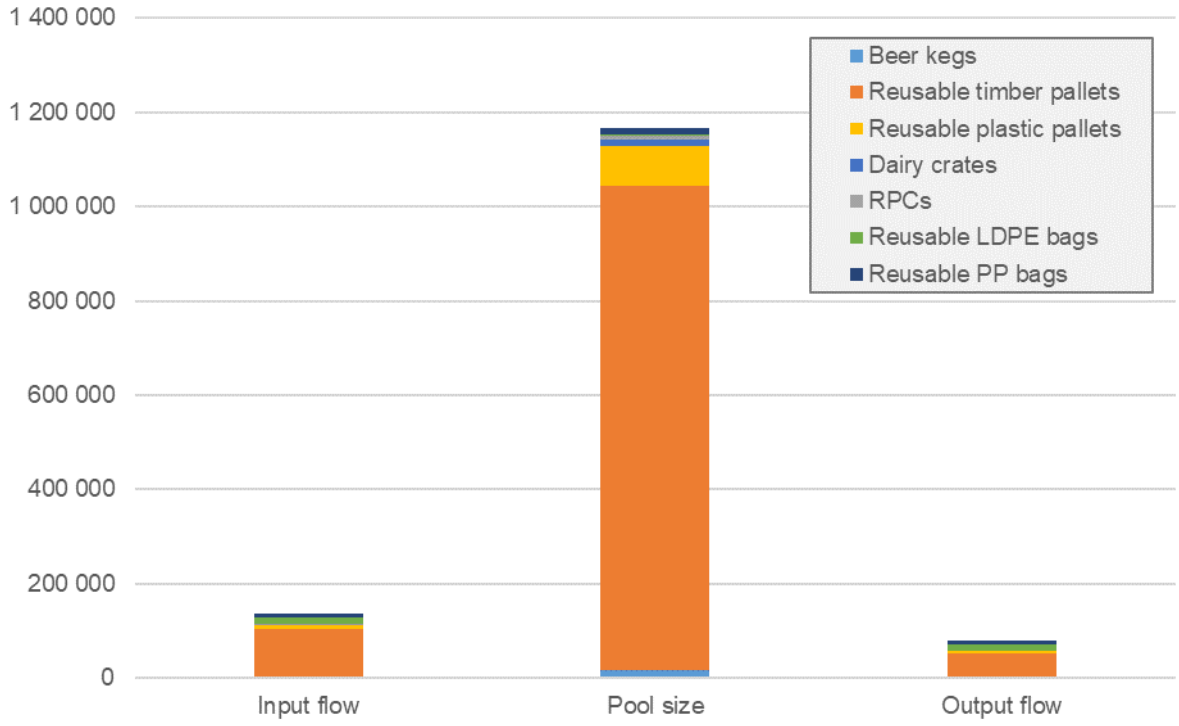


Figure 46. Reusable packaging systems flow in 2018-9 (tonnes)

Reusable packaging system inputs in 2018–19, by material group, are provided in **Table 56** and **Figure 47.**

Wood was the most significant material input into the quantified systems, making up 103 kt or 76% of total inputs. Plastic made up 33 kt (24%) and metal contributed 500 tonnes (0.4%).

Table 56. Reusable packaging input flows in 2018–19, by material group

Packaging system	Paper & paperboard	Glass	Plastic	Metal	Wood	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beer kegs	0	0	0	500	0	500
Reusable timber pallets	0	0	0	0	102 900	102 900
Reusable plastic pallets	0	0	8 600	0	0	8 600
Dairy crates	0	0	1 200	0	0	1 200
RPCs	0	0	900	0	0	900
Reusable LDPE bags	0	0	14 700	0	0	14 700
Reusable PP bags	0	0	7 200	0	0	7 200
Total (tonnes)	**0**	**0**	**32 700**	**500**	**102 900**	**136 000**
Total (%)	**0%**	**0%**	**24%**	**0.4%**	**76%**	**100%**

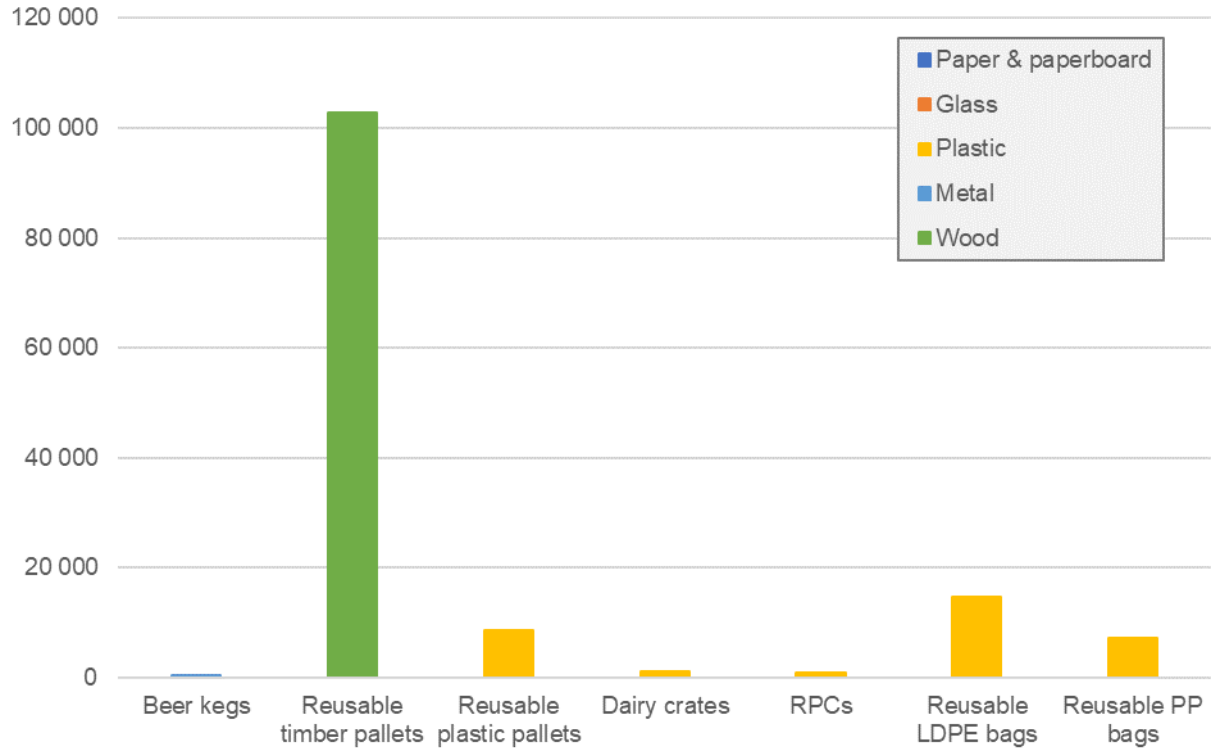


Figure 47. Reusable packaging input flows in 2018–19, by material group (tonnes)

Reusable packaging system outputs in 2018–19, by fate, are provided in **Table 57** and **Figure 48**.

The most significant fate was 49 kt of wood to composting, which was 61% of total output flows. Overall diversion of outputs to recovery fates was 71%, reflecting the high rates of recovery that are achievable with (mostly) closed system reusable packaging flows.

Table 57. Reusable packaging system output flow fates in 2018–19

Packaging system	Recycling	Composting	Landfill	System leakage	Other	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beer kegs	500	0	0	50	0	**540**
Reusable timber pallets	0	48 850	0	2 570	0	**51 430**
Reusable plastic pallets	4 100	0	0	210	0	**4 290**
Dairy crates	1 100	0	0	120	0	**1 230**
RPCs	300	0	0	10	0	**270**
Reusable LDPE bags	1 300	0	13 400	0	0	**14 750**
Reusable PP bags	900	0	6 300	0	0	**7 250**
Total (tonnes)	**8 200**	**48 850**	**19 700**	**2 960**	**0**	**79 700**
Total (%)	**10%**	**61%**	**25%**	**3.7%**	**0%**	**100%**

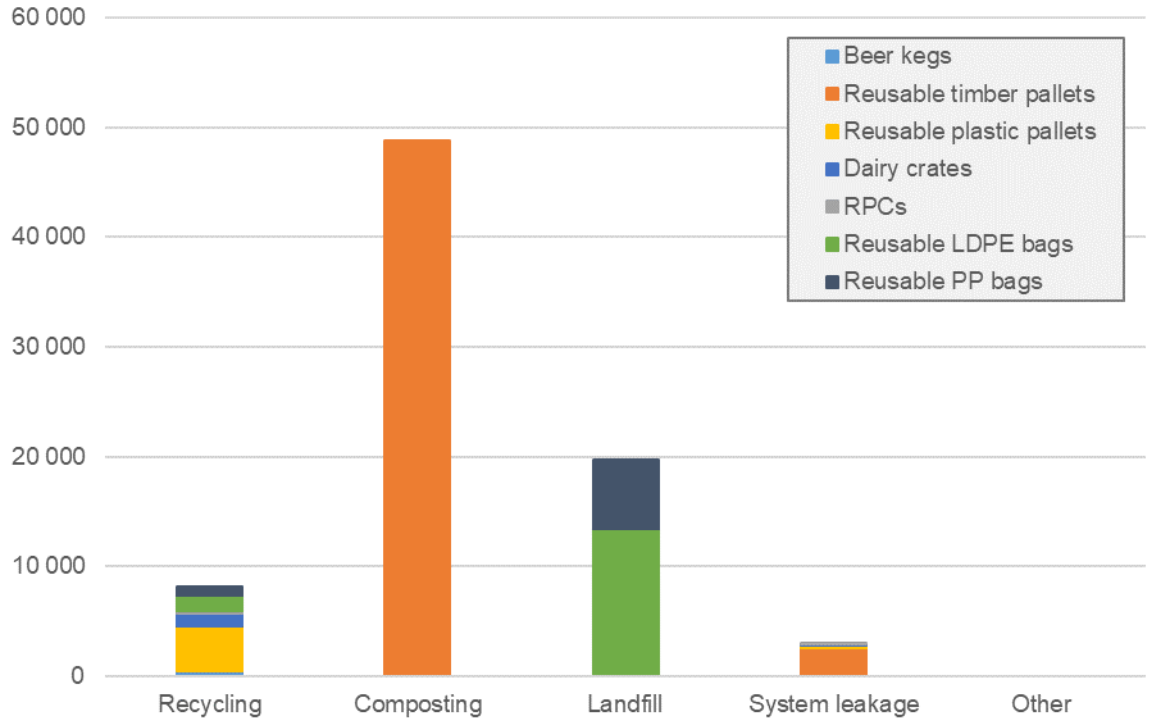


Figure 48. Reusable packaging system output flow fates in 2018–19 (tonnes)

5.4 Reusable packaging system use phase parameters

Provided in **Table 58** is a summary of significant use phase parameters for the quantified reusable packaging systems. Beer kegs, dairy crates and RPCs in particular have long lifespans coupled with relatively high rotations (use cycles) per year.

Table 58. Reusable packaging system use phase parameters

Packaging system	Average weight	Average lifespan	Rotations	Rotation time	Average deliverable volume
	(kg/unit)	(yr)	(rotations /life cycle)	(rotations/yr)	(litres/rotation)
Beer kegs	14.0	15	180	12	50
Reusable timber pallets	35.0	5–15	5–200	2–10	1 000
Reusable plastic pallets	35.0	5–15	5–200	2–10	1 000
Dairy crates	1.2	10	120	12	18
RPCs	1.5	10	120	12	15
Reusable LDPE bags	0.0	0.1	3	52	14
Reusable PP bags	0.1	2	104	52	17
Simple average (unweighted)	**12.4**	**8**	**88**	**21**	**302**

5.5 Avoided single-use packaging

This section provides indicative estimates of the quantities of single-use packaging that are avoided by using the quantified reusable packaging systems.

The reusable packaging systems have differing levels of competition with the alternative single-use packaging systems. However, this substitutability aspect has been ignored for the purposes of this exercise, which was to determine the theoretical performance of reusable packaging systems relative to single-use packaging systems, in terms of the comparative material flows.

Provided in **Table 59** and **Figure 49** are estimates of the single-use packaging avoided by each reusable packaging rotation, by material group. Beer kegs avoid the most single-use packaging, reflecting the high packaging to product weight ratio of single-serve beverage containers made from glass.

