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AUSTRALIAN PACKAGING CONSUMPTION & RECOVERY DATA 2020-21

APCO
AUSTRALIAN PACKAGING COVENANT ORGANISATION

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Acknowledgements

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Authors

Report prepared by Blue Environment and IndustryEdge on behalf of APCO.

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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).

This report provides packaging consumption and recovery data for Australia for financial year 2020–21, to inform the measurement of progress towards the 2025 Targets. This is the fourth iteration of the annual report, which began with a 2017–18 base year.

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

Please note: In the tables presented in this report, minor discrepancies may occur between summed totals 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

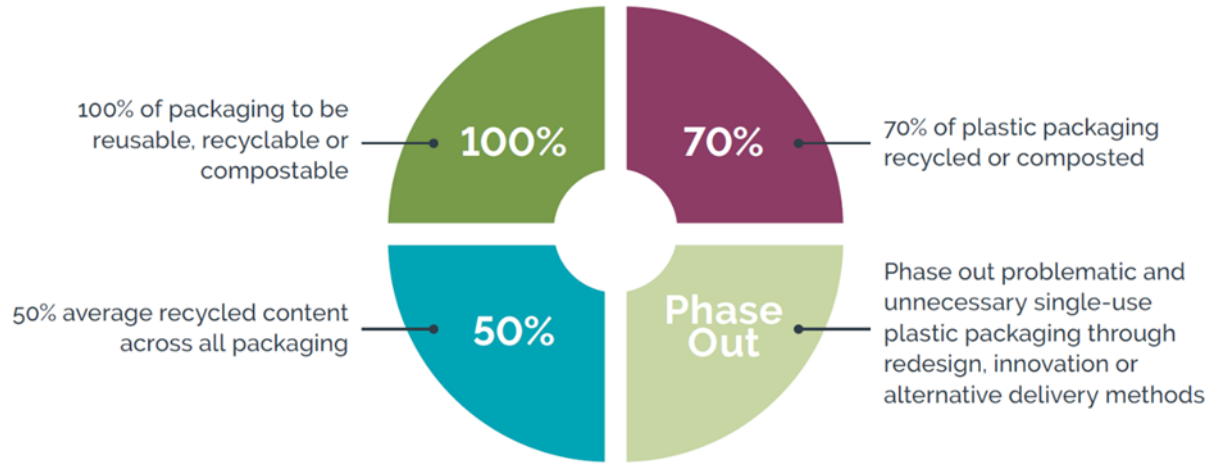

Figure ES-1 – Australia's 2025 National Packaging Targets.

Packaging consumption

2020–21

Total packaging placed on market (POM) in Australia in 2020–21 is estimated at 6.74 million tonnes (±12%). 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 6.74 million tonnes of packaging POM in 2020–21, around half was paper & paperboard packaging (50.3%), followed by glass packaging (19.0%), plastic packaging (17.5%), wood packaging (9.5%), and metal packaging (3.8%).

Estimates for packaging POM by material group are provided in **Table ES-1** and **Figure ES-2**. The aggregated accuracy range estimates for each of the material groups are also provided as error bars in **Figure ES-2**.

Table ES-1 – Packaging POM in 2020–21, by material group.

Material group	POM			Accuracy range
	(tonnes)	(%)	(kg/person)	(±%)
Paper & paperboard	3,387,000	50.3%	132	7%
Glass	1,283,000	19.0%	50	12%
Plastic	1,179,000	17.5%	46	16%
Metal	254,000	3.8%	10	9%
Wood	638,000	9.5%	25	34%
Total	**6,740,000**	**100.0%**	**262**	**12%**

The accuracy ranges are weighted sum averages of packaging manufacturer reported estimates of the level of accuracy (±%) of packaging POM. The accuracy range provides an estimate of the range within which the true value can be found, with the reported value being the best estimate of the true value.

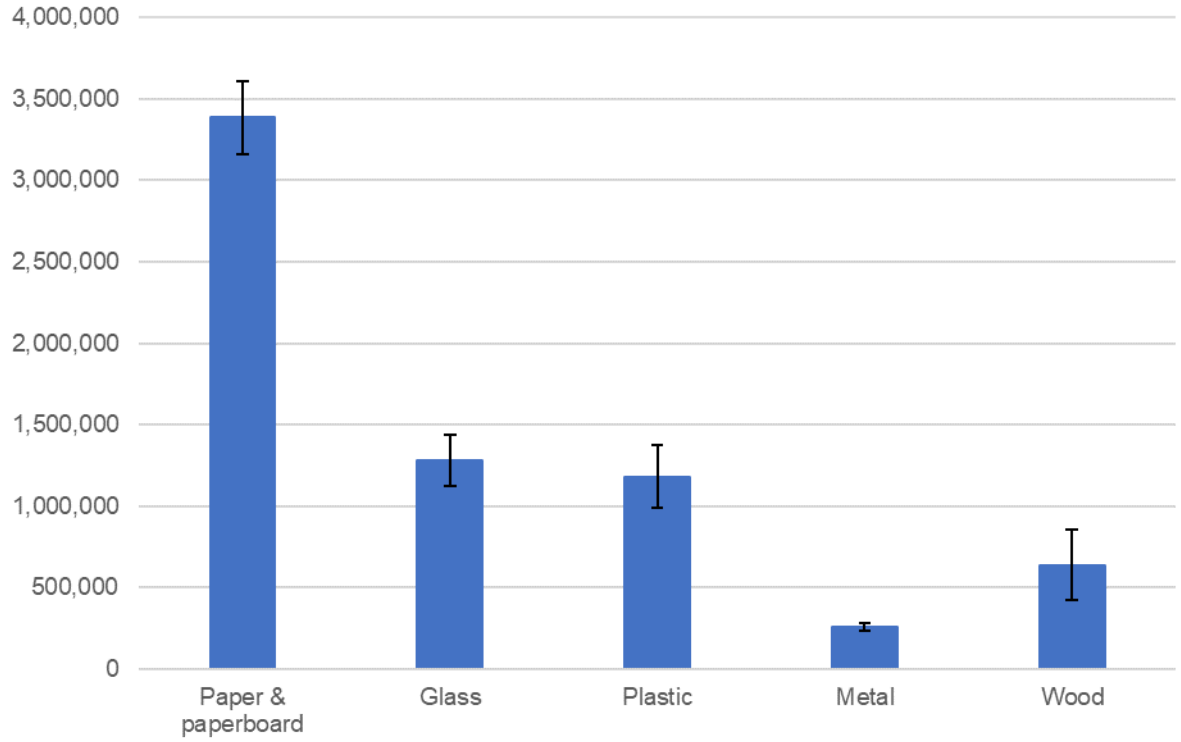

Figure ES-2 – Total tonnes of packaging POM in 2020–21, by material group.

Progress from 2017–18 to 2020–21

In 2020–21, packaging POM increased by 8% compared to the 2019–20 estimate of 6.27 million tonnes.

The survey identified more business-to-business (B2B) wood packaging POM in 2019–20 and 2020–21, which has influenced the result. Excluding wood provides a more comparable trend estimate. This gives an estimated total packaging POM of 6.10 million tonnes in 2020–21, up 5% from the comparable estimate of 5.80 million tonnes in 2019–20.

The most significant trends in packaging POM, excluding wood, were increases in glass packaging (+11%) and plastic packaging (+5%).

Table ES-2 compares POM data by material group from 2017–18 to 2020–21.

Table ES-2 – Packaging POM from 2017–18 to 2020–21, by material group, including a change percentage between 2019-20 and 2020-21.

Material group	2017–18	2018–19	2019–20	2020–21	Change 2019–20 to 2020–21
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Paper & paperboard	2,901,000	3,262,000	3,277,000	3,387,000	3%
Glass	1,273,000	1,283,000	1,156,000	1,283,000	11%
Plastic	1,067,000	1,000,000	1,124,000	1,179,000	5%
Metal	213,000	246,000	248,000	254,000	2%
Wood[a]	NR[b]	124,000	462,000	638,000	38%
Total (tonnes)	**5,453,000**	**5,916,000**	**6,266,000**	**6,740,000**	**8%**
Total (kg/person)	**218**	**234**	**244**	**262**	**7%**

a) The apparent large year-on-year increases in wood packaging is due to improvements in survey coverage.

b) NR – Not reported.

Packaging recovery

2020–21

Total Australian post-consumer packaging recovery in 2020–21 is estimated at 3.79 million tonnes (±13%). This recovery estimate is measured at the out-going gate of the secondary processing facility for the used packaging.

Of the packaging recovered in 2020–21, nearly two thirds were paper & paperboard packaging (62.6%), followed by glass packaging (21.2%), plastic packaging (5.5%), wood packaging (6.9%), and metal packaging (3.9%).

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

Table ES-3 – Post-consumer packaging recovery in 2020–21, by material group.