Table 59. Single-use packaging avoided per reusable packaging rotation, by material group

Packaging system	Paper & paperboard	Glass	Plastic	Metal	Wood	Total
	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)
Beer kegs	**3.2**	**14.4**	0.0	**1.6**	**0.0**	19.3
Reusable timber pallets	0.0	0.0	0.0	0.0	10.0	10.0
Reusable plastic pallets	0.0	0.0	0.0	0.0	10.0	10.0
Dairy crates	0.5	0.0	0.0	0.0	0.0	0.5
RPCs	0.6	0.0	0.0	0.0	0.0	0.6
Reusable LDPE bags	0.0	0.0	0.0	0.0	0.0	0.0
Reusable PP bags	0.0	0.0	0.0	0.0	0.0	0.0

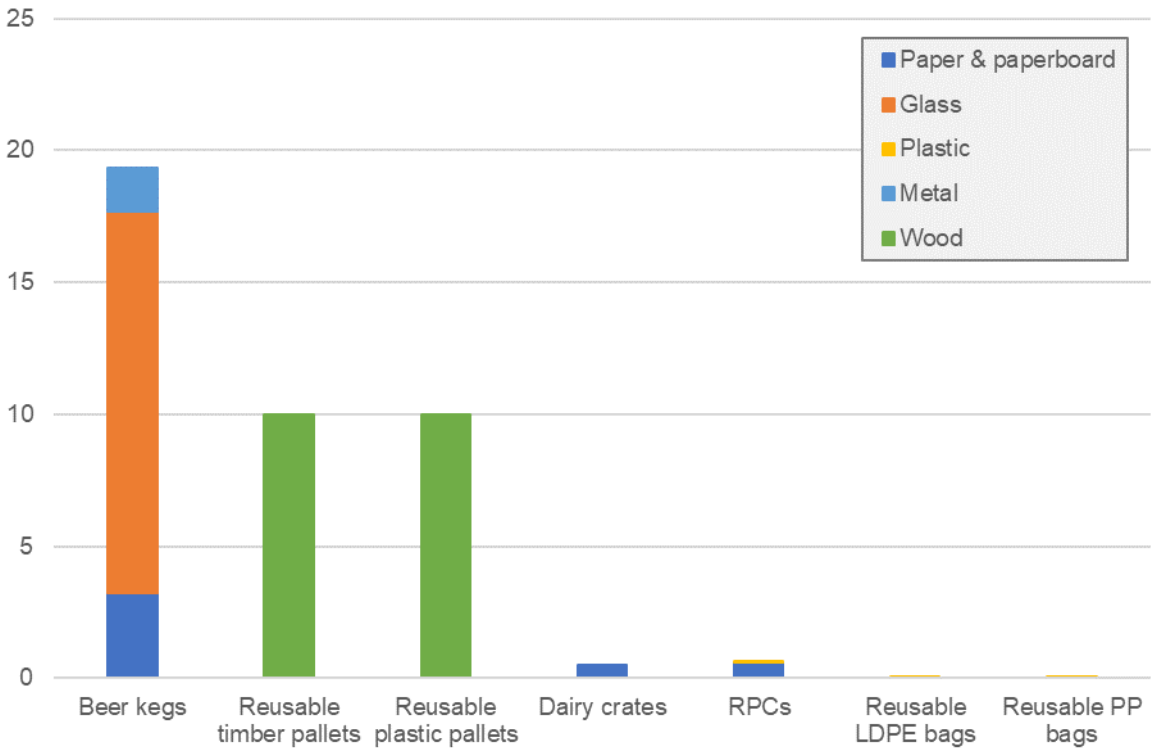


Figure 49. Single-use packaging avoided per reusable packaging rotation, by material group (kg)

Provided in **Table 60** and **Figure 50** are estimates of the total quantities of single-use packaging avoided in 2018–19 through the use of the five quantified reusable packaging systems.

The reusable packaging systems avoided the use of 1.7 million tonnes of single-use packaging. Approximately 89% of the avoided single-use packaging consumption benefit is provided by reusable pallets and beer kegs. The net theoretical reduction in packaging use was 1.6 million tonnes, as there were 0.1 million tonnes of reusable packaging inputs in 2018–19.

Table 60. Total single-use packaging avoided in 2018–19 through use of the quantified reusable packaging systems

Packaging system	Paper & paperboard	Glass	Plastic	Metal	Wood	Total
	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)
Beer kegs	42 900	190 400	0	21 600	0	254 900
Reusable timber pallets	0	0	0	0	1 175 400	1 175 400
Reusable plastic pallets	0	0	0	0	122 400	122 400
Dairy crates	62 500	0	0	0	0	62 500
RPCs	43 700	0	2 300	0	0	46 000
Reusable LDPE bags	0	0	11 000	0	0	11 000
Reusable PP bags	0	0	68 200	0	0	68 200
Total (tonnes)	**149 100**	**190 400**	**81 500**	**21 600**	**1 297 900**	**1 740 500**
Total (%)	**8.6%**	**10.9%**	**4.7%**	**1.2%**	**74.6%**	**100.0%**

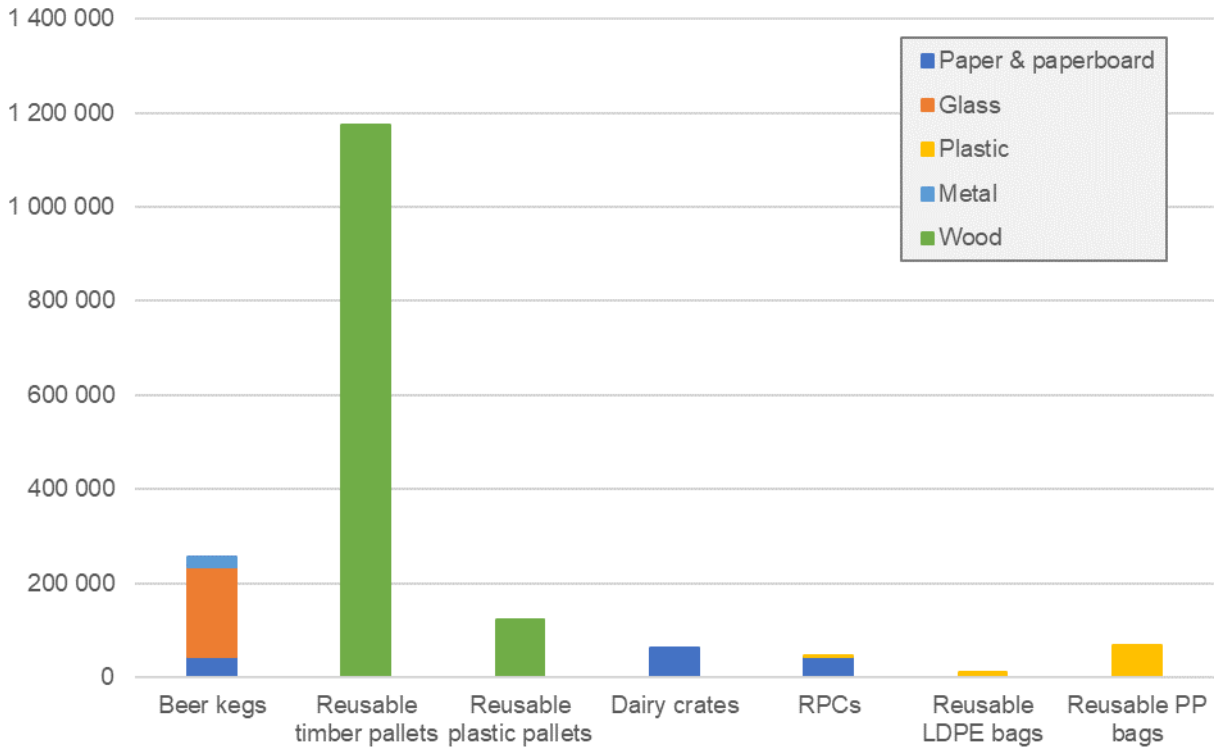


Figure 50. Total single-use packaging avoided in 2018–19 through use of the quantified reusable packaging systems (tonnes)

Table 61 provides estimates of the material inputs reduction ratios in 2018–19 through the use of the quantified reusable packaging systems. Beer kegs in particular have an excellent reduction ratio of 500. That is, every kilogram of beer keg avoids the use of 500 kg of single-use packaging over the lifespan of the beer keg. On average, every kilogram of the quantified reusable packaging systems avoided the use of 12.8 kg of single-use packaging.

Table 61. Material inputs reduction ratio in 2018–19 through use of the quantified reusable packaging systems

Packaging system	Paper & paperboard	Glass	Plastic	Metal	Wood	Overall
	(ratio)	(ratio)	(ratio)	(ratio)	(ratio)	(ratio)
Beer kegs	RNC	RNC	N/A	42.3	N/A	500
Reusable timber pallets	N/A	N/A	N/A	N/A	11.4	11
Reusable plastic pallets	N/A	N/A	RNC	N/A	RNC	14
Dairy crates	RNC	N/A	RNC	N/A	N/A	51
RPCs	RNC	N/A	2.6	N/A	N/A	52
Reusable LDPE bags	N/A	N/A	0.7	N/A	N/A	0.7
Reusable PP bags	N/A	N/A	9.4	N/A	N/A	9.4
Overall	**RNC**	**RNC**	**2.5**	**42.3**	**12.6**	**12.8**

RNC – Ratio not calculable, as either the denominator or numerator is zero.

6 REFERENCES

ABS, 2018. *3222.0 Projected population (data cube), components of change and summary statistics – Australia, state/territory, greater capital city/balance of state, 2017 (base) to 2066 (released 22 November 2018).* [Online] Available at: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3222.02017%20(base)%20-%202066?OpenDocument [Accessed 31 July 2019].

ABS, 2019a. *5206.0 Australian National Accounts: National Income, Expenditure and Product. Table 1. Key National Accounts Aggregates (released 5 June 2019).* [Online] Available at: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5206.0Mar%202019?OpenDocument [Accessed 16 August 2019].

ABS, 2019b. *3236.0 Household and Family Projections, Australia, 2016 to 2041.* [Online] Available at: https://www.abs.gov.au/statistics/people/population/household-and-family-projections-australia/latest-release#data-download [Accessed 30 October 2020].

ABS, 2020a. *3101.0 Australian Demographic Statistics, Dec 2019. Table 4. Estimated Resident Population, States and Territories (Number) (released 18 June 2020).* [Online] Available at: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Sep%202018?OpenDocument [Accessed 3 August 2020].

ABS, 2020b. *6401.0 Consumer Price Index, Australia, Jun 2020. Tables 1 and 2. CPI: All Groups, Index Numbers and Percentage Changes (released 29 July 2020).* [Online] Available at: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Jun%202019?OpenDocument [Accessed 4 October 2020].

AGA, 2015. *Hot-dip galvanizing takes LEED with recycled content,* Colorado: American Galvanizers Association.

AISI, 2009. *Steel Takes LEED with Recycled Content,* Connecticut: American Iron and Steel Institute.

Antrekowitsch, J., 2014. Zinc and Residue Recycling (Chapter 9.3). In: *Handbook of Recycling.* Online: ScienceDirect.

APCO, 2018. *Towards 2025 – Discussion paper,* Sydney: Australian Packaging Covenant Organisation.

APCO, 2019. *Australian Packaging Consumption and Resource Recovery Data,* Melbourne: Report prepared by Envisage Works, IndustryEdge, Institute for Sustainable Futures, Randell Environmental Consulting and Sustainable Resource Use on behalf of the Australian Packaging Covenant Organisation.

APCO, 2020a. *Our packaging future – A collection impact framework to achieve the 2025 national packaging targets,* Sydney: Australian Packaging Covenant Organisation.

APCO, 2020b. *APCO Action Plan for Problematic and Unnecessary Single Use Plastic Packaging,* Sydney: Australian Packaging Covenant Organisation.

Blue Environment, 2015. *Packaging data collection methodologies 2015,* Melbourne: Reported prepared by Blue Environment on behalf of the Australian Packaging Covenant Council.

Blue Environment, 2018. *Improving national waste data and reporting,* Melbourne: Report prepared by Blue Environment on behalf of the Department of the Environment and Energy.

Blue Environment, 2019. *MRF, organics processing facilities and CDS survey results provided in MS Excel workbook '20190719 Output data for Envisage Works.xlsx' (dated 19 July 2019),* Melbourne: Blue Environment.

COAG, 2020. *Phasing out exports of waste plastic, paper, glass and tyres – Response strategy to implement the August 2019 agreement of the Council of Australian Governments,* Canberra: Council of Australian Governments.

Dama International, 2017. *DAMA-DMBOK: Data Management Body of Knowledge.* 2nd edition ed. s.l.:Dama International.

Envisage Works, et. al., 2020. *National survey of packaging manufacturers and reprocessors for 2018–19,* Melbourne: Surveys undertaken by Envisage Works, IndustryEdge, Randell Environmental Consulting and Sustainable Resource Use on behalf of the Australian Packaging Covenant Organisation.

Envisage Works, 2019. *Packaging consumption and recycling data (APCO project 1.1),* Melbourne: Report prepared by Envisage Works, IndustryEdge, Institute for Sustainable Futures, Randell Environmental Consulting and Sustainable Resource Use on behalf of the Australian Packaging Covenant Organisation.

Envisage, 2020. *2018–19 Australian Plastics Recycling Survey,* Melbourne: Report prepared by Envisage Works and Sustainable Resource Use on behalf of the Department of Agriculture, Water and the Environment.

European Aluminium, 2016. *Recycled Content vs End-of-Life Recycling Rate,* Brussels: s.n.

Green Industries SA, 2019. *South Australia's Recycling Activity Survey 2017–18 Report,* Adelaide: Report prepared by Rawtec Pty Ltd on behalf of Green Industries SA.

GS1, 2013. *GS1 global protocol for packaging sustainability packaging variables (MS Excel workbook),* Brussels: GS1.

IAI, 2009. *Global Aluminium Recycling: A Cornerstone of Sustainable Development,* London: International Aluminium Institute, European Aluminium Association and Organisation of European Aluminium Refiners and Remelters.

IBISWorld, 2020a. *IBISWorld Industry Report C1912A – Plastic Bottle Manufacturing in Australia Industry Report 2018–19,* Melbourne: IBISWorld.

IBISWorld, 2020b. *IBISWorld Industry Report C1912B – Plastic Pipe and Plastic Packaging Material Manufacturing in Australia Industry Report 2019–20,* Melbourne: IBISWorld.

IBISWorld, 2020c. *IBISWorld Industry Report C2010 – Glass and Glass Product Manufacturing in Australia Industry Report 2019–20,* Melbourne: IBISWorld.

IBISWorld, 2020d. *IBISWorld Industry Report C2239 – Metal Drum Can and Bin Manufacturing in Australia Industry Report 2019–20,* Melbourne: IBISWorld.

IBISWorld, 2020e. *IBISWorld Industry Report C1499 – Pallets and Other Wood Product Manufacturing in Australia Industry Report 2019–20,* Melbourne: IBISWorld.

IBISWorld, 2020f. *IBISWorld Industry Report C1911 – Plastic Bag and Film Manufacturing in Australia 2018–19,* Melbourne: IBISWorld.

IBISWorld, 2020g. *IBISWorld Industry Report C1212 – Beer Manufacturing in Australia Industry Report 2019–20,* Melbourne: IBISWorld.

IndustryEdge, 2020a. *Packaging related imports in 2018–19 by the Combined Australian Customs Tariff Nomenclature and Statistical Classification (the Customs Tariff) code – Customised report,* Geelong West: IndustryEdge Pty Ltd.

IndustryEdge, 2020b. *Packaging related exports in 2018–19 by the Australian Harmonized Export Commodity Classification (AHECC) code – Customised report,* Geelong West: IndustryEdge Pty Ltd.

ISO, 2013a. *ISO 18601:2013 Packaging and the environment – General requirements for the use of ISO standards in the field of packaging and the environment,* Geneva: The International Organization for Standardization.

ISO, 2013b. *ISO 18602:2013 Packaging and the environment – Optimization of the packaging system,* Geneva: The International Organization for Standardization.

ISO, 2013c. *ISO 18603:2013 Packaging and the environment – Reuse,* Geneva: The International Organization for Standardization.

ISO, 2013d. *ISO 18605:2013 Packaging and the environment – Material recycling,* Geneva: The International Organization for Standardization.

ISO, 2013e. *ISO 18604:2013 Packaging and the environment – Energy recovery,* Geneva: The International Organization for Standardization.

ISO, 2013f. *ISO 18606:2013 Packaging and the environment – Organic recycling,* Geneva: The International Organization for Standardization.

ISO, 2015. *ISO 21067-2:2015 Packaging – Vocabulary – Part 2: Packaging and the environment terms,* Geneva: The International Organization for Standardization.

ISO, 2016. *ISO 21067-1:2016 Packaging – Vocabulary – Part 1: General terms,* Geneva: The International Organization for Standardization.

RMIT, 2015. *LCA of Kerbside Recycling in Victoria,* Melbourne: Report prepared by RMIT University on behalf of Sustainability Victoria.

Steel Recycling Institute, 2001. *The Inherent Recycled Content of Today's Steel,* Pittsburgh: Steel Recycling Institute.

SV, 2019a. *Recovered Resources Market Bulletin – August 2019,* Melbourne: Sustainability Victoria.

SV, 2019b. *Recovered Resources Market Bulletin – November 2019,* Melbourne: Sustainability Victoria.

Wine Australia, 2020. *Export Report - 12 months to 30 June 2019,* Adelaide: Wine Australia.

APPENDIX A – GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Definition
Accuracy range	The accuracy ranges provided in this report are weighted sum averages of packaging manufacturer and reprocessor reported estimates of the level of accuracy (±%) of their reported packaging material POM or total reprocessing. The accuracy range provides an estimate of the range within which the true value can be found.
Beneficiation (of glass)	Processing of used glass packaging. The beneficiation process includes sorting (including colour sorting), cleaning, crushing and sizing. Beneficiated glass is considered “furnace-ready” for sale to glass product manufacturers.
Biodegradable	A generic term that indicates a polymer is biologically available for microbial decomposition, with no detail on breakdown products, time or extent of degradation or end environments.
Bioplastics	Plastics that are biobased, biodegradable or both. Bioplastics fall into three broad groupings, which are: biobased (but not biodegradable); biodegradable (but not biobased); or biobased and biodegradable. Conventional polymers (e.g. PET and HDPE) can also be fully or partially ‘biobased’.
Business-to-business (B2B) packaging	Packaging used for the containment, protection or handling of product where the end-customer, prior to the packaging reaching end-of-life, is a business or institution. Typically includes the secondary and tertiary packaging that is used to move products between businesses prior to sale to end-consumers, but can also include primary packaging if the business is the end-user. Same meaning as 'Commercial packaging'. Also see 'Packaging' and 'Business-to-consumer (B2C) packaging'.
Business-to-consumer (B2C) packaging	Packaging used for the containment, protection, marketing or handling of product where the end-customer, prior to the packaging reaching end-of-life, is a consumer (i.e. a person). Includes the primary packaging that is sold to end-consumer, and possibly some secondary packaging, but excludes any B2B packaging that is part of the packaging system. Same meaning as 'Consumer packaging'. Also see 'Packaging' and 'Business-to-business (B2B) packaging'.
Certified compostable	Means that claims of compliance with Australian Standard 4736-2006, compostable and biodegradable plastics – “Biodegradable plastics suitable for composting and other microbial treatment” and Australian Standard AS 5810-2010 Home Composting – “Biodegradable plastics suitable for home composting” have been verified.
Circular economy	The circular economy concept is a systems approach to material/energy flows that extends significantly on the ‘waste hierarchy’, with the objective being to decouple economic growth/development from the use of non-renewable resources (including energy). It is a concept that extends to cover the entire life cycle of products and services, including design. It assumes that the current approach of incremental and fractured improvements in materials and energy efficiency are not sufficient to achieve the potential (much larger) economic and environmental gains that are available.
Closed-loop recycling	Material from a product system is recycled in the same product system, and is of the same quality and functionality as the original material. In terms of end-of-life fates, closed-loop recycling will typically provide greatest environmental benefits, with the key attribute being the displacement (competition with) virgin resource extraction. Also see 'Open-loop recycling' and 'Downcycling'.
Collection	Packaging materials collected for recycling.

Term	Definition
Collection efficiency	Materials collected for recycling divided by total packaging waste entering the collection system.
Commercial and industrial (C&I) waste	Solid inert waste generated from trade, commercial and industrial activities including the government sector. It includes waste from offices, manufacturing, factories, schools, universities, state and government operations and small to medium enterprises e.g. food waste.
Commercial packaging	The same meaning as 'Business-to-business' (B2B) packaging.
Commingled recyclables	Materials combined generally for the purposes of collection, mainly through municipal collection services. Includes plastic bottles, other plastics, paper, glass and metal containers. Commingled recyclable materials require sorting after collection before they can be reprocessed. Can also be called commingled materials.
Compostable packaging	A packaging or packaging component (1) is compostable if it is certified to AS4736 or a similar standard for commercial composting, and if its successful post-consumer (2) collection, (sorting), and composting is proven to work in practice and at scale (3). Also see the related ‘Recyclable packaging’ and ‘Reusable packaging’ definitions. Supporting notes: 1. ISO 18601:2013: A packaging component is a part of packaging that can be separated by hand or by using simple physical means (e.g. a cap, a lid and (non in-mould) labels). 2. ISO 14021 clarifies post-consumer material as material generated by households or by commercial, industrial and institutional facilities in their role as end users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain. 3. ‘At scale’ implies that there are significant and relevant geographical areas, as measured by population size, where the packaging is actually composted in practice.
Composted (packaging)	Packaging that underwent degradation by biological processes during composting to yield CO2, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leaves no visible, distinguishable or toxic residue, in accordance with accepted industry standards (1). Supporting notes: 1. Accepted industry standards include standards referred in the above definitions ‘Compostable packaging – industrial’ and ‘Compostable packaging – home’. Reference to accepted industry standards is to ensure packaging can fully degrade within specified periods of time in the conditions of standard composting system and does not alter the quality of compost.
Construction and demolition (C&D) waste	Solid inert waste generated from residential and commercial construction and demolition activities e.g. bricks and concrete.
Consumer packaging	Packaging used for the containment, protection, marketing or handling of product where the end-customer, prior to the packaging reaching end-of-life, is a consumer (i.e. a person). Includes the primary packaging that is sold to end-consumer, and possibly some secondary packaging, but excludes any B2B packaging that is part of the packaging system. Same meaning as Business-to-consumer' (B2C) packaging. Also see 'Packaging' and 'Business-to-business (B2B) packaging'. It is worth noting that the *National Environment Protection (Used Packaging Materials) Measure 2011* defines *consumer packaging* to mean all packaging products made of any material, or combination of materials, for the containment, protection, marketing or handling of consumer products. This includes: • Primary packaging – materials directly containing the product.

Term	Definition
	• Secondary packaging – materials used to contain single or multiple primary packed products. • Tertiary packaging – materials used to distribute packaged and unpackaged products. This NEPM definition for consumer packaging is different from that adopted for consumer packaging (and B2C packaging) in this study in that the adopted definition excludes all tertiary packaging, even if it is part of the (upstream) consumer packaging system.
Consumption	Total use of product by Australian industry and consumers. Includes locally made and used product, imported product and locally utilised recyclate. Does not include locally made product that is exported.
Consumption of packaging	Packaging put onto the market in Australia from local and imported sources. Because most packaging is single-use, it is assumed that packaging consumed equates to packaging waste generated. Does not include locally made product that is exported for sale.
Container deposit scheme (CDS) collection	Separate collection system for paper, plastic and metal containers.
Contaminants – Out throws	A sorted scrap (bale) related term. Recyclable materials that are unsuitable for inclusion in the sorted grade (product) in which they are present, but can be sorted, separated and/ or removed easily during the recycling process. Out throws generally have significantly higher allowable thresholds, compared to prohibited materials, in bale specifications for sorted recycled material commodities. Also see ‘Contaminants – Prohibited materials’ entry.
Contaminants – Prohibited materials	A sorted scrap (bale) related term. Unrecyclable materials that are unsuitable for inclusion in the sorted grade (product) in which they are present, and cannot be sorted, separated and/or removed during the recycling process. Prohibited materials cause adverse impacts on end-products and may damage the recycling facilities. Prohibited materials generally have significantly lower allowable thresholds, compared to out throws, in bale specifications for sorted recycled material commodities. Also see ‘Contaminants – Out throws’ entry.
Converter	Company which converts material inputs into a finished packaging product (whether filled or unfilled).
Cullet	Sorted glass feedstock resulting from the beneficiation process of mixed container glass. Generally consists of sorted streams of amber, flint and green glass of particle size greater that 5–10 mm depending on the capacity of the beneficiation plant.
Delamination	The process of splitting a composite material into its component parts e.g. laminated glass.
Disposal	Discarding solid waste to landfill or incineration (without energy recovery).
Diversion rate	Recovery (at a defined point) as a percentage of end-of-life disposal. Also see 'Recovery rate' and 'Recycling rate'.
Domestic	Material from domestic (household) sources.