Material group	Recovery			Accuracy range
	(tonnes)	(%)[a]	(kg/person)	(±%)
Paper & paperboard	2,370,000	62.6%	92	12%
Glass	805,000	21.2%	31	10%
Plastic	207,000	5.5%	8	14%
Metal	147,000	3.9%	6	17%
Wood	260,000	6.9%	10	21%
Total	**3,788,000**	**100.0%**	**147**	**13%**

a) Percent contribution to the total tonnes of packaging recovered, not the individual material recovery rate.

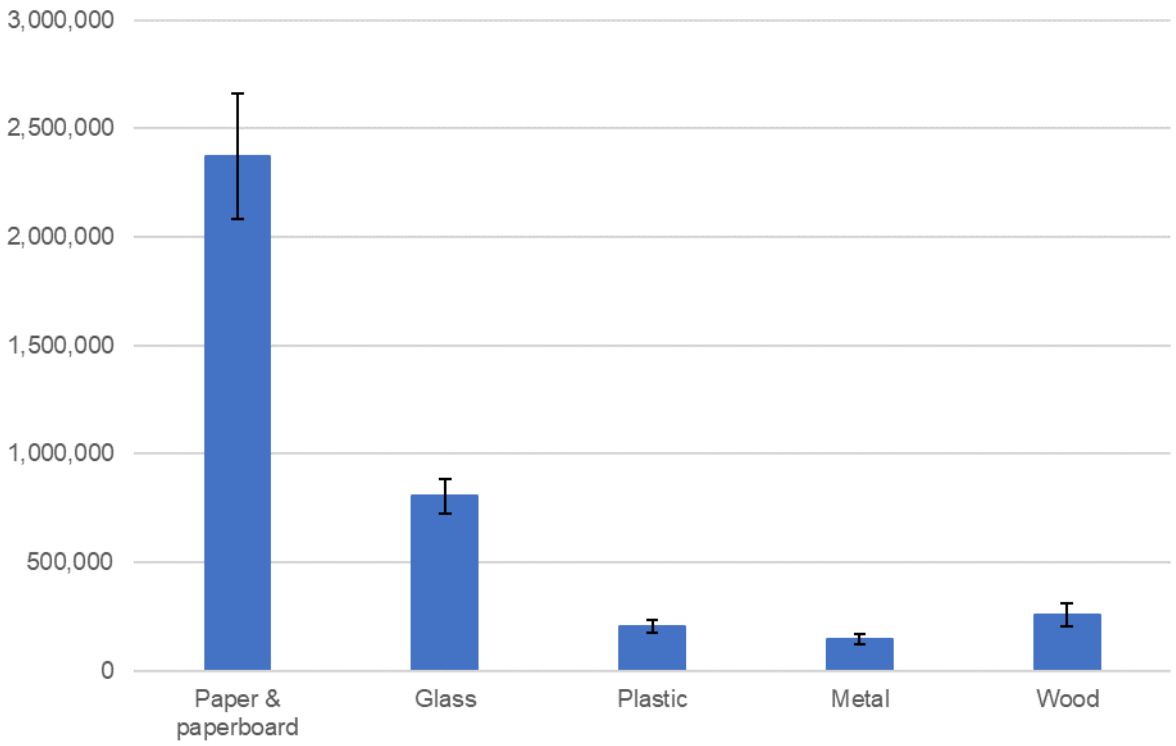

Figure ES-3 – Post-consumer packaging recovery in 2020–21, by material group (tonnes).

Progress from 2017–18 to 2020–21

Packaging recovery in 2020–21 was 3.79 million tonnes, which was an 11% increase (+0.37 million tonnes) on the 2019–20 packaging recovery estimate of 3.42 million tonnes.

Excluding wood, 3.53 million tonnes of packaging was recovered in 2020–21, a 9% increase on the 2019–20 estimate of 3.25 million tonnes.

Table ES-4 compares recovery data by material group from 2017–18 to 2020–21.

Table ES-4 – Post-consumer packaging recovery from 2017–18 to 2020–21, by material group, including a change percentage between 2019-20 and 2020-21.

Material group	2017–18	2018–19	2019–20	2020–21	Change 2019–20 to 2020–21
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Paper & paperboard	1,817,000	2,045,000	2,229,000	2,370,000	6%
Glass	582,000	574,000	699,000	805,000	15%
Plastic	173,000	182,000	179,000	207,000	16%
Metal	102,000	137,000	139,000	147,000	5%
Wood[a]	NR[b]	44,000	171,000	260,000	52%
Total (tonnes)	**2,673,000**	**2,982,000**	**3,416,000**	**3,788,000**	**11%**
Total (kg/person)	**107**	**118**	**133**	**147**	**11%**

a) The apparent large year-on-year increases in wood packaging is due to improvements in survey coverage.

b) NR – Not reported.

Packaging recovery rates

2020–21

The Australian post-consumer packaging recovery rate in 2020–21 is estimated at 56%. This is based on the recovery of each material group as measured at the out-going gate of the secondary processing facility for the used packaging, divided by the related packaging POM by material group.

Paper & paperboard has the highest recovery rate at 70%, followed by glass packaging (63%), metal packaging (58%), wood packaging (41%), and plastic packaging (18%).

Table ES-5 – Post-consumer packaging recovery rates in 2020–21, by material group

Material group	POM (tonnes)	Recovery (tonnes)	Recovery rate (%)
Paper & paperboard	3,387,000	2,370,000	70%
Glass	1,283,000	805,000	63%
Plastic	1,179,000	207,000	18%
Metal	254,000	147,000	58%
Wood	638,000	260,000	41%
Total	**6,740,000**	**3,788,000**	**56%**

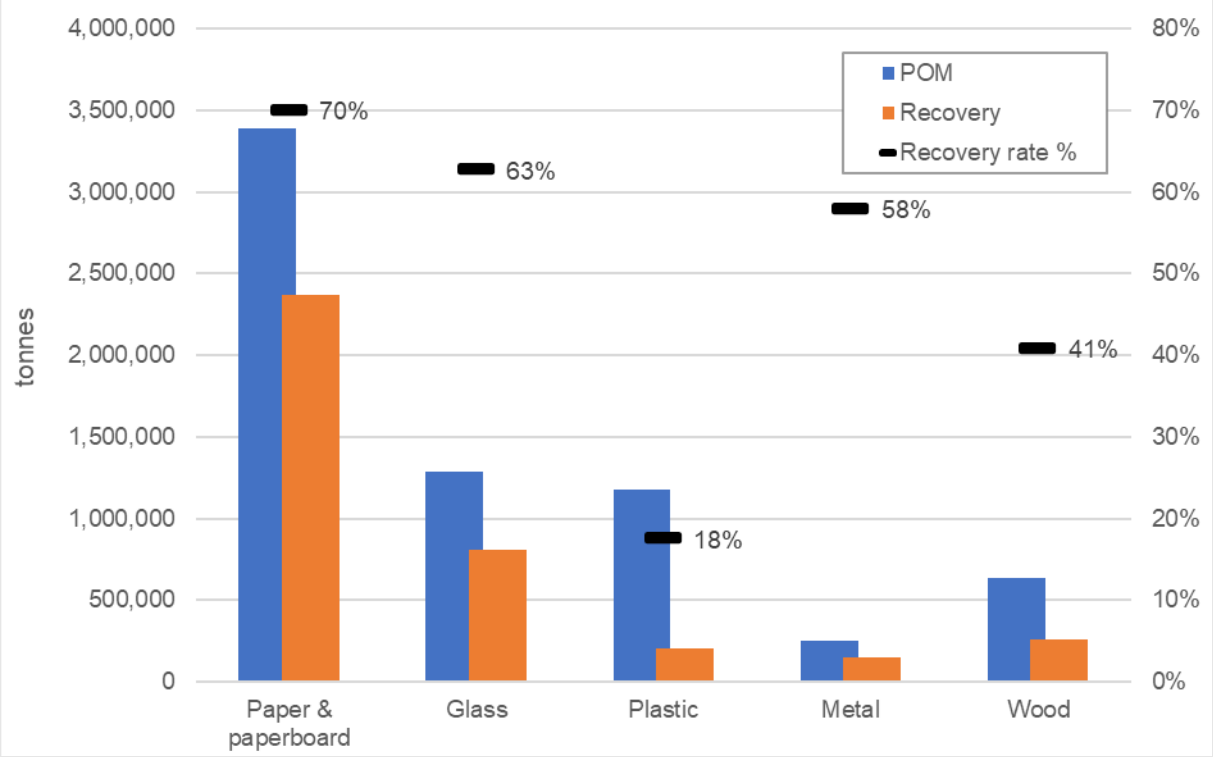

Figure ES-4 – Comparison of packaging POM, packaging recovery and post-consumer packaging recovery rates in 2020–21, by material group.

Progress from 2017–18 to 2020–21

Table ES-6 and **Figure ES-5** compare recovery rates by material group from 2017–18 to 2020–21.

In 2020–21 there were consistent increases in packaging recovery rates compared to 2019–20.