Term	Definition
Downcycling	Recycled material is of lower quality and functionality than the original material(s). Materials are recycled into different applications with less stringent performance specifications, and where the recycled materials are typically substituting for (competing with) materials other than the original high quality virgin materials. Examples of this include the recycling of mixed polymer rigid plastics, e.g. a mixture of HDPE, low-density polyethylene (LDPE) and polypropylene (PP) into timber substitute products (e.g. outdoor furniture, pallets and fencing), where the recovered plastics are competing primarily with timber as the alternative material. Down-cycled materials are potentially more difficult to recycle at end-of-life (although they often have long functional lifespans), and are more likely to be disposed to landfill at end-of-life. Also see 'Closed-loop recycling' and 'Open-loop recycling'.
Drop off centre/site	A facility where households can drop off selected materials and household items for recycling and reuse. Also called drop off facilities.
End user (of recycled content raw materials)	A user of raw materials that have a recycled content. Examples of end users include plastic product manufacturers that use recycled polymer in their products, or agricultural producers that purchased composted organics as a soil conditioner/fertiliser.
Energy from waste (EfW)	The terms ‘energy recovery from waste’, ‘waste to energy’ or ‘energy from waste’ can be used interchangeably to describe a number of treatment processes and technologies used to generate a usable form of energy from waste materials. Examples of usable forms of energy include electricity, heat and transport fuels.
Energy recovery	A waste fate in which a substantial portion of energy value in a waste is recovered.
Energy recovery facility	A facility that captures, on average, more than 20% of the embodied energy in the waste it receives for beneficial use.
Export for reprocessing	Material sent for reprocessing overseas.
Feedstock	Raw material used to manufacture products. Material varies depending on what is being produced.
Feedstock (chemical) recycling	The use of chemical processes such as pyrolysis to convert scrap plastics into a hydrocarbon gas or liquid (often a polymer to monomer conversion) that is usable as a fuel or as an input for manufacturing plastics resins.
Fines (glass)	Unsorted sub 5–10 mm glass material left over from the glass beneficiation process. It can contain contamination including plastics and small pieces of metals. These fines can be further processed to produce a glass sand product which has a number of uses.
Flexible packaging	Soft (flexible) plastics are generally defined as plastics that can be scrunched into a ball, unlike ‘rigid’ plastics such as bottles and tubs, which are moulded and hold their shape. Also refer to the 'Rigid packaging' entry.
Foam packaging	Foam plastic packaging is in a lightweight cellular form resulting from introduction of gas bubbles during manufacture. Foam packaging is typically used to reduce shock and vibration or abrasion. The most common example used in packaging is expanded polystyrene (EPS).
Food organics	Food waste from households or industry, including food processing waste, out- of-date or off-specification food, meat, fruit and vegetable scraps. Excludes liquid wastes.
Garden organics	Organics derived from garden sources e.g. grass clippings, tree prunings. Also known as green organics.
Generated material/waste	Materials or waste originating from a point source or source of origin.
Green organics	See garden organics.

Term	Definition
Greenhouse gases	Gases, including carbon dioxide and methane, that trap heat in the earth's atmosphere, affecting weather and climate patterns.
Hard waste	The term applied to household garbage that is not usually accepted in kerbside garbage bins by local councils e.g. old fridges and mattresses.
Hazardous waste	Waste with potentially adverse impacts on human health and the environment.
Household	Material from domestic (household) sources.
In the gate	Material entering a facility for reprocessing. This may include material that is unusable due to contamination. In the gate material that is subsequently sent to landfill is generally either a combination of gross contamination (i.e. materials that should not have been presented and are not recyclable at the receiving facility) and/or designated scrap plastics that were not recovered into product due to cross contamination with unrecyclable materials or losses due to other types of production inefficiencies (e.g. losses to trade waste). Also see 'Out the gate'.
Incinerator	A site and/or process that facilitates disposal of waste streams through burning, without producing another useful end product or capturing value from the waste material.
Internal use	Recyclate processed and used within the one company.
In-vessel composting	Composting technology involving the use of a fully enclosed chamber or vessel in which the composting process is controlled by regulating the rate of mechanical aeration. Aeration assists in heat removal, temperature control and oxygenation of the mass. Aeration is provided to the chamber by a blower fan which can work in a positive (blowing) and/or negative (sucking) mode. Rate of aeration can be controlled with temperature, oxygen or carbon dioxide feedback signals.
Kerbside waste/ collection	Waste collected by local councils from residential properties, including garbage, commingled recyclables and garden organics, but excluding hard waste.
Kraft paper	Kraft paper is paper or paperboard (cardboard) produced from chemical pulp produced in the kraft process. It is commonly used in paper sacks, food and other paper based wraps (including burger wraps and similar). Kraft pulp is normally darker than other wood pulps, but it can be bleached to make white papers.
Landfill	Discharge or deposit of solid wastes onto land that cannot be practically removed from the waste stream.
Liquid paperboard (LPB)	Liquid paperboard (LPB) is a fibre-based packaging board that is designed to hold a liquid. It is commonly comes in two main types, which are gable-topped LPB (plastic polymer layer / paperboard layer / plastic polymer layer), and aseptic LPB (plastic polymer layer / paperboard layer / aluminium foil layer / plastic polymer layer). Also see Polymer-coated paperboard (PCPB).
Local material utilisation	Materials recovered and reprocessed (recyclate) for use within Australia for the manufacture of new products.
Local material utilisation rate	Materials recovered for local manufacturing of new product divided by total packaging waste entering the system.
Local use	Recyclate used within Australia by an Australian company in the manufacture of a new product.
Local/Locally	In Australia.
Material flow analysis (MFA)	Material flow analysis (MFA) is a mass balanced based analytical method to quantify flows and stocks of materials or substances for a well-defined system and time period. MFA is also referred to as substance flow analysis (SFA).

Term	Definition
Material recycling	Reprocessing, by means of a manufacturing process, of a used packaging material into a product, a component incorporated into a product, or a secondary (recycled) raw material
Materials recovered	Materials diverted from landfill for use or reprocessing irrespective of where the recovery or reprocessing takes place.
Materials recovery facility (MRF)	A centre for the receipt, sorting and transfer of materials recovered from the waste stream prior to transport to another facility for recovery and management. At a MRF materials may undergo mechanical treatment for sorting by characteristics such as weight, size, magnetism and optical density and may include cleaning and compression. Materials may be received as mixed streams such as commingled recyclables from households and businesses or single streams such as metals.
Mechanical recycling	The use of physical processes such as sorting, chipping, grinding, washing and extruding to convert scrap plastics to a usable input for the manufacture of new products.
Mild steel	Mild steel is defined as having no more than 2% carbon and no other functional alloying elements. Mild steel is also referred to as ‘carbon steel’.
Mixed paper	Post-consumer kerbside mix of fibre based packaging and non-packaging papers. Includes materials such as magazine, newspaper, marketing, some OCC and others fibre based formats. Typically has high levels of contamination, of which broken glass is a particular issue.
Mixed plastics	Post-consumer kerbside mix of plastics based packaging and non-packaging plastic items. Includes materials such as bottles, containers and other packaging formats consisting of all the major polymer groups. Often undergoes a polymer sort at MRFs or post-MRFs to positively recover a limited range of polymer types, typically PET and HDPE. Often has moderate to high levels of contamination.
MRF	Material Recovery Facility – a facility for the sorting of recyclables (typically packaging) into various product streams.
Municipal solid waste (MSW)	Solid waste generated from municipal and residential activities, and including waste collected by, or on behalf of, a municipal council. Excludes dedicated container deposit scheme (CDS) collections or drop-off by consumers or businesses.
Non-packaging / durable	Long-term use item; not designed to be single use or disposable within a 12-month period.
OCC	Old corrugated cardboard (unbleached kraft).
ONP	Old newsprint.
Open-loop recycling	Material from a product system is recycled into a different product system, and may be of lower quality and functionality than the original material. Importantly, the recycled materials substitute for, and avoid the use of virgin materials in the new applications. Examples of this in Australia include the recycling of PET bottles into fibre for use in clothing and other textiles, and high-density polyethylene (HDPE) milk bottles into mobile garbage bins and milk crates. Open-loop recycling can be as environmental beneficial as closed-loop recycling. Also see 'Closed-loop recycling' and 'Downcycling'.
Optical sorting	Technologies used to sort glass by colour type, and plastics by polymer type.
Organic material	Plant or animal matter, e.g. grass clippings, tree prunings and food waste, originating from domestic or industrial sources.
Organics recycling	The treatment of separately collected organics waste by anaerobic digestion, composting or vermiculture.
Out the gate	Material leaving a facility following reprocessing and excluding most contamination. Also see ‘In the gate’.

Term	Definition
Oxo-degradable or photo-degradable	Conventional fossil-based polymers (usually polyethylene or polypropylene) that have additives incorporated into the polymer at low rates (2-3%) to provide highly accelerated fragmentation of the plastic in sunlight or in the presence of oxygen or in an anaerobic environment.
Packaging	Material used for the containment, protection, marketing or handling of product. Includes primary, secondary and tertiary/freight packaging in both consumer and industrial packaging applications.
Packaging component	A part of a packaging format that can be separated by hand or by using simple physical means. Also see 'Packaging format.'
Packaging constituent	A part from which a packaging format or its components are made and which cannot be separated by hand or by using simple physical means.
Packaging format	A collection of packaging components that are intended to function as a single packaging unit. For example a single-use glass soft-drink bottle is typically a packaging format consisting of; a glass bottle, a metal or plastic closure and a paper or plastic label. Also see 'Packaging component'.
Packaging level	Identifies the hierarchical level of the packaging format, i.e. primary, secondary or tertiary. **Primary packaging**, also known as consumer or retail packaging, refers to the layer/s that contain and protect individual product units up to the point of sale (e.g. bag, bottle, jar, box etc.) and that are removed for use. Primary packaging also includes any packaging given to consumers at the point of retail sales (e.g. retail bag, tissue paper etc.) as well as packaging delivered to consumers with online sales (e.g. bag, cushioning, box etc.). **Secondary packaging** is additional to the primary packaging and is used to protect and collate individual product units during storage, transport and distribution. This may include shelf-ready packaging (SRP), also known as retail-ready packaging (RRP) or counter- top display units (CDUs), containing multiple product units and used for retail display. **Tertiary packaging** is used in the protection and shipping of a product. This type of packaging is also known as distribution packaging, transport packaging and business-to-business (B2B packaging). It consists of packaging and components such as cardboard cartons, pallets, slip sheets, stretch wrap, strapping and any labels.
Packaging system	Complete set of packaging for a packaged good, encompassing one or more of the following that are applicable (depending on the packaged goods): Primary packaging, Secondary packaging, Tertiary (distribution or transport) packaging.
Paper & paperboard	Paperboard is a group term related to papers (including multi-ply papers) that have been manufactured specifically for packaging purposes. Paper is both an input into paperboard manufacturing and can be a packaging product in its own right.
PE-HD or HDPE	High-density polyethylene (PIC 2). Typically referred to as HDPE.
PE-LD or LDPE	Low-density polyethylene (PIC 4). Typically referred to as LDPE.
PE-LLD or LLDPE	Linear low-density polyethylene (PIC 4). Typically referred to as LLDPE.
PET	Polyethylene terephthalate (PIC 1).
PIC	Plastic identification code. Also referred to as the resin identification code (RIC) in some other countries.
Placed on market (POM)	Packaging is defined as being 'placed on market' (POM) when it is first made available to the end-consumer, and disposal is following the intended full use of the packaging, and can be considered 'post-consumer'. Packaging losses prior to the point of POM are considered pre-consumer losses.

Term	Definition
Polymer coated paperboard (PCPB)	Paper-based packaging with a polymer coating for water resistance and structural integrity, generally, polyethylene (PE) or polylactic acid (PLA). Aseptic PCPB containers also contain a foil/metallised film layer.
Post-consumer domestic	Used material from household sources. Mostly packaging material from kerbside recycling collections.
Post-consumer industrial	Used material from non-household sources.
Post-consumer recycled content (PCR)	The post-consumer recycled content of packaging placed on market is sourced from end-of-life materials generated by households or by commercial, industrial and institutional facilities.
Post-consumer used packaging	ISO 14021 defines post-consumer material as material generated by households or by commercial, industrial and institutional facilities in their role as end users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain. It excludes pre-consumer material (e.g. production scrap).
PP	Polypropylene (PIC 5).
Pre-consumer recycled content	The pre-consumer recycled content of packaging placed on market is sourced from scrap materials generated during manufacturing (excluding rework). The compositional profile of the pre-consumer recycled content of the material is typically the same as that of the packaging material POM, and reflects the composition of the incoming material into the packaging manufacturing. That is, it can have a proportion of virgin, pre-consumer and post-consumer content. If manufacturing processes, including scrap reprocessing processes, are considered a single black box, then the sources of pre-consumer materials upstream from manufacturing processes are either virgin or post-consumer sourced materials only.
Pre-consumer scrap packaging	Scrap off-cuts and off-specification materials in the manufacturing industry which are collected for reprocessing at a different facility. Does not include material that is recycled directly back into manufacturing processes at the same facility. Does not include material that has reached the end-consumer, whether domestic, commercial or industrial.
PREP	Packaging Recyclability Evaluation Portal (PREP) is an online platform used to verify if packaging is or isn't recyclable in Australian and New Zealand kerbside collections.
Primary material	See ‘Virgin material’.
Problematic	Can be considered a ‘contaminant’ in the recycling facility because it is either 1) not one of the requested materials 2) causes problems e.g. getting entangled in machinery 3) reduces the quality of the recyclate or some other reason.
Process derived fuels	Also called process engineered fuel (PEF) or refuse derived fuel (RDF), is a fuel produced after basic processing in a MRF or MBT to increase the calorific value and remove recyclable materials and contaminants of municipal solid waste, commercial and industrial waste and construction and demolition waste.
Processing facilities	Facilities which either receive materials directly from collection systems or from recovery facilities for further sorting and/or processing to provide material for use in the generation of new products.
Product stewardship	A concept of shared responsibility by all sectors involved in the manufacture, distribution, use and disposal of products, which seeks to ensure value is recovered from products at the end-of-life.
PS-E or EPS	Expanded polystyrene (PIC 6). Typically referred to as EPS.
Public place recycling	Recycling facilities found in public areas, such as parks, reserves, transport hubs, shopping centres and sport and entertainment venues, that allow the community to recycle when away from home.