Table ES-6 – Post-consumer packaging recovery rates from 2017–18 to 2020–21, by material group, including a change percentage between 2019-20 and 2020-21.

Material group	2017–18	2018–19	2019–20	2020–21	% change[a] 2019–20 to 2020–21
	(%)	(%)	(%)	(%)	(%)
Paper & paperboard	63%	63%	68%	70%	2%
Glass	46%	45%	60%	63%	2%
Plastic	16%	18%	16%	18%	2%
Metal	48%	56%	56%	58%	2%
Wood	NR[b]	36%	37%	41%	4%
Average percentage (%)	**49%**	**50%**	**55%**	**56%**	**2%**

a) % change values are calculated prior to rounding the annual values. See Section 1.4 for more details.

b) NR – Not reported.

The underlying accuracy ranges for the packaging POM and recovery estimates mean that it is not possible to state with certainty whether real changes in the recovery rates have occurred between the two years. However, the increases since 2017–18 are generally significant, with the exception of plastic packaging.

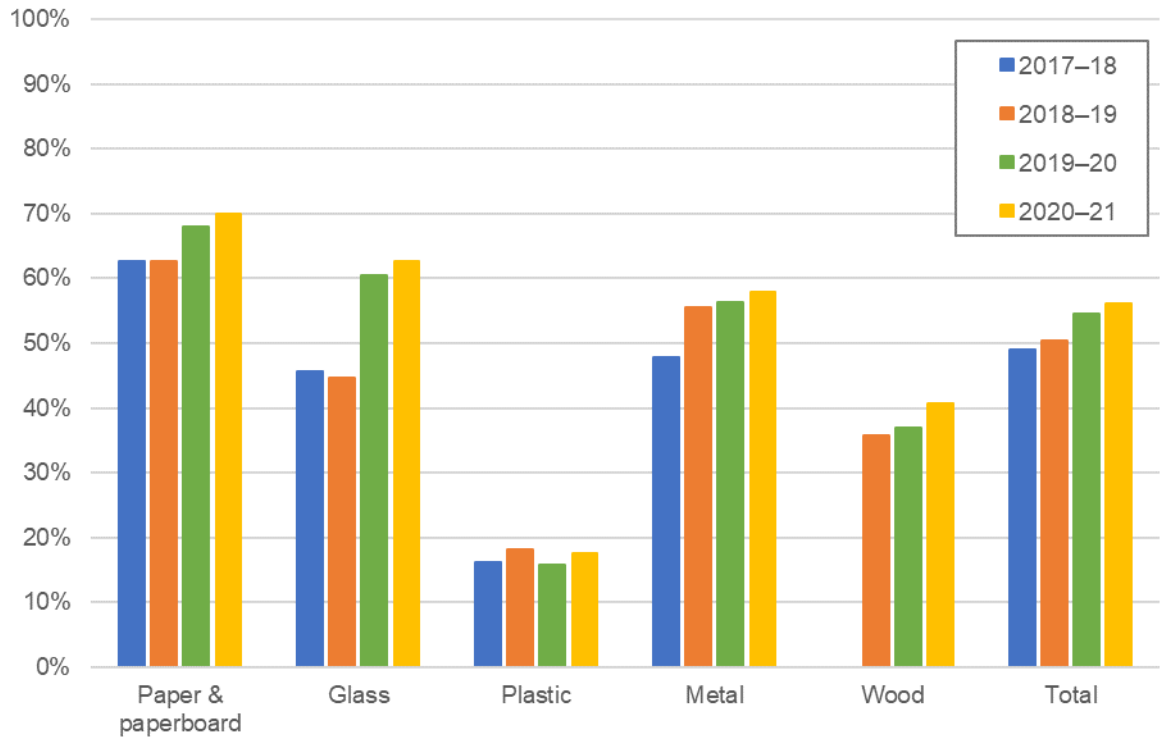

Figure ES-5 – Post-consumer packaging recovery rates (%) from 2017–18 to 2020–21, by material group.

Packaging recycled content

2020–21

Estimates of the recycled content incorporated into packaging POM in 2020–21, by material group, are provided in **Table ES-7** and **Figure ES-6**. The post-consumer recycled (PCR) content across all packaging was 2.4 million tonnes, or 39% of total packaging POM (excluding wood).

The pre-consumer recycled content was 0.7 million tonnes (11%), and 3.1 million tonnes (50%) was sourced from virgin (primary) feedstocks.

Table ES-7 – Packaging POM in 2020–21, by material group (excluding wood) and content source.

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Paper & paperboard	1,801,000	53%	497,000	15%	1,089,000	32%	3,387,000
Glass	480,000	37%	114,000	9%	689,000	54%	1,283,000
Plastic	36,000	3%	22,000	2%	1,121,000	95%	1,179,000
Metal	37,000	15%	61,000	24%	156,000	61%	254,000
Total	**2,354,000**	**39%**	**695,000**	**11%**	**3,054,000**	**50%**	**6,103,000**

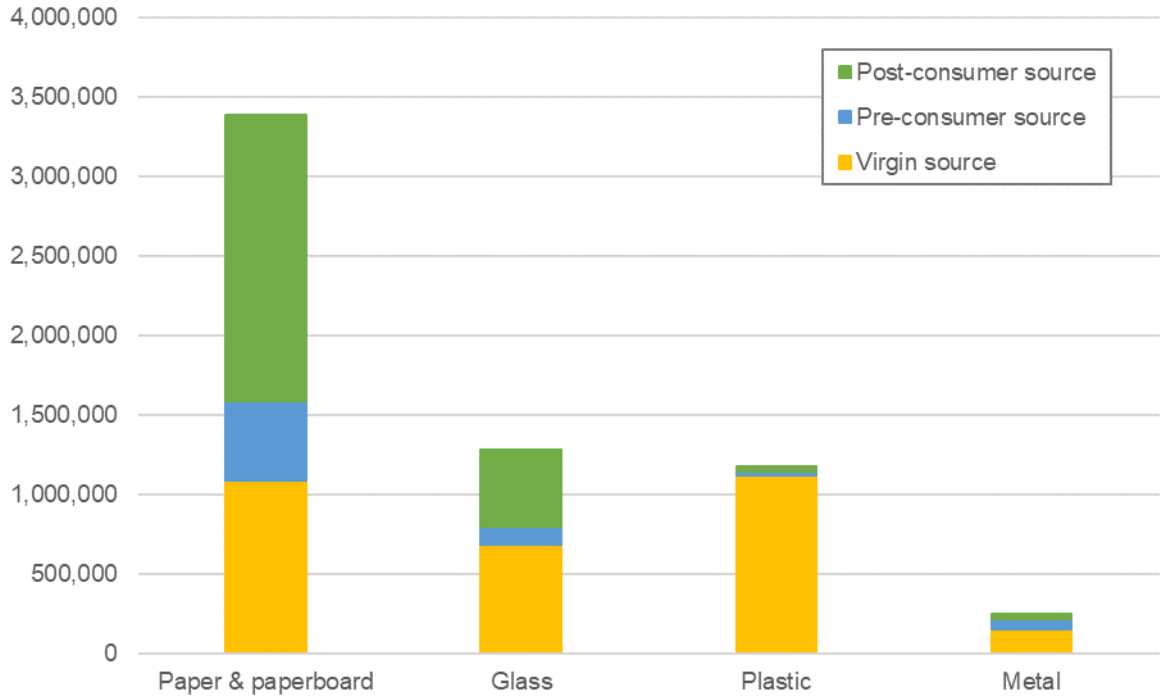

Figure ES-6 – Packaging POM in 2020–21, by material group (excluding wood) and content source (tonnes)

Progress from 2017–18 to 2020–21

Table ES-8 compares the PCR content of packaging by material group from 2017–18 to 2020–21.

In 2020–21 the total quantity of PCR material in packaging increased by an estimated 94 kilotonnes (kt) (4%) compared to the previous year.

The PCR content of packaging, excluding wood, was steady at 39% in 2020–21 compared with 2019–20.

Table ES-8 – Packaging PCR content from 2017–18 to 2020-21, as a percentage of packaging POM, by material group (excluding wood).

Material group	2017–18		2018–19		2019–20		2020–21	
	(tonnes)	(% POM)	(tonnes)	(% POM)	(tonnes)	(% POM)	(tonnes)	(% POM)
Paper & paperboard	1,421,000	49%	1,667,000	51%	1,768,000	54%	1,801,000	53%
Glass	407,000	32%	474,000	37%	428,000	37%	480,000	37%
Plastic	23,000	2%	37,000	4%	36,000	3%	36,000	3%
Metal	64,000	30%	59,000	24%	28,000	11%	37,000	15%
Total	**1,915,000**	**35%**	**2,237,000**	**38%**	**2,260,000**	**39%**	**2,354,000**	**39%**

a) NR – Not reported.

Packaging recyclability

Estimates of packaging recyclability by recyclability classification and material group are provided in **Table ES-9** and **Figure ES-7**. Throughout the report the term *packaging recyclability* is used as an umbrella term for reusable, recyclable, or compostable packaging.