Term	Definition
Putrescible waste	Waste that readily decomposes, including food waste and organic waste from gardens.
PVC	Polyvinyl chloride (PIC 3).
Pyrolysis	Thermal breakdown of waste in the absence of air, to produce char, pyrolysis oil and syngas e.g. the conversion of wood into charcoal.
Recover / recovery / resource recovery	The process of recovering resources from waste for reuse or reprocessing. This includes collection, sorting and aggregation of materials. To convert waste into a reusable material.
Recovery rate	Recovery (at a defined point) as a percentage of end-of-life disposal. Similar meaning to 'Recycling rate' but can include material into composting and energy recovery. Excludes reused products. Also see 'Diversion rate' and 'Recycling rate'.
Recyclable packaging	A packaging (1) or packaging component (2,3) is recyclable if its successful post-consumer (4) collection, sorting, and recycling is proven to work in practice and at scale. Also see the related ‘Compostable packaging’ and ‘Reusable packaging’ definitions. Supporting notes: 1. A package can be considered recyclable if its main packaging components, are recyclable according to the above definition, and if the remaining minor components are compatible with the recycling process and do not hinder the recyclability of the main components. The PREP design tool provides information on recyclability of packaging through kerbside collection services. 2. A packaging component is a part of packaging that can be separated by hand or by using simple physical means (ISO 18601), e.g. a cap, a lid and (non in-mould) labels. 3. A packaging component can only be considered recyclable if that entire component, excluding minor incidental constituents (5), is recyclable according to the definition above. If just one material of a multi-material component is recyclable, one can only claim recyclability of that material, not of the component as a whole (in line with ISO 14021). 4. ISO 14021 defines post-consumer material as material generated by households or by commercial, industrial and institutional facilities in their role as end users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain. It excludes pre-consumer material (e.g. production scrap). 5. ISO 18601:2013: A packaging constituent is a part from which packaging or its components are made and which cannot be separated by hand or by using simple physical means (e.g. a layer of a multi-layered pack or an in-mould label).
Recyclability	See the 'Recyclable packaging' entry.
Recyclate	Scrap material either before or after reprocessing.
Recycle/Recyclables/Recycling	In common practice the term is used to cover a wide range of activities, including collection, sorting, reprocessing and reuse.
Recycled (packaging)	Packaging is recycled if at least 70% of its weight is recycled into a product, a component incorporated into a product, or a secondary (recycled) raw material.
Recycled content	Is the proportion, by mass, of pre-consumer and post-consumer recycled (PCR) material in packaging (AS/ISO 14021). ‘Pre-consumer’ material is material diverted from the waste stream during manufacturing (excluding rework). ‘Post-consumer’ material is material waste generated by households or by commercial, industrial and institutional facilities. The amount of renewable or recycled material is expressed as a percentage of the quantity of packaging material put onto the market.

Term	Definition
Recycling	Activities in which solid wastes are collected, sorted, processed (including through composting), and converted into raw materials to be used in the production of new products (the amount of solid waste recycled is net of any residuals disposed). Excludes energy recovery and stockpiles.
Recycling rate	Recovery (at a defined point) as a percentage of end-of-life disposal. Similar meaning to 'Recovery rate' but excludes material into energy recovery and reused products. Also see 'Diversion rate' and 'Reprocessing rate'.
Refuse derived fuels	Refer to Process derived fuels.
Reprocess / reprocessing	To put a material that has been used through an industrial process to change it so that it can be used again.
Reprocessor / reprocessing facility / reprocessing infrastructure	Facility that uses an industrial process to change the physical structure and properties of a waste material so it can be used again. This can include facilities that dismantle products, such as tyres, e-waste and mattresses, and energy from waste facilities that use materials to generate energy.
Resale centre / shop	A centre/shop that enables the sale and subsequent reuse of good quality, saleable products and materials that were disposed of by their previous owner.
Residual waste	Residual material that remains after any source separation or reprocessing activities of recyclable materials or garden organics. Waste that is left over after suitable materials have been recovered for reuse and recycling. This generally means the environmental or economic costs of further separating and cleaning the waste are greater than any potential benefit of doing so.
Resin	Raw plastic polymer material.
Resource recovery	Total materials recovered including materials sent to recycling and energy recovery, including export and stockpiling, net of contaminants and residual wastes sent to disposal.
Resource recovery infrastructure	Facility that receives and manages materials to enable them to be reused or reprocessed. This includes drop off points, resale centres, resource recovery centres, transfer stations and materials recovery facilities.
Resource recovery rate	The proportion calculated by dividing resource recovery by waste generation (also referred to as the ‘recovery rate’).
Reusable packaging	Packaging or packaging component which has been designed to accomplish or proves its ability to accomplish a minimum number of trips or rotations in a system for reuse. Also see the related ‘Compostable packaging’ and ‘Recyclable packaging’ definitions. Supporting notes: 1. A trip is defined as transfer of packaging, from filling/loading to emptying/unloading. A rotation is defined as a cycle undergone by reusable packaging from filling/loading to filling/loading (ISO 18603). 2. The minimum number of trips or rotations refers to the fact that the ‘system for reuse’ in place should be proven to work in practice, i.e. that a significant share of the package is actually reused (measured e.g. by an average reuse rate or an average number of use-cycles per package). 3. A system for reuse is defined as established arrangements (organisational, technical or financial) which ensure the possibility of reuse, in closed-loop, open-loop or in a hybrid system (ISO 18603). 4. Reuse is an operation by which packaging is refilled or used for the same purpose for which it was conceived, enabling the packaging to be refilled (ISO 18603).

Term	Definition
	Also refer to the 'Single-use packaging' entry.
Reuse	Recovering value from a discarded resource without processing or remanufacture e.g. garments sold though opportunity shops.
Rigid packaging	Rigid plastic packaging such as bottles and tubs, which are (generally) moulded and hold their shape. Also refer to the 'Flexible packaging' entry.
Scrap packaging	Used packaging that has been recovered for reprocessing, but has not yet been reprocessed.
Secondary processing	A process undertaken after sorting in which a recovered material is put through an industrial process to change it so that it can be used as an input for the manufacture of new products. Also see ‘Reprocessor’.
Sectors / industry sectors	Groupings of industries used to generalise patterns in waste generation and disposal e.g. construction and demolition, food services including food retail and food manufacturing, small to medium enterprises.
Single-use packaging	Single-use packaging is defined as a packaging system or packaging component which has been principally designed to accomplish a single trip, even if some form of reuse is possible. Single-use packaging does not meet the definitional requirements of ISO 18603:2013 (Packaging and the environment – Reuse) as reusable packaging. Also refer to the 'Reusable packaging' entry.
Soft plastics packaging	Soft (flexible) plastics are generally defined as plastics that can be scrunched into a ball, unlike ‘rigid’ plastics such as bottles and tubs, which are moulded and hold their shape.
Solid industrial waste (SIW)	Solid waste generated from commercial, industrial or trade activities, including waste from factories, offices, schools, universities, state and federal government operations and commercial construction and demolition work. Excludes MSW and hazardous wastes.
Solid inert waste	Solid inert waste is hard waste that has a negligible activity or effect on the environment. The waste may be either a municipal or industrial waste.
Solid waste	Non-hazardous, non-prescribed, solid waste materials, ranging from municipal garbage to industrial waste.
Sorting / primary sorting	A process typically between collection (recovery) and reprocessing in which collected end-of-life materials are sorted (or disassembled) into more usable and economically valuable material fractions. Material recovery facilities (MRFs) are sorting facilities.
Sorting efficiency	Material processed at MRF or CDS divided by total packaging waste entering the system.
Source separation	The practice of segregating materials into discrete material streams prior to collection by, or delivery to, processing facilities.
Source stream	Either MSW, C&I, C&D or CDS.
Stockpile	Unprocessed or processed material where 500 tonnes or more of the same material has been held for more than six months.
Stockpiling	Storage of materials in line with the 'stockpile' definition.
Transfer coefficient	A derived factor that defines the partitioning of an input entering a process into a transformed material stream (e.g., the separation of PET from kerbside recycling materials at MRF).
Transfer station	Facility which receives materials from the waste stream for possible segregation, consolidation, or compaction for bulk transport for resource recovery, treatment or disposal facilities.
Unprocessed material	Material that is unrefined and has not been through any process of recycling.

Term	Definition
Virgin material	Material that has been sourced through primary resource extraction. Virgin materials are often referred to as primary materials. Virgin materials are not sourced from recycled materials (sometimes called secondary materials). For example, ‘virgin’ steel is manufactured from iron ore, and ‘virgin’ paper is manufactured from plantation sourced wood fibre.
Waste	Any discarded, rejected, unwanted, surplus or abandoned matter, including where intended for recycling, reprocessing, recovery, purification or sale. Anything that is no longer valued by its owner for use or sale and which is, or will be, discarded. In this document, the term 'solid waste' refers to non-hazardous, solid waste materials ranging from municipal garbage to industrial waste.
Waste packaging export	Export of (typically baled) scrap packaging materials sent off-shore for reprocessing.
Waste to energy	Refer to Energy from waste.

APPENDIX B – PACKAGING MATERIAL AND COMPONENT LISTS

The lists of packaging material (type) labels applied during data collection, analysis and reporting are provided in the following tables.

Two separate lists are provided for the consumption and recovery/disposal life cycle stages. These are as consistent as possible, while reflecting the difficulties of disaggregating data collection, particularly at the recovery/disposal stage.

Table B-1. Packaging types lists

Material types – Consumption related	Material type list – Collection or sorting output related	Material group
Boxboard/Cartonboard	Boxboard/Cartonboard	Paper & paperboard
Corrugated cardboard	Corrugated cardboard	Paper & paperboard
High wet strength carrier board	Other fibre packaging	Paper & paperboard
Kraft paper	Other fibre packaging	Paper & paperboard
Moulded fibreboard	Other fibre packaging	Paper & paperboard
Polymer coated paperboard – Aseptic	Polymer coated paperboard	Paper & paperboard
Polymer coated paperboard – Gable top	Polymer coated paperboard	Paper & paperboard
Polymer coated paperboard – Cold cup	Polymer coated paperboard	Paper & paperboard
Polymer coated paperboard – Hot cup	Polymer coated paperboard	Paper & paperboard
Polymer coated paperboard – Other	Polymer coated paperboard	Paper & paperboard
Other fibre packaging	Other fibre packaging	Paper & paperboard
N/A	Mixed paper & paperboard	Paper & paperboard
Newsprint and magazine	Newsprint and magazine	Paper & paperboard
Other fibre non-packaging	Other fibre non-packaging	Paper & paperboard
Glass – Amber	Glass – Amber	Glass
Glass – Flint	Glass – Flint	Glass
Glass – Green	Glass – Green	Glass
N/A	Glass – Mixed	Glass
Glass – Other	Glass – Other	Glass
Plastic – PET (1)	Plastic – PET (1)	Plastic
Plastic – HDPE (2)	Plastic – HDPE (2)	Plastic
Plastic – PVC (3)	Plastic – PVC (3)	Plastic
Plastic – LDPE (4)	Plastic – LDPE (4)	Plastic
Plastic – PP (5)	Plastic – PP (5)	Plastic
Plastic – PS (6)	Plastic – PS (6)	Plastic
Plastic – EPS (6)	Plastic – EPS (6)	Plastic
Plastic – Bioplastic – Compostable (7)	Plastic – Bioplastic – Compostable (7)	Plastic
Plastic – Other (7)	Plastic – Other (7)	Plastic
N/A	Plastic – Mixed (1–7)	Plastic
N/A	Plastic – Mixed (3–7)	Plastic

Material types – Consumption related	Material type list – Collection or sorting output related	Material group
N/A	Plastic – Mixed	Plastic
Plastic – Unidentified	Plastic – Unidentified	Plastic
Plastic – Non-packaging	Plastic – Non-packaging	Plastic
Aluminium – Beverage	Aluminium – Beverage	Metal
Aluminium – Non-beverage	Aluminium – Non-beverage	Metal
Aluminium – Other	Aluminium – Other	Metal
Steel – Tin-plate	Steel – Tin-plate	Metal
Steel – Mild steel	Steel – Mild steel	Metal
Steel – Stainless steel	Steel – Stainless steel	Metal
Steel – Other	Steel – Other	Metal
Metal – Other	Metal – Other	Metal
Fibreboard – Low-density	Fibreboard	Wood
Fibreboard – Medium-density	Fibreboard	Wood
Fibreboard – High-density	Fibreboard	Wood
Fibreboard – Oriented strand board	Fibreboard	Wood
Wood – Hard	Wood – Hard	Wood
Wood – Soft	Wood – Soft	Wood
Wood – Plywood	Wood – Plywood	Wood
Wood – Other	Wood – Other	Wood
Ceramic	Ceramic	Other
Cloth or fabric	Cloth or fabric	Other
Composite	Composite	Other
Other packaging	Other packaging	Other
Other non-packaging	Other non-packaging	Other
N/A	Commingled recyclables	Commingled recyclables
Contamination	Contamination	Other
Waste to landfill	Waste to landfill	Mixed wastes
Unknown	Unknown	Unknown