The method for determining packaging recyclability uses a scoring framework based on three criteria:

- The availability of a collection system.
- Whether the material is technically recyclable, i.e., it can be sorted and recycled.
- The availability of end markets.

Using this framework, each packaging format was classified as having either good recyclability, poor (limited) recyclability or being not recyclable. Packaging classified as having poor recyclability, does not meet or only partially meets, one or more criteria.

2020–21

It is estimated that 5.8 million tonnes (86%) of packaging POM in 2020–21 had good recyclability. This was dominated by paper & paperboard (of which 93% had good recyclability) and glass (of which 100% had good recyclability). Effectively all metal packaging (99.9%) was classified as having good recyclability, but only 60% of plastic packaging was classified as having good recyclability (steady from the 60% in 2019–20). Wood packaging had 67% classified as having good recyclability.

Around 0.8 million tonnes (12%) of packaging POM was classified as having poor recyclability or not being recyclable. Around 42% of this was plastic packaging, and another 31% was paper & paperboard packaging.

The recyclability status of another 0.1 million tonnes of packaging, almost entirely plastic packaging, could not be determined. It is likely that most of this packaging would tend towards having poor recyclability or not being recyclable.

Table ES-9 – Packaging POM in 2020–21, by recyclability classification and material group.

Material group	Good recyclability	Poor recyclability	Not recyclable	Unknown	Total
	(%)	(%)	(%)	(%)	(%)
Paper & paperboard	92.9%	5.3%	1.8%	0.0%	100.0%
Glass	100.0%	0.0%	0.0%	0.0%	100.0%
Plastic	60.2%	14.3%	13.5%	12.0%	100.0%
Metal	99.9%	0.1%	0.0%	0.0%	100.0%
Wood	66.9%	12.4%	20.6%	0.0%	100.0%
Total (%)	**86.3%**	**6.3%**	**5.2%**	**2.1%**	**100.0%**

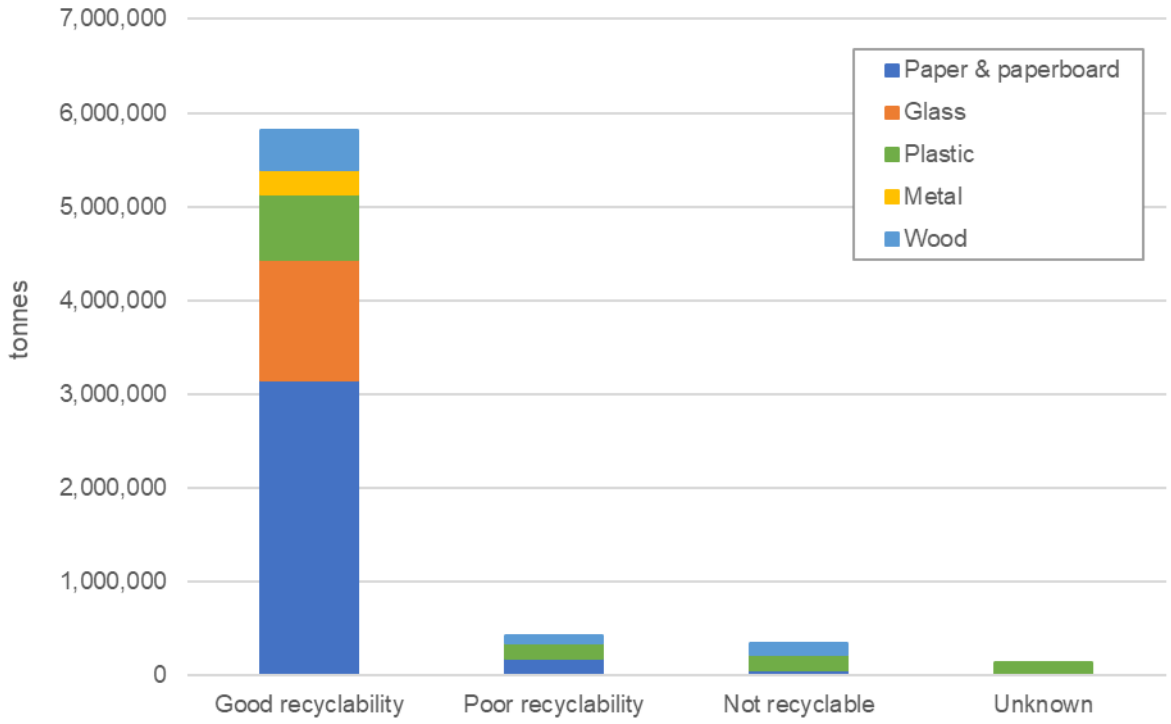

Figure ES-7 – Total tonnes of packaging POM in 2020–21, by recyclability classification and material group.

Progress from 2017–18 to 2020–21

Table ES-10 compares the 2017–18 to 2020–21 quantities of packaging with a 'good recyclability' classification. There were some changes in the percentages of packaging with good recyclability between 2019–20 and 2020–21, with the most noteworthy being an increase in the paper & paperboard good recyclability percentage value, due in most part to an update in the recyclability classification of kraft paper.

Table ES-10 – Packaging POM with a 'good recyclability' classification from 2017–18 to 2020–21, including a percentage of the total tonnes of the material group POM, by material group.

Material group	2017–18		2018–19		2019–20		2020–21	
	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)
Paper & paperboard	2,682,000	92%	2,962,000	91%	2,961,000	90%	3,147,000	93%
Glass	1,273,000	100%	1,283,000	100%	1,156,000	100%	1,283,000	100%
Plastic	627,000	59%	663,000	66%	676,000	60%	710,000	60%
Metal	201,000	95%	243,000	99%	240,000	97%	253,000	100%
Wood	NR[a]	NR[a]	121,000	98%	359,000	78%	427,000	67%
Total	**4,783,000**	**88%**	**5,273,000**	**89%**	**5,392,000**	**86%**	**5,820,000**	**86%**

a) NR – Not reported.

Packaging projections

As part of the study, projections of the following have been undertaken:

- **Annual packaging POM estimates from 2020–21 to 2024–25 by material type** – These projections are generally based on manufacturer reported market growth estimates by packaging material type and component group. Population growth estimates have been adopted where survey data was not available.
- **Annual recovery estimates from 2020–21 to 2024–25 by material type** – These projections are based on reprocessor reported (spare) capacity and committed new capacity.

These baseline POM and recovery projections quantify the impact of planned infrastructure changes reported by packaging manufacturers and reprocessors during the surveys undertaken for this project.

Packaging consumption

Presented in **Table ES-11** and **Figure ES-8** are annual packaging POM estimates from 2020–21 to 2024–25 by material group. The compound annual growth rate (CAGR) for packaging POM over this period is estimated to be 3.6% per year.

Table ES-11 – Estimated annual packaging POM from 2019–20 to 2024–25, by material group.

Material group	2019–20[a]	2020–21	2021–22	2022–23	2023–24	2024–25	5-year CAGR[b]
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(% per yr)
Paper & paperboard	3,277,000	3,387,000	3,492,000	3,600,000	3,711,000	3,826,000	3.1%
Glass	1,156,000	1,283,000	1,313,000	1,345,000	1,377,000	1,409,000	4.0%
Plastic	1,124,000	1,179,000	1,202,000	1,226,000	1,251,000	1,277,000	2.6%
Metal	248,000	254,000	259,000	265,000	270,000	276,000	2.2%
Wood	462,000	638,000	653,000	669,000	687,000	705,000	8.8%
Total	**6,266,000**	**6,740,000**	**6,919,000**	**7,104,000**	**7,295,000**	**7,493,000**	**3.6%**

a) 2019–20 and 2020–21 data is actual year data. Data for 2021–22 to 2024–25 are projections.

b) CAGR – Compound annual growth rate.

Between 2020–21 and 2024–25 there is projected to be 753 kt (11.2%) of growth in packaging POM, based largely on packaging manufacturer estimates of prospective market growth. Of this, 439 kt (58%) is projected to be paper & paperboard packaging, 126 kt (17%) glass packaging, 98 kt (13%) plastic packaging, 22 kt (3%) metal packaging and 67 kt (9%) wood packaging.