Table B-2. Packaging component groups

Packaging component groups	In scope?	Comments
Bag or pouch	Yes	Includes bags, bladders, envelopes, liners, nets, pouches (including peel pouches) and sachets
Barrel or drum	Yes	Barrels includes barrels, casks and kegs. Drums are plastic and steel containers of >20 L. Note that barrels, casks and kegs are not classified as drums. This group includes rigid intermediate bulk container (RIBC) and flexible intermediate bulk containers (FIBC).
Bottle or jar	Yes	See Table B-3 entries for more details.
Can	Yes	A metallic and generally cylindrical container of unspecified size. Includes aerosol containers.
Carton or box	Yes	See Table B-3 entries for more details.
Closure or label	Yes	See Table B-3 entries for more details.
Pallet or bin	Yes	Group for larger format packaging types not covered elsewhere.
Returnable plastic crate (RPC)	Yes	Returnable plastic crate (RPC).
Shopping bag	Yes	See Table B-3 entries for more details.
Tableware	Yes	Includes plates, bowls, straws, stirrers, cups, cup lids and cutlery, all intended for single-use.
Tub, tray or punnet	Yes	See Table B-3 entries for more details.
Tube or cartridge	Yes	See Table B-3 entries for more details.
Wrap	Yes	See Table B-3 entries for more details. Note that 'Film seals' have been moved to the 'Closure or label' group.
Other packaging component	No	See Table B-3 entries for more details.

Provided in the following table is the proposed list of packaging components, and the related groups (as summarised in Table B-2), to be adopted next year. Note that project reporting is generally not at the component level, but rather at the component group level summarised in Table B-2, except as identified elsewhere in this report.

Table B-3. Packaging components

Component	Component group	In scope?	Comments
Bag	Bag or pouch	Yes	A preformed, flexible container, generally enclosed on all but one side, which forms an opening that may or may not be sealed after filling.
Liner	Bag or pouch	Yes	A liner is any layer of material that is not acting as a bag or wrapper, but is being used to protect or separate contents from outer packaging. Can be found as inner linings of liquid or pressurised containers (B2C), or as lining cartons in B2B use. Note, bags or wrappers may also be used, where liners are present.
Net	Bag or pouch	Yes	A container of meshwork material made from threads or strips twisted or woven to form a regular pattern with spaces between the threads that is used for holding, carrying, trapping, or confining something.
Pouch	Bag or pouch	Yes	A preformed, flexible container, typically enclosed with a gusset seal at the bottom of the pack can be shaped/arranged to allow the pack to stand on shelf. Pouches are currently used in a wide range of packaging. Specifically, pouches can be for single-serve food item and as such may have integrated mouthpiece, which is not detachable. 'Pouch' also includes 'Envelopes', which are a predominantly flat container of flexible material having only two faces, and joined at three edges to form an enclosure. The non-

Component	Component group	In scope?	Comments
			joined edge provides a filling opening, which may later be closed by a gummed or adhesive flap, heat seal, tie string, metal clasp, or other methods. Also includes packages used for sterile products which may be torn open without touching the product inside (peel pouches).
Sachet	Bag or pouch	Yes	A small sealed bag or packet containing a small quantity of a product, usually food related.
Barrel, cask or keg	Barrel or drum	Yes	This packaging component includes barrels, casks and kegs. Packaging of circular cross-section, with greater length than breadth, with convex sides and two ends of equal diameter. A barrel is normally made of wooden staves bound together with hoops. Note that barrels, casks and kegs are not classified as drums.
Drum	Barrel or drum	Yes	Plastic and steel containers of >20 L. Cylindrical packaging whose bottom end is permanently fixed to the body and top end (head) is either removable or non-removable. Note that barrels, casks and kegs are not classified as drums.
IBC – flexible	Barrel or drum	Yes	A non-rigid container used for transport and storage of fluids and other bulk materials. The construction of the IBC container and the materials used are chosen depending on the application, but is typically woven polypropylene fabric reinforced with nylon or polyester strapping.
IBC – rigid	Barrel or drum	Yes	A rigid intermediate bulk container (RIBC) that is attached to a pallet or has the pallet integrated into the RIBC. The container is used for the transport and storage of fluids and other bulk materials. The construction of the IBC container and the materials used are chosen depending on the application. There are various types available in the market place: Foldable (collapsible) IBC Container, Plastic composite IBC Container, Wire Cage IBC Container, Steel IBC Container, and Stainless steel IBC Container.
Bottle	Bottle or jar	Yes	A container having a round neck of relatively smaller diameter than the body and an opening capable of holding a closure for retention of the contents. Specifically, a narrow-necked container as compared with a jug, jar or wide-mouth container. The cross section of the bottle may be round, oval, square, oblong, or a combination of these. The bottle may also have an integrated handle. Bottles generally are made of glass or plastics, but can also be earthenware or metal. Bottle may be disposable, recyclable, returnable, or reusable.
Jar	Bottle or jar	Yes	A rigid container made of glass, stone, earthenware, plastic or other appropriate material with a large opening, which is used to store products, (e.g., jams, cosmetics). Usually with a secure closure
Jug	Bottle or jar	Yes	A rigid container with a handle, and large opening or spout for holding and pouring liquids, generally with no secure closure. They can be cylindrical, round, oval, square, oblong, or a combination of these.
Aerosol	Can	Yes	A gas-tight, pressure-resistant container with a valve and propellant. When the valve is opened, propellant forces the product from the container in a fine or coarse spray pattern or stream. (e.g., a spray can dispensing paint, furniture polish, etc, under pressure). It does not include atomizers, because atomizers do not rely on a pressurised container to propel product from the container.
Can	Can	Yes	A metallic and generally cylindrical container of unspecified size. Generally unpressurised.
Box	Carton or box	Yes	A non-specific term used to refer to a rigid, three-dimensional container with closed faces that completely enclose its contents and may be made out of any material.
Carton	Carton or box	Yes	A non-specific term for an open or re-closable container used mostly for perishable foods (e.g. eggs, or fruit). Includes aseptic PCPB packs or 'bricks', which are defined as rectangular-shaped, stackable packages designed primarily for liquids such as juice or milk. Includes gable top PCPB cartons, which are rectangular-shaped, non-stackable packages designed primarily for liquids such as juice or milk.
Crate (single-use)	Carton or box	Yes	A non-specific term usually referring to a rigid three-dimensional container with semi-closed faces that enclose its contents for shipment or storage. Crates could have an open or closed top and may have internal dividers.
Wrap or	Carton or box	Yes	Cardboard (typically) wraps and baskets for beer, soft drink, ready to drink pre-mix beverages, and multi-packs of single-serve food

Component	Component group	In scope?	Comments
basket			containers or tins. Note that non-beverage 'wrappers' are defined as a separate packaging component, and in a different component group.
Closure	Closure or label	Yes	Lids, caps, stoppers and all other closures.
Hook, kimble, affixing item	Closure or label	Yes	Includes: hooks for hanging clothing or displays; plastic kimbles that attach tags, accessories, and similar to clothing; string or other methods of attaching tags and accessories to clothing; and any other item that is used to link, attach or fix something temporarily to a product prior to sale.
Label	Closure or label	Yes	Separately affixed labels, that is, labels that are a separate component and are not printed directly onto packaging components with other major functions. Can include stickers,
Seal	Closure or label	Yes	Containment, freshness or safety seals on rigid containers. Usually plastic, polymer coated paper/paperboard, or aluminium foil.
Bin	Pallet or bin	Yes	A three-dimensional container which either has a pallet platform permanently attached at its base or alternatively requires a platform for its handling and storage as due to its constitution it cannot be handled without it. Also referred to as a 'pallet box'.
Cage	Pallet or bin	Yes	Includes containers enclosed on at least one side by a grating of wires or bars that lets in air and light.
Pallet	Pallet or bin	Yes	A platform used to hold or transport unit loads.
Skid	Pallet or bin	Yes	A group of parallel runners (usually made from timber) attached to a single top-desk or the undersides of boxes, crates, and machines to allow entry of platform trucks or fork lift tines. Unlike a pallet, a skid has no bottom deck.
Stillage	Pallet or bin	Yes	Includes containers enclosed on at least one side by a grating of wires or bars that lets in air and light.
Milk crate	Returnable plastic crate (RPC)	Yes	Non-collapsible RPCs typically used as B2B shelf ready packaging for transporting milk bottles from dairy-processing companies to supermarkets.
RPC	Returnable plastic crate (RPC)	Yes	Collapsible RPCs typically used as B2B shelf ready packaging for transporting fruit and vegetables from farms to supermarkets. Also known as 'Reusable plastic crates'.
Produce bag	Shopping bag	Yes	A bag intended for single-use, without handles, for holding fresh produce.
Reusable bag	Shopping bag	Yes	A bag with handles, intended for carrying shopping, multiple uses are possible.
Single-use bag	Shopping bag	Yes	A bag with handles, intended for carrying shopping and for single-use.
Other bag	Shopping bag	Yes	Any other shopping bag, not already described in other categories.
Bowl	Tableware	Yes	Any size bowl, intended for single-use for takeaway food.
Cup	Tableware	Yes	Any size cup, intended for single-use for takeaway drinks. Can be made from polymer-coated paperboard (PCPB), polystyrene (PS) or expanded polystyrene (EPS).
Cup lid	Tableware	Yes	A closure for single-use cup, commonly made from polystyrene. Can also be from polypropylene (PP) or bioplastic (PLA).
Cutlery	Tableware	Yes	Any type of utensil, usually fork, knife, or spoon, or combination of two, intended for single-use. Can be part of a shelf product, or accompany take-away food. Usually made from plastic or wood(other stuff…?).
Plate	Tableware	Yes	Any size plate, intended for single-use for takeaway food.
Stirrer	Tableware	Yes	Intended for single-use, to stir drinks. Usually made of plastic.
Straw	Tableware	Yes	Any size straw, intended for single-use. Usually plastic or waxed paper.
Blister pack	Tub, tray or punnet	Yes	A type of packaging in which the item is secured between a thermoformed dome or “bubble” (usually transparent plastic) and a paperboard surface or “carrier.” This packaging component relates to the plastic bubble component only, not any non-plastic carrier. Attachment to the carrier may be by stapling, heat- sealing, gluing, or other means. In other instances, the blister folds over the product in clam-shell fashion to form an enclosing container. Blisters are often thermoformed from polyvinyl chloride. However, almost any

Component	Component group	In scope?	Comments
			thermoplastic can be thermoformed into a blister. Where a blisterpack is made from a plastic polymer the packaging is usually thermoformed (sheet plastic is heated to soften and then placed into a mould).
Carrier	Tub, tray or punnet	Yes	The base of a blister pack. The base is what the preformed shape attaches to, by stapling, heat- sealing, gluing, or other means. The carrier is usually made of boxboard/cartonboard and often has labelling printed on it.
Pot	Tub, tray or punnet	Yes	A flat-bottomed container that has a base of any shape and which may or not be closed with a lid. Pots are usually made of cardboard, plastic, ceramic, metal or other materials and may be used for a wide array of products such as cosmetics, food/liquids, dairy products, plants.
Punnet or clamshell	Tub, tray or punnet	Yes	A punnet is a small box or square basket for the transport and sale of fruit and vegetables, typically for small fruits such as berries. Punnets can consist of a base only, a separable base and lid, or be a one-piece container consisting of a base and lid joined by a hinge area which allows the pack to come together to close. A clamshell is typically a one-piece container consisting of a base and lid joined by a hinge area which allows the pack to come together to close. The clamshell format is often also used in takeaway food packaging. NOTE: Punnets have base and closure of same material, so they are considered to be same component and weighed together. This is consistent with how the clamshell format is weighed. Where a punnet or clamshell is made from a plastic polymer the packaging is usually thermoformed (sheet plastic is heated to soften and then placed into a mould).
Tray	Tub, tray or punnet	Yes	A shallow container, usually rectangular, which may or may not have a cover, and is used for displaying or carrying items. The base is bigger than the height. It may have moulded pockets or forms for holding contents. Where a tray is made from a plastic polymer the packaging is usually thermoformed (sheet plastic is heated to soften and then placed into a mould).
Tub	Tub, tray or punnet	Yes	A flat-bottomed container that has a base of any shape and which may or not be closed with a lid. The height is usually greater than the base. Usually made of paper, plastic or other materials, these containers are typically used to contain mostly (but not exclusively) foods such as ice cream, margarine, yoghurt, sour cream, confections, etc. Includes 'cups', usually for smaller volume product.
Cartridge	Tube or cartridge	Yes	A rigid cylindrical container holding a item or substance, typically designed for insertion into a delivery mechanism.
Tube – flexible	Tube or cartridge	Yes	A flexible cylindrical container sealed on one end that could be closed with a cap or dispenser on the other end.
Tube – rigid	Tube or cartridge	Yes	A rigid cylindrical component for holding product around the outside, typically designed for holding and dispensing yarn, string or flexible films. Includes consumer packaging 'Reels' and 'Rolls'.
Shrink wrap	Wrap	Yes	A plastic film around an item or group of items which is heated causing the film to shrink, securing the film. The use of shrunken film to tightly wrap a package or a unit load in order to bind, protect and immobilise it for further handling or shipping.
Sleeve	Wrap	Yes	A non-rigid container usually made of paper, cardboard or plastic, that is open-ended and is slid over the contents for protection or presentation.
Strapping or banding	Wrap	Yes	Something used to bind, tie, or encircle the item or its packaging to secure and maintain unit integrity.
Stretch wrap	Wrap	Yes	A high-tensile plastic film, stretched and wrapped repeatedly around an item or group of items to secure and maintain unit integrity. The use of stretch film to tightly wrap a package or a unit load in order to bind, protect and immobilise it for further handling or shipping. This includes both B2B and B2C use.
Wrapper	Wrap	Yes	The process of enclosing all or part of an item with layers of flexible wrapping material (e.g. chocolate blocks). Does not include items which are shrink-wrapped or vacuum-packed. Note that cardboard beverage 'wraps' are defined as a separate packaging component, and in a different component group.
Absorbent	Other packaging	Yes	Pouches, sachets or similar filled with an absorbent material or

Component	Component group	In scope?	Comments
	component		chemical for absorbing liquids or gases. Often used to extend the shelf-life of fresh foods but also used with clothing, electronic items, papergoods and other products.
Applicator	Other packaging component	Yes	Includes balls for roll-on deodorants, pump dispensers from sprays and atomizers, and the tubing and springs that accompany such, and any other fitting that is used to apply a product. Also includes plastic components used to present goods at point of sale, such as plastic components used to present and hold disposable razors and razor blades.
Basket	Other packaging component	No	A semi rigid container usually open at the top traditionally used for gathering, shipping and marketing agricultural products.
Coat hanger	Other packaging component	No	Coat hangers for clothes.
Dunnage	Other packaging component	No	Loose wood, matting, or similar material used to keep a cargo in position during sea, road or air transport.
Rack	Other packaging component	No	A non-specific term identifying a framework or stand for carrying, holding, or storing items. Commonly on wheels and primarily used in the logistical functions to deliver items such as hanging garments, or items on shelves such as dairy products and bakery items and flowers.
Reel	Other packaging component	No	A B2B spool on which thread, wire, film, etc, is wound. Any device on which a material may be wound. Usually has flanged ends and is used for shipping or processing purposes.
Slip sheet	Other packaging component	Yes	A strong sheet of plastic, cardboard or other material which may be grabbed, hooked or attached to a forklift or other transportation equipment. The slip sheet is used to pull the products stacked on top of it, i.e. to remove all products from a pallet in one action.
Void fill	Other packaging component	Yes	Materials use to prevent goods from moving around and being damaged within secondary freight packaging (typically corrugated cardboard boxes). Types of void fill include bubble wrap, creased kraft paper and EPS foam.
Other packaging component	Other packaging component	Yes	Packaging components not currently specified on the list.

Table B-4. Reusable packaging systems

System	Packaging level	Sector of use	Profiled in 2018–19 (Section 5)	Comments
Kegs – Beer & cider	Primary	B2B	Yes	-
Plastic crates – Collapsible – RPCs	Secondary	B2B	Yes	-
Plastic crates – Non-collapsible – Dairy	Secondary	B2B	Yes	-
Reusable pallets – Plastic	Tertiary	B2B	Yes	Includes display pallets.
Reusable pallets – Timber	Tertiary	B2B	Yes	Includes display pallets.
Reusable shopping bags – LDPE bags (supermarket type)	Secondary	B2C	Yes	-
Reusable shopping bags – Non-woven PP (NWPP) bags	Secondary	B2C	Yes	-
Barrels and drums	Primary	B2B	No	Excludes beer kegs (and kegs for other beverages) and IBCs.
Beverage bottles	Primary	B2C	No	-
Coat hangers	Primary	B2C	No	-
Cups/mugs	Primary	B2C	No	-
Gas cylinders – BBQ gas bottles	Primary	B2C	No	-
Gas cylinders – Compressed CO2 cylinders for home beverage carbonation	Primary	B2C	No	For example Sodastream.
Intermediate bulk containers	Tertiary	B2B	No	-

System	Packaging level	Sector of use	Profiled in 2018–19 (Section 5)	Comments
Kegs – Other beverages	Primary	B2B	No	-
Metal stillages	Tertiary	B2B	No	-
Pallet slip sheets, wrapping and strapping	Tertiary	B2B	No	-
Plastic crates – Non-collapsible – Non-dairy	Secondary	B2B	No	For example the AusPost fluted polypropylene crate system.
Plastic crates – Trays	Secondary	B2B	No	For example bread trays.
Produce bins	Tertiary	B2B	No	-
Reusable consumer packaging	Primary	B2C	No	For example the Loop/TerraCycle refillable food and personal care packaging system.
Tableware	Primary	B2C	No	-
Toner cartridges	Primary	B2C + B2B	No	-

APPENDIX C – JURISDICTIONAL DATA

Table C-1. Australian packaging consumption and recovery data in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	3 262 000	2 045 000	63%
Glass	1 283 000	574 000	45%
Plastic	1 000 000	182 000	18%
Metal	246 000	137 000	56%
Wood	124 000	44 000	36%
Total	**5 916 000**	**2 982 000**	**50%**

Table C-2. ACT packaging consumption and recovery data in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	62 000	43 000	70%
Glass	22 000	9 000	42%
Plastic	17 000	4 000	25%
Metal	4 000	2 000	40%
Wood	2 000	1 000	36%
Total	**106 000**	**59 000**	**55%**

Table C-3. NSW packaging consumption and recovery data in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	1 130 000	701 000	62%
Glass	409 000	218 000	53%
Plastic	321 000	61 000	19%
Metal	79 000	49 000	63%
Wood	40 000	14 000	36%
Total	**1 978 000**	**1 044 000**	**53%**

Table C-4. NT packaging consumption and recovery data in 2018–19, by material group

Material group	POM (tonnes)	Recovery (tonnes)	Recovery rate (%)
Paper & paperboard	32 000	9 000	27%
Glass	12 000	6 000	47%
Plastic	10 000	1 000	9%
Metal	2 000	1 000	58%
Wood	1 000	0	36%
Total	**57 000**	**17 000**	**30%**

Table C-5. QLD packaging consumption and recovery data in 2018–19, by material group

Material group	POM (tonnes)	Recovery (tonnes)	Recovery rate (%)
Paper & paperboard	647 000	338 000	52%
Glass	258 000	63 000	24%
Plastic	200 000	18 000	9%
Metal	49 000	24 000	48%
Wood	25 000	9 000	36%
Total	**1 179 000**	**451 000**	**38%**

Table C-6. SA packaging consumption and recovery data in 2018–19, by material group

Material group	POM (tonnes)	Recovery (tonnes)	Recovery rate (%)
Paper & paperboard	211 000	134 000	63%
Glass	89 000	52 000	59%
Plastic	68 000	18 000	26%
Metal	17 000	9 000	52%
Wood	9 000	3 000	36%
Total	**394 000**	**215 000**	**55%**

Table C-7. TAS packaging consumption and recovery data in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	64 000	34 000	52%
Glass	27 000	0	0%
Plastic	21 000	3 000	15%
Metal	5 000	2 000	34%
Wood	3 000	1 000	36%
Total	**120 000**	**40 000**	**33%**

Table C-8. VIC packaging consumption and recovery data in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	801 000	649 000	81%
Glass	334 000	167 000	50%
Plastic	261 000	65 000	25%
Metal	64 000	34 000	53%
Wood	32 000	12 000	36%
Total	**1 492 000**	**927 000**	**62%**

Table C-9. WA packaging consumption and recovery data in 2018–19, by material group

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	316 000	138 000	44%
Glass	133 000	60 000	45%
Plastic	103 000	12 000	12%
Metal	25 000	16 000	63%
Wood	13 000	5 000	36%
Total	**590 000**	**230 000**	**39%**

APPENDIX D – EMPLOYMENT AND CAPACITY DATA

This year, the project included an expanded scope to quantify 2018–19 packaging industry employment and facility capacity (existing and planned). This included:

- Packaging related employment by companies undertaking packaging manufacturing or reprocessing. A national survey of MRF operators was not undertaken for the project, so the employment data does not include MRF related employment.
- Packaging related facility capacity (existing and planned). Planned capacity increases are those that relate to increased use of post-consumer packaging in manufacturing or post-consumer packaging reprocessing, and where capital works are approved and funded.

D.1 Packaging industry employment

Estimates of 2018–19 packaging related employment in terms of equivalent full-time employees (EFTE) are provided in Tables D-1 and D-2, by organisation type, for packaging manufacturers and reprocessors respectively. Employment is also normalised to 10 kt of throughput to provide a standard basis for comparisons.

Table D-1. Number of employees involved in packaging manufacturing related activities

Organisation type	Employment	Normalised employment
	(EFTE)	(EFTE/10 kt)
Manufacturer – fibre	5 700	17.5
Manufacturer – glass	3 700	28.8
Manufacturer – metals	3 600	147.4
Manufacturer – plastics	21 800	217.6
Total	**34 800**	**58.8**

Table D-2. Number of employees involved in packaging reprocessing related activities

Organisation type	Employment	Normalised employment
	(EFTE)	(EFTE/10 kt)
Reprocessor – fibre	900	4.5
Reprocessor – glass	400	6.2
Reprocessor – metals	100	5.0
Reprocessor – plastics	1 800	109.5
Total	**3 200**	**10.7**

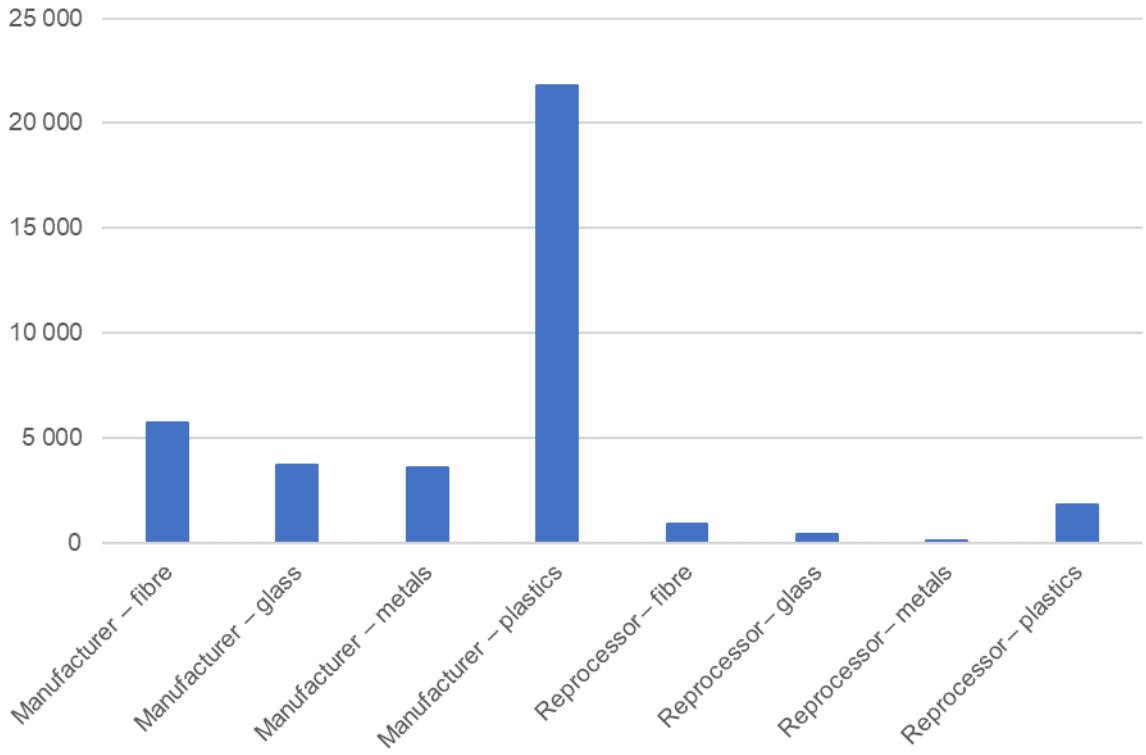


Figure D-1. Number of employees involved in packaging related activities (EFTE)

D.2 Facility capacities

D.2.1 Packaging manufacturers

Packaging manufacturers were surveyed to collect data on facilities (by count and quantity) with funded and approved plans to increase the use of post-consumer recycled content in packaging over the next few years. The summary results by facility count are provided in Table D-3, and by quantity of increased use of post-consumer packaging (tonnes) in Table D-4.