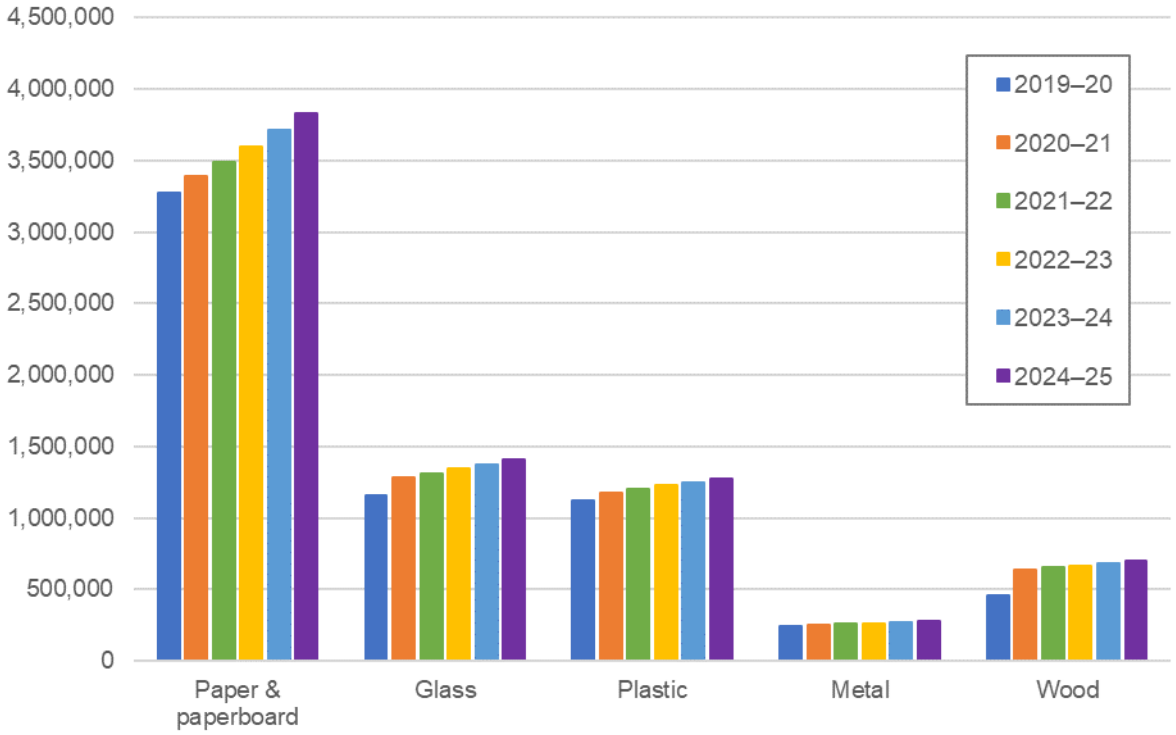

Figure ES-8 – Annual packaging POM from 2019–20 and 2020-21, and estimated annual packaging POM from 2021-22 to 2024–25, by material group (tonnes)

Reprocessing capacity

Presented in **Table ES-12** and **Figure ES-9** are packaging reprocessing capacity projections (assuming there are no further interventions) from 2019–20 to 2024–25 by material group. The 5--year CAGR for reprocessing capacity growth over this period is 8.5% per year (compared with 2.8% per year in the 2019–20 report), which is now notably higher than that for packaging POM.

The estimated increase in capacity over the 5-year period is now 1.7 million tonnes (compared with the 0.5 million tonnes identified in the 2019–20 report), with the most significant increases for glass (790,000 tonnes), paper & paperboard (420,000 tonnes), and plastics (410,000 tonnes). A significant proportion of the glass capacity relates to glass crushing into aggregate and sand products only.

The projected reprocessing capacity for 2024–25 is equivalent to around 69% of projected POM in the same year. The projected reprocessing capacity for plastic packaging is equivalent to 46% of projected packaging POM.

Table ES-12 – Annual packaging reprocessing capacity projections from 2019–20 to 2024–25, by material group

Material group	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	5-year CAGR[a]
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(% per yr)
Paper & paperboard	2,229,000	2,370,000	2,439,000	2,509,000	2,579,000	2,649,000	3.5%
Glass	699,000	805,000	976,000	1,147,000	1,318,000	1,489,000	16.3%
Plastic	179,000	207,000	303,000	399,000	496,000	592,000	27.1%
Metal	139,000	147,000	147,000	148,000	148,000	148,000	1.2%
Wood	171,000	260,000	260,000	260,000	260,000	260,000	8.8%
Total	**3,416,000**	**3,788,000**	**4,126,000**	**4,463,000**	**4,801,000**	**5,139,000**	**8.5%**

a) CAGR – Compound annual growth rate.

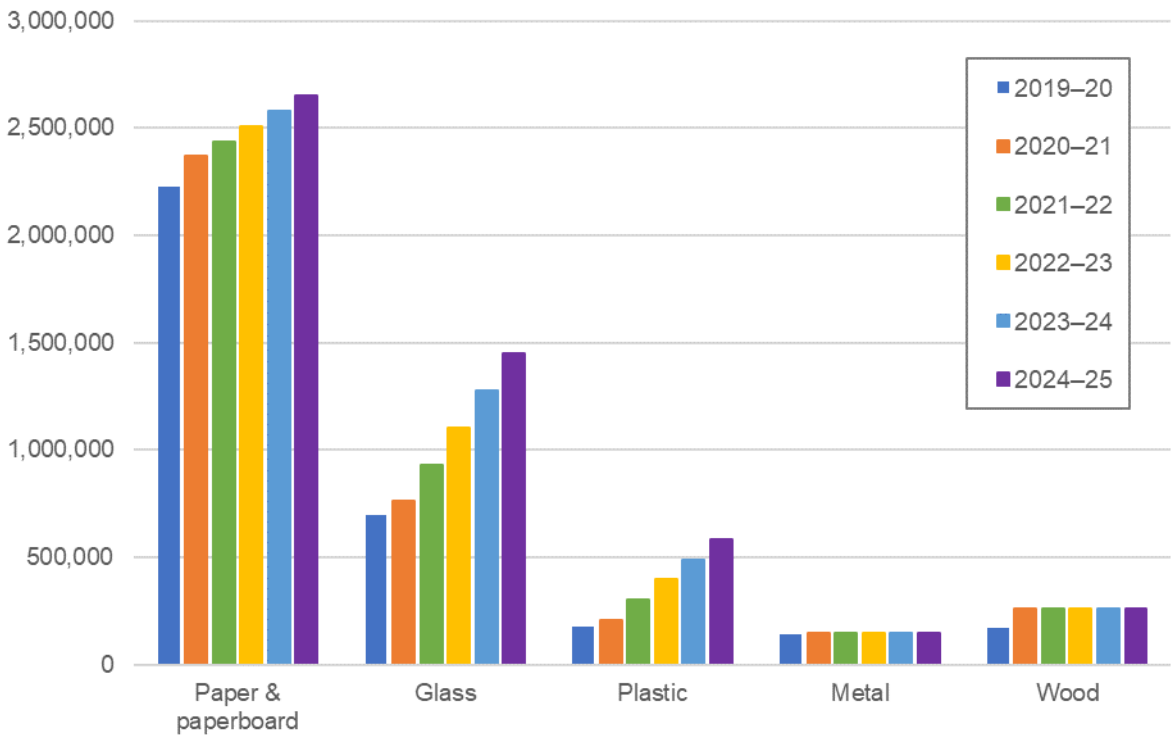

Figure ES-9 – Annual packaging reprocessing capacity projections from 2019–20 to 2024–25, by material group (tonnes)

Packaging reuse

The flows of eight reusable packaging systems have been quantified as part of the project, which are the same eight that were quantified in 2019–20. These reusable packaging flows are:

- **Kegs** – Beer kegs only.
- **Drums (200–205 litre)** – All reusable steel and plastic drums in the 200–205 litre volumetric capacity range (44-gallon UK or 55 gallon US).
- **Intermediate bulk containers (IBCs)** – All rigid IBCs are assumed to be reusable (rather than single-use) packaging.
- **Milk crates** – Non-collapsible plastic crates. Limited to dairy applications only.
- **Pallets** – Reusable timber and plastic pallets only, including display pallets. Single-use pallets are excluded.
- **Returnable plastic crates (RPCs)** – Collapsible plastic crates. Limited to major supermarket systems only (e.g.., ALDI, Coles and Woolworths).
- **Reusable shopping bags** – Reusable non-woven PP (NWPP) bags, and reusable HDPE and LDPE bags (supermarket type).
- **Reusable coffee cups** – Reusable coffee cups used in an away-from-home (AfH) setting where they could be reasonably expected to have avoided the use of a single-use coffee cup.

The quantified reusable packaging systems avoided the use of 2.6 million tonnes of single-use packaging. Approximately 92% of the avoided single-use packaging consumption benefit is provided by reusable pallets and plastic crates. The net theoretical reduction in packaging use was 2.4 million tonnes, as there were 0.2 million tonnes of reusable packaging inputs in 2020–21.

Progress towards the 2025 National Packaging Targets

Table ES-13 provides a summary of the 2025 Targets and the 2017–18 to 2020–21 results against each.

Table ES-13 – Summary of the 2025Targets and progress to 2020–21.