Table D-3. Manufacturing facilities with funded and approved plans to increase use of post-consumer recycled content in packaging over the next few years, by material group

Material group	Yes	No	Maybe	No response	Total
	(count)	(count)	(count)	(count)	(count)
Paper & paperboard	0	4	0	28	**32**
Glass	4	4	0	3	**11**
Plastic	5	5	4	28	**42**
Metal	0	0	1	7	**8**
Total	**9**	**13**	**5**	**67**	**94**

Table D-4. Manufacturing facilities with funded and approved plans to increase use of post-consumer recycled content in packaging over the next few years, by material group

Material group	Yes	No	Maybe	No response	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	0	N/A	0	N/A	**0**
Glass	176 745	N/A	0	N/A	**176 745**
Plastic	16 650	N/A	0	N/A	**16 650**
Metal	0	N/A	0	N/A	**0**
Total	**193 395**	**N/A**	**0**	**N/A**	**193 395**

D.2.2 Packaging reprocessors – Existing capacity

Packaging reprocessors were surveyed to collect data on their average reprocessing capacity utilisation in 2018–19, by material type and capacity utilisation category. The summary results by utilisation category are provided in Table D-5 and Figure D-2. The tonnages reported are the reprocessing throughput for the facilities that reported under each capacity utilisation category. These quantities are then converted to estimate 'spare' capacities in Table D-6 and Figure D-3.

Table D-5 – Average reprocessing capacity utilisation in 2018–19, by material group and capacity utilisation category

Material group	At <50% capacity	At 50% capacity	At 75% capacity	At 90% capacity	At capacity	No response	Not applicable[a]	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	0	0	57 600	661 600	464 600	0	861 000	**2 044 800**
Glass	11 300	117 000	0	59 000	4 900	356 600	25 000	**573 700**
Plastic	100	2 400	3 900	0	16 800	30 200	128 600	**182 100**
Metal	0	0	0	0	0	20 900	116 100	**137 000**
Wood	0	0	0	0	0	44 400	0	**44 400**
Total	**11 400**	**119 400**	**61 500**	**720 600**	**486 300**	**452 100**	**1 130 700**	**2 981 900**

a) The 'Not applicable' quantity is mostly exported material.

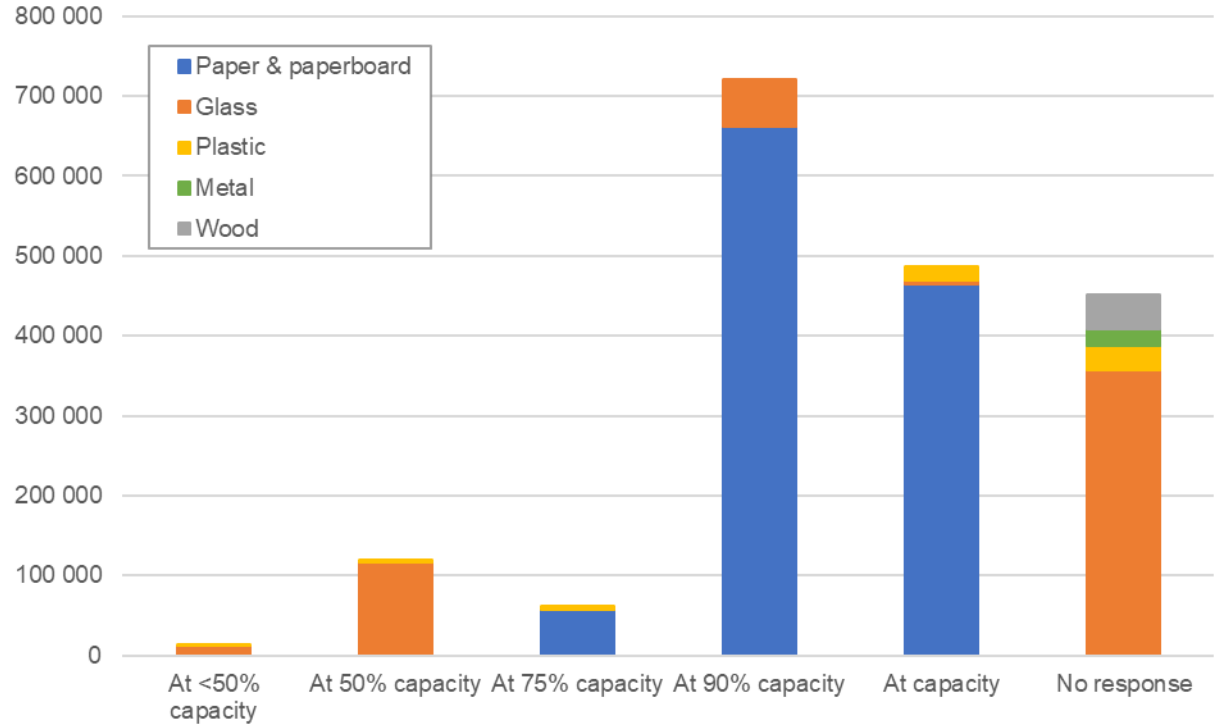


Figure D-2. Average reprocessing capacity utilisation in 2018–19, by material group and capacity utilisation category (tonnes)

Table D-6 and Figure D-3 present the estimated quantities of spare reprocessing capacity nationally in 2018–19. Total reported spare capacity was 254 kt, which is nearly 10% of actual reprocessing. There would also have been some additional spare capacity at those reprocessors that did not report their capacity utilisation. These reprocessors made up 15% of total recovery.

Table D-6. Spare reprocessing capacity utilisation in 2018–19, by material group and capacity utilisation category

Material group	At <50% capacity[a]	At 50% capacity	At 75% capacity	At 90% capacity	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	0	0	19 200	73 500	92 700
Glass	33 800	117 000	0	6 600	157 300
Plastic	400	2 400	1 300	0	4 000
Metal	0	0	0	0	0
Wood	0	0	0	0	0
Total	**34 100**	**119 400**	**20 500**	**80 100**	**254 100**

a) Reprocessors that reported being at less than 50% capacity in 2018–19 were assumed to be at 25% capacity utilisation in calculating spare capacity, i.e. half-way between 0% and 50%.

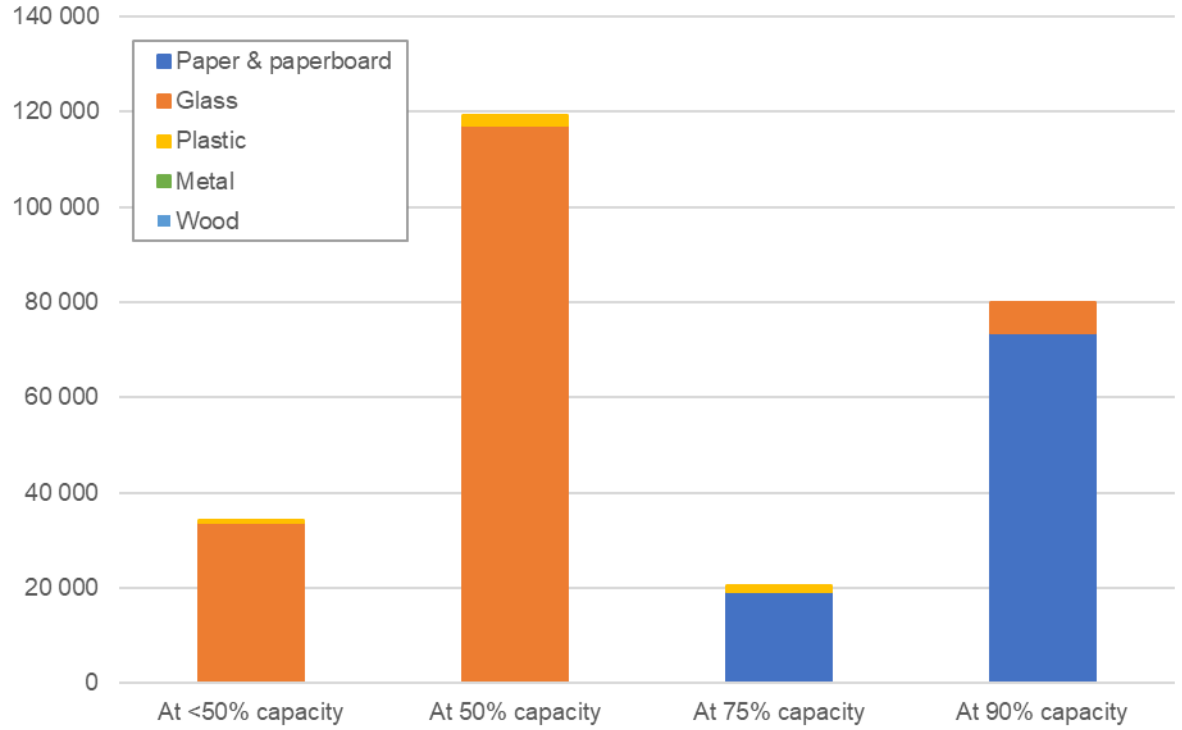


Figure D-3. Spare reprocessing capacity utilisation in 2018–19, by material group and capacity utilisation category (tonnes)

D.2.3 Packaging reprocessors – Planned new capacity

Packaging reprocessors were surveyed to collect data on their funded and approved plans to increase reprocessing capacity over the next 6 years, by material type. The summary results by material group are provided in Table D-7 and Figure D-4. There was 113 kt of new reprocessing capacity reported to be in the pipeline, 72% of which was related to plastic packaging reprocessing.

Table D-7. Expected increase in reprocessing capacity over the next 6 years, by material group

Material group	Quantity (tonnes)
Paper & paperboard	0
Glass	29 000
Plastic	81 000
Metal	3 000
Total	**113 000**

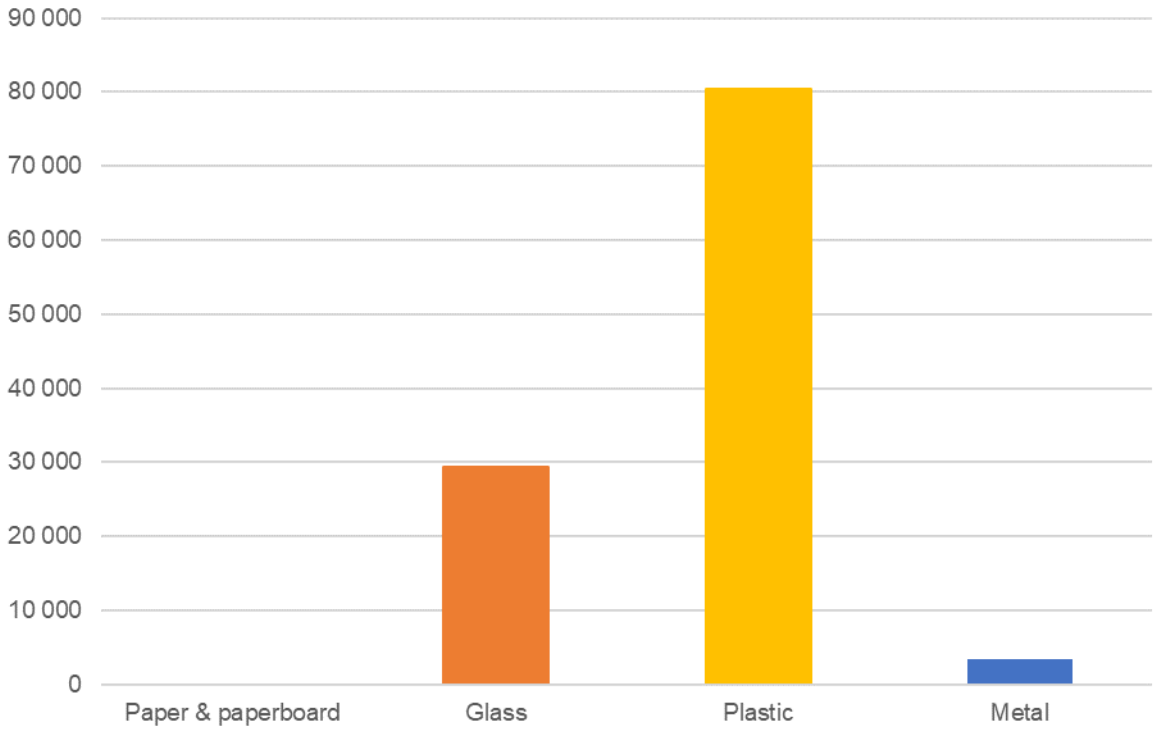


Figure D-4. Expected increase in reprocessing capacity over the next 6 years, by material group (tonnes)

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