Target	Target	2017–18 result	2018–19 result	2019–20 result	2020–21 result
100% of all Australia's packaging will be reusable, recyclable or compostable by 2025 or earlier	100%	88%	89%	86%	86%
70% of Australia's plastic packaging will be recycled or composted by 2025	70%	16%	18%	16%	18%
50% average recycled content will be included across packaging by 2025[a]	50%	35%	38%	39%	39%
Problematic and unnecessary single-use plastic packaging will be phased out[b,c]	Reduction in priority items	Baseline	-41%	-31%	-28%

a) Post-consumer recycled content only. Does not include wood or manufacturing scrap (pre-consumer) recycled content.

b) Priority items considered include PVC, PS, EPS, oxo-degradable plastics, and retail shopping bags POM.

c) These estimates are subject to a relatively large accuracy range and high year-on-year reporting volatility. Estimated value is relative to the previous year.

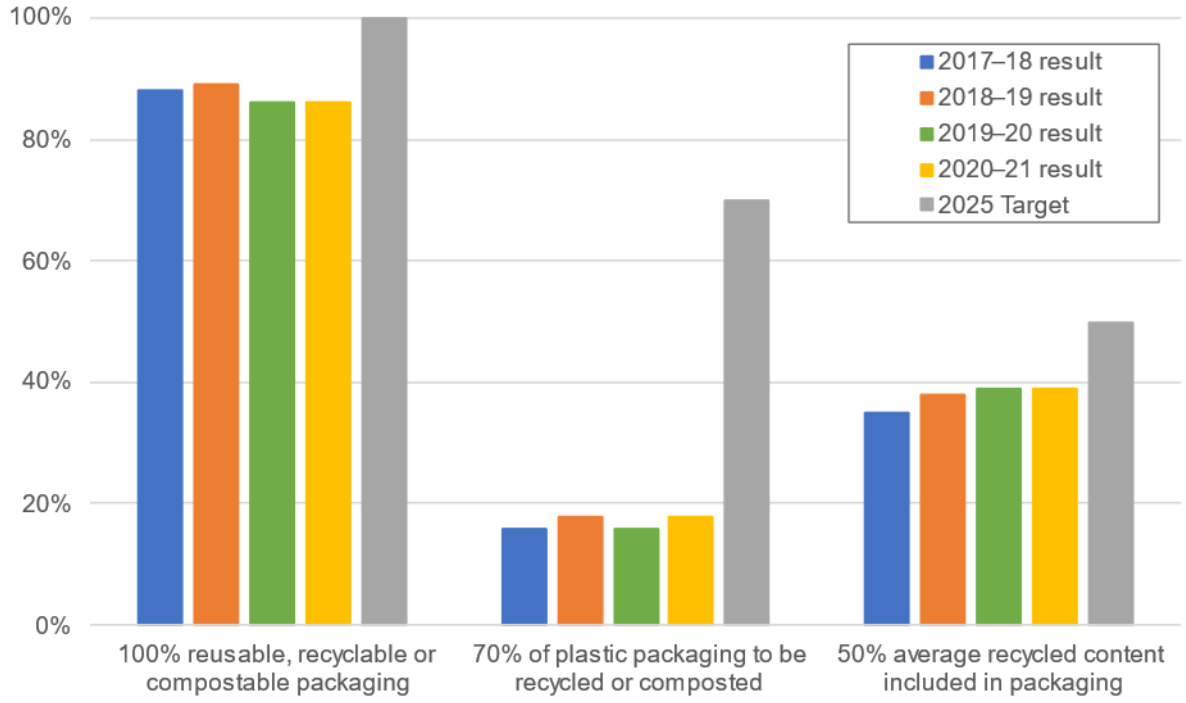

Figure ES-10 – Summary of the 2025 Targets and progress to 2020–21.

Project method

Consumption quantification

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

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

Packaging consumption is measured in terms of packaging POM.

Recovery quantification

Australian packaging recovery was determined through a national survey 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 the survey 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.

Survey response rate

Across the 5 main cohorts of those surveyed for this study, a total of 75% of those contacted responded to the survey request. Responses for another 13% were estimated based on publicly available data or through consultation with others in the industry. Refer to Section 1.2 for more details on response rates and on the management of data gaps.

1 INTRODUCTION

1.1 This project

This report provides packaging consumption and recovery data for Australia for the 2020–21 financial year. For the full twelve months of this time period, the COVID-19 pandemic was impacting packaging flows in Australia.

This is the fourth iteration of the Packaging Consumption and Recovery Data Report published by the Australian Packaging Covenant Organisation (APCO). The previous reports are for the 2017–18 (baseline), 2018–19 and 2019–20 financial years (APCO, 2019; APCO, 2020a; APCO, 2021b).

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

The 2025 Targets are:

- **100% reusable, recyclable or compostable packaging.**
- **70% of plastic packaging will be recycled or composted.**
- **50% average recycled content included in packaging.**
- **Phase out of problematic and unnecessary single-use plastic packaging.**

This report also provides forecasts for key packaging flow quantities out to 2025.

Additional data is provided in the following appendices:

- **Appendix A** – Glossary of terms and abbreviations used throughout this report.
- **Appendix B** – Packaging material and component lists.
- **Appendix C** – Consumption and recovery data by state and territory.
- **Appendix D** – Employment and facility capacity data.
- **Appendix E** – Container deposit eligible packaging data.

Please note: In the tables presented in this report, minor discrepancies may occur between summed totals 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.

1.2 Project method

Data sources

Packaging consumption and recovery data was obtained from a combination of sources. The main data sources and the related reporting contributions are summarised in **Table 1**.

Table 1 – Data sources and reporting outputs.

Data source	Data collection method	Primary reporting contributions
Packaging manufacturers and importers	National survey undertaken as part of this project.	• Packaging POM (Section 2). • Recovery rate (Sections 3.7–3.9). • Packaging recyclability (Section 3.10). • Packaging losses (Section 4). • Packaging projections (Section 5).
Packaging reprocessing facility operators	National survey undertaken as part of this project.	• Packaging recovery (Section 3). • Recovery rate (Sections 3.7–3.9). • Packaging losses (Section 4). • Packaging projections (Section 5).
Container deposit scheme (CDS) operators	National survey undertaken as part of this project.	• National CD eligible packaging dataset (Appendix E). • Quantification of CDS recovery collection services (Section 3.1).
Reusable packaging system operators and users	Selective survey undertaken as part of this project.	• Packaging reuse (Section 6).
Organics recyclers and energy recovery facility operators interview form	Selective survey undertaken as part of this project.	• Packaging recovery (Section 3). • Recovery rate (Sections 3.7–3.9). • Packaging losses (Section 4).
Australian import and export data	Australian Customs import/export HTISC/AHECC[1] data extracts (ABS & IndustryEdge, 2021a; 2021b).	• Packaging POM (Section 2). • Packaging recovery (Section 3). • Recovery rate (Sections 3.7–3.9).

[1] Australian Harmonized Tariff Item Statistical Code (HTISC) data (imports) / Australian Harmonized Export Commodity Classification (AHECC) data (exports).

Data collection and stakeholder consultation

Survey forms were prepared for the stakeholder groups listed above. Copies of the packaging survey 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 2**. All manufacturers and reprocessors that were identified were contacted.

Table 2 – Packaging manufacturer, reprocessor and other survey responses (facility count).

Organisation type	Complete – interview /phone/e-mail	Complete – estimated	No response or decline	Total
Manufacturer – fibre	6	3	0	9
Manufacturer – glass	5	1	0	6
Manufacturer – metals	10	3	2	15
Manufacturer – plastics	53	4	19	76
Manufacturer – wood	0	1	0	1
Reprocessor – fibre	5	7	0	12
Reprocessor – glass	10	10	0	20
Reprocessor – metals	2	3	0	5
Reprocessor – plastics	91	2	2	95
Reprocessor – organics	1	1	1	3
Container deposit scheme (CDS) operator	6	0	1	7
Energy recovery – WtE[1] fuel manufacturer	2	0	0	2
Industry group	1	0	1	2
Reusable packaging system operator	11	0	6	17
Reusable packaging system user	3	0	0	3
Total	**206**	**35**	**32**	**273**
Total (%)	75%	13%	12%	100%

[1] WtE – Waste-to-energy.

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 19 non-responding plastic packaging manufacturers. However, whole of market estimates of packaging consumption in 2020–21 were available through the Australian Plastics Flows and Fates Study 2020–21 (Blue Environment, 2022b), and the estimates of packaging consumption / packaging placed on the market (POM) were scaled based on the data in this report.

It was not possible to estimate production for two non-responding metal packaging manufacturers. However, it is known that both were producing only small quantities of metal (steel) packaging in 2020–21.

It was not possible to estimate recovery for two non-responding (potential) plastic packaging reprocessors. Neither of these reprocessors is relatively large and probably did not accept significant quantities of scrap plastic packaging during 2020–21. Assuming these two reprocessors did not export any product then local recovery of scrap plastic packaging may be understated in this report by around 500–1,000 tonnes (<1% of recovery stated in this report).However, if these two companies sold any process scrap product into export markets (which was possible) these quantities would be picked up in the analysis of the 2020–21 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 national survey of packaging manufacturers to obtain data on the following packaging attributes:

- Packaging POM by material type – see Appendix B for the consumption related material types list.
- Estimated accuracy range of reported POM, by material type.
- 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.
- Single-use / reusable packaging allocation.
- Degradability rating.
- Recycled content source – post-consumer, pre-consumer or virgin (primary).
- Packaging jurisdiction of use.
- Packaging sector of use, allocated to:
    - Business-to-consumer (B2C) – At home
    - Business-to-consumer (B2C) – Away-from-home (AfH)
    - 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 paperboards and rolls of plastic film for local filling) were determined through an extensive analysis of Australian import and export data for the 2020–21 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 (online and instore) and manufacturer reports of their quantities of imported and exported packaging. Where no other data was available, standard conversions were applied to convert imports/exports of products into equivalent packaging quantities.

There were two main categories of codes that were allocated through the quantification framework:

- **Codes where the imported/exported product is the packaging** – Allocations were undertaken of the (packaging) product to: material type, packaging component, sector of use, data accuracy rating and other data attributes. These codes were also assessed under the following category.
- **Codes where the imported/exported product is contained in primary, secondary and tertiary packaging** – Allocations were undertaken of the packaging (on the product) to: material type, packaging component, sector of use, data accuracy rating and other data attributes.

Due to the relatively sparse information that was available to support many code allocations, the data accuracy rating for these allocations was often low to very low, which is quantified in the aggregated accuracy range estimates that are reported.

Determination of packaging recovery

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

- Recovery by material type – see Appendix B for the list of recovery related material types.
- Estimated accuracy range of reported recovery, by material type.
- 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: 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 component group – bottle or jar, carton or box, closure or label, etc.
- Single-use / reusable packaging material source.
- 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 quantities of post-consumer scrap plastic packaging sent to energy recovery in 2020–21. This is estimated to have been 9,000 tonnes in 2020–21, compared with 16,000 tonnes in 2019–20 and 2018–19, and 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 generally based on the post-consumer packaging recovery measured at the out-going gate of the secondary processing facility (including WtE fuel manufacturers) for the used packaging, divided by packaging POM by material group/type.

The exception to this is packaging to organics reprocessing, for which the post-consumer packaging recovery is measured at the in-coming gate of the secondary processing facility.

It is important to note that in the determination of recovery rates, packaging POM is assumed to be equivalent to post-consumer used packaging. That is, all packaging POM in 2020–21, also reached end-of-life and was made available for recovery in 2020–21. This is largely the case for single-use packaging, but is less applicable to some forms of longer lived packaging in reusable packaging systems.

Determination of packaging recyclability

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

- 100% reusable, recyclable or compostable packaging.

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

The method for determining packaging recyclability uses scores based on the Packaging Recyclability Evaluation Portal (PREP) assessment framework. Generalised PREP extracted scores 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 ‘recycling potential’ 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 the following tables. The primary difference is in the description of the collection system criteria.

Table 3 – 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[1], or is a certified compostable plastic.	The material can be readily sorted at a Material Recovery Facility (MRF) and causes no significant issues for reprocessors, or is a soft plastic that can be recycled through the REDcycle system, or is a certified compostable plastic.	There is a well-established market for the use of the recycled material, or is a certified compostable plastic.
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 use in other applications.

[1] The REDcycle program was paused in November 2022 due to issues with reprocessing partners ability to accept the collected material. However, the program was operating normally during 2020–21, which is the time-period covered in this report.

Table 4 – 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 use of the recycled 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 use in other applications.

Determination of reusable packaging

This year a quantification of the following eight reusable packaging systems was undertaken:

- **Kegs** – Beer kegs only.

- **Drums (200–205 litre)** – All reusable steel and plastic drums in the 200–205 litre volumetric capacity range (44-gallon UK or 55 gallon US).
- **Intermediate bulk containers (IBCs)** – All rigid IBCs are assumed to be reusable (rather than single-use) packaging.
- **Milk crates** – Non-collapsible plastic crates. Limited to dairy applications only.
- **Pallets** – Reusable timber and plastic pallets only, including display pallets. Single-use pallets are excluded.
- **Returnable plastic crates (RPCs)** – Collapsible plastic crates. Limited to major supermarket systems only (e.g., ALDI, Coles and Woolworths).
- **Reusable shopping bags** – Reusable non-woven PP (NWPP) bags, and reusable HDPE and LDPE bags (supermarket type).
- **Reusable coffee cups** – Reusable coffee cups used in an away-from-home (AfH) setting where they could be reasonably expected to have avoided the use of a single-use coffee cup.

Refer to **Section 6.1** for more detail on the reusable packaging systems quantification method.

1.3 Comparability of 2020–21 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 to 2020–21 datasets, and with studies prior to 2017–18. The changes have all been adopted to improve the quality and depth of the packaging quantification dataset.

Scope or method changes between 2019–20 and 2020–21

The noteworthy changes this year include:

- **Packaging component level recovery data has been collected from packaging reprocessors for the first time in 2020–21** – Prior to this year, packaging component level recovery data was not requested in the reprocessor surveys. This year this data has been collected, which allows the reporting of component level recovery data (Section 3.3), and the reporting of component level recovery rates (Section 3.9).
- **ANZSIC division source level data has not been collected from packaging reprocessors in 2020–21** – In 2019–20 (and the two previous years) data was collected from packaging reprocessors on the ANZSIC division source of packaging that is received. However, it was identified as unnecessary to collect ANZSIC level recovery data every year. In addition, as the additional component level data was to be collected this year from reprocessors, removing the ANZSIC level survey requirement would reduce the impost on respondents. The ANZSIC level recovery data collection may be undertaken in future years as needed. It is also noted that it is anticipated that the collection of ANZSIC level consumption data will continue.

Refer to previous reports for details on scope or method changes between 2017–18, 2018–19 and 2019–20.

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

The noteworthy changes include:

- **This study has standardised packaging consumption to packaging POM** – Studies prior to 2017–18 may have included pre-consumer manufacturing losses and recovered scrap in either consumption and/or recovery estimates. This update has impacted consumption and/or recovery estimates compared to previous years, 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** – Studies prior to 2017–18 may have determined recovery at the incoming MRF gate or various points after that. This standardisation will 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** – Studies prior to 2017–18 largely did not consider pre-consumer manufacturing scrap and post-consumer packaging recovery separately. While significantly smaller in terms of absolute quantity, 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.

Other scope limitations

Other ongoing scope limitations include:

- There are other reusable packaging systems that are not yet included in the project scope. See Table B-4 in Appendix B for a list of all identified reusable packaging systems and their status with respect to scope inclusion/exclusion in the 2020–21 packaging data.

1.4 Data limitations and interpretation

In the tables presented in this report, minor discrepancies may occur between summed totals 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, mass 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 the estimated levels of accuracy (±%) reported by packaging manufacturers and reprocessors about their reported packaging material POM or total amount reprocessed. The accuracy range provides an estimate of the range within which the true value can be found, with the reported value being the best estimate of the true value.

In essence, small year-on-year changes in data may be based on data volatility, and so the underlying data uncertainties mean that care should be taken with assigning too much weight to these small movements. However, more weight can be placed on larger year-on-year shifts or consistent trends over a number of years, especially where these shifts or trends are consistent with known significant movements in the market.

2 PACKAGING CONSUMPTION IN 2020–21

This section of the report provides estimates of packaging POM in Australia in 2020–21, with data reported at the following levels:

- Material group.
- Material type.
- Packaging component group.
- Packaging count.
- Packaging material source location.
- Rigid/flexible plastic packaging.
- Degradability rating.
- Recycled content.
- ANZSIC division.
- Problematic and unnecessary single-use plastics.

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

2.1 Material group

Total packaging POM in Australia in 2020–21 is estimated at 6.74 million tonnes (±12%). Estimates for packaging POM by material group are provided in **Table 5** 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 6.74 million tonnes of packaging POM in 2020–21, around half was paper & paperboard packaging (50.3%), followed by glass packaging (19.0%), plastic packaging (17.5%), wood packaging (9.5%), and metal packaging (3.8%).

Refer to **Appendix A**108 for the glossary of terms and abbreviations used throughout this report.

Table 5 – Packaging POM in 2020–21, by material group.

Material group	POM			Accuracy range
	(tonnes)	(%)	(kg/person)	(±%)
Paper & paperboard	3,387,000	50.3%	132	7%
Glass	1,283,000	19.0%	50	12%
Plastic	1,179,000	17.5%	46	16%
Metal	254,000	3.8%	10	9%
Wood	638,000	9.5%	25	34%
Total	**6,740,000**	**100.0%**	**262**	**12%**

POM means that the packaging has been made available to the end-consumer (including business users), and the subsequent disposal follows the intended use of the packaging, also known as 'post-consumer' disposal. Packaging losses prior to the point of POM are considered ‘pre-consumer’ losses and are not included in **Table 5**.

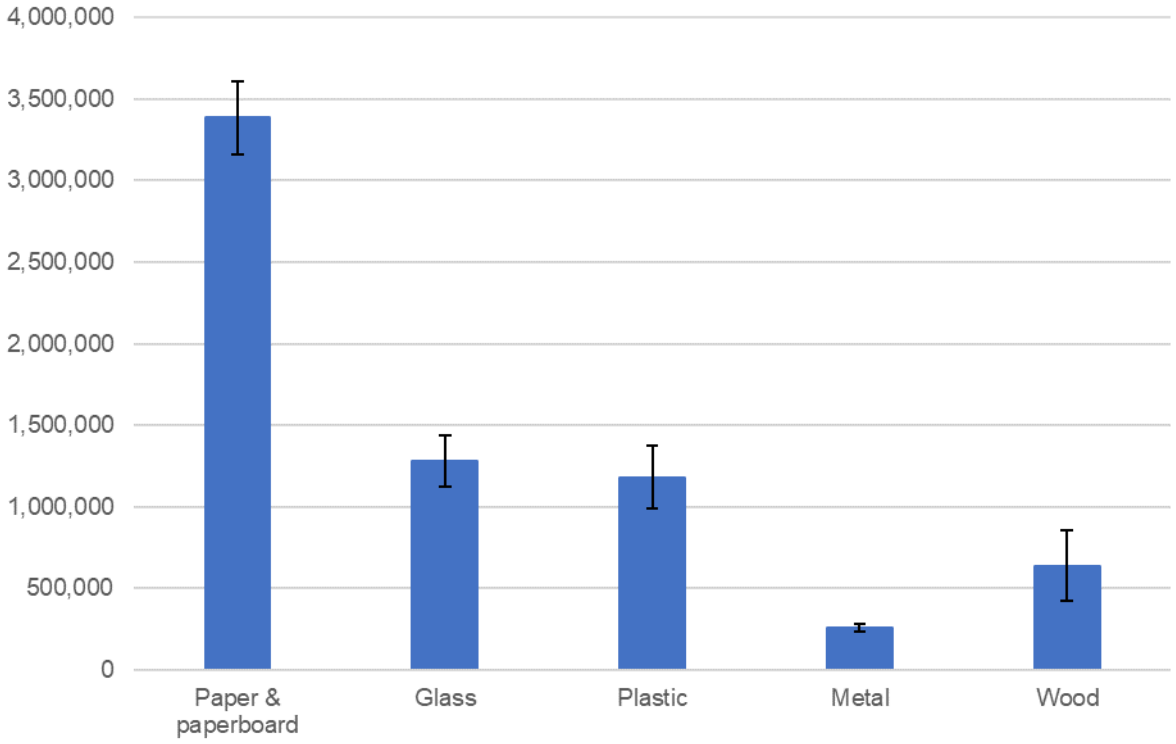

Figure 1 – Total tonnes of packaging POM in 2020–21, by material group.

Table 6 and **Figure 2** compare the POM data by material group from 2017–18 to 2020–21.

Table 6 – Packaging POM from 2017–18 to 2020–21, by material group, including a change percentage between 2019-20 and 2020-21.

Material group	2017–18	2018–19	2019–20	2020–21	Change 2019–20 to 2020–21
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Paper & paperboard	2,901,000	3,262,000	3,277,000	3,387,000	3%
Glass	1,273,000	1,283,000	1,156,000	1,283,000	11%
Plastic	1,067,000	1,000,000	1,124,000	1,179,000	5%
Metal	213,000	246,000	248,000	254,000	2%
Wood[a]	NR[b]	124,000	462,000	638,000	38%
Total (tonnes)	**5,453,000**	**5,916,000**	**6,266,000**	**6,740,000**	**8%**
Total (kg/person)	**218**	**234**	**244**	**262**	**7%**

a) The apparent large year-on-year increases in wood packaging is due to improvements in survey coverage.
b) NR – Not reported.

In 2020–21, packaging POM increased by 8% compared to the 2019–20 estimate of 6.27 million tonnes.

The survey identified more B2B wood packaging POM in 2019–20 and 2020–21 due to improving market coverage, which has influenced the result. Excluding wood provides a more comparable

trend estimate. This gives an estimated total packaging POM of 6.10 million tonnes in 2020–21, up 5% from the comparable estimate of 5.80 million tonnes in 2019–20. The per capita increase, excluding wood, was also 5%.

The most significant trends in packaging POM, excluding wood, were increases in glass packaging (+11%) and plastic packaging (+5%).

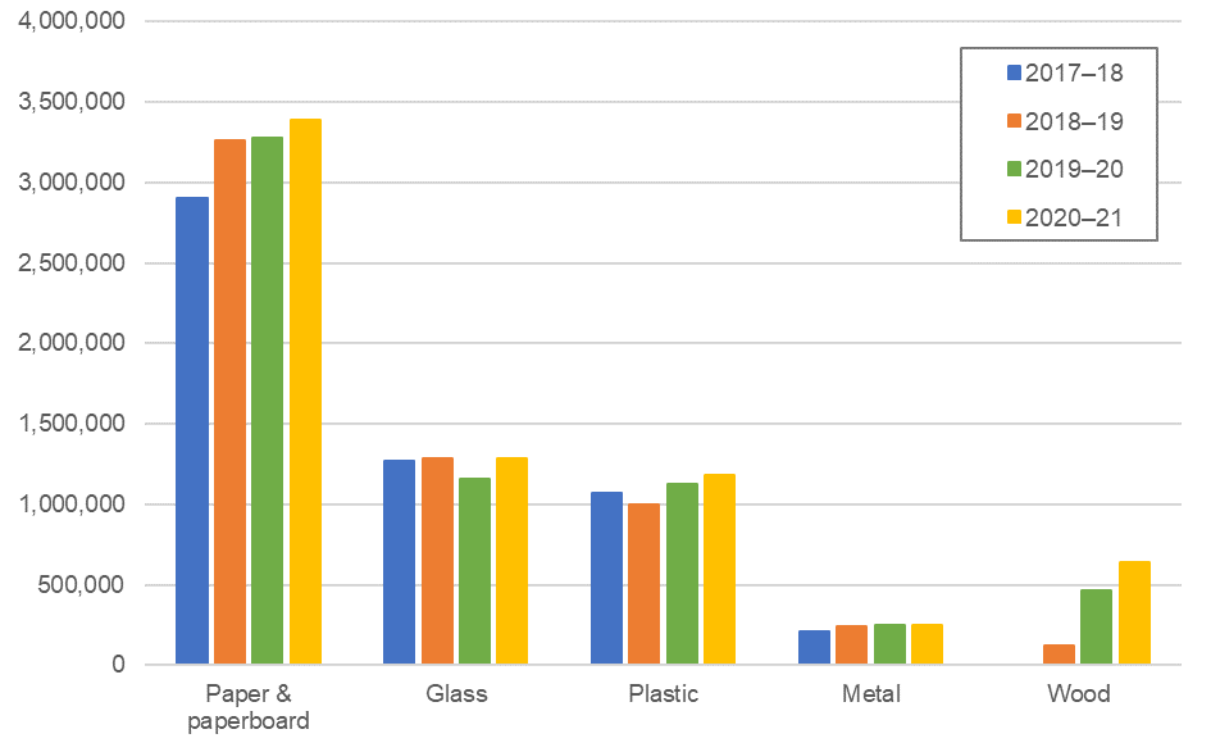

Figure 2 – Packaging POM from 2017–18 to 2020–21, by material group (tonnes)

There is a strong general trend in the increased use of paper & paperboard, and a lesser trend in the increase of plastic packaging. However, there is no particularly strong discernible trends in the use of glass and metal packaging.

2.2 Material type

Paper & paperboard packaging

Paper & paperboard packaging POM in Australia in 2020–21 is estimated at 3.4 million tonnes (±7%), which was 50.3% of all packaging POM. Estimates for paper & paperboard packaging POM by material type and sector of use are provided in **Table 7** and **Figure 3**.

In 2020–21 around 75% of paper & paperboard packaging was corrugated cardboard, of which 77% was used in the B2B sector, and 20% was used in B2C applications. The sector of use of the other 3% could not be identified.

Between 2019–20 and 2020–21 (**Table 6**) there was an increase in paper & paperboard packaging POM of 110,000 tonnes (+3%). The biggest increase was for kraft paper (+66,000 tonnes) followed by moulded fibreboard and aseptic cartons, while consumption for corrugated cardboard remained steady.

Table 7 – Paper & paperboard packaging POM in 2020–21, by material type and sector of use.

Material type	B2C – At home[a]	B2C – AfH[a]	B2B	Other or unknown	Total[b]		Accuracy range
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Boxboard/Cartonboard	229,000	15,000	67,000	5,000	315,000	9.3%	4%
Corrugated cardboard	509,000	10,000	1,940,000	81,000	2,539,000	75.0%	6%
HWS[c] carrierboard	16,000	15,000	0	0	31,000	0.9%	4%
Kraft paper	58,000	39,000	145,000	3,000	246,000	7.3%	9%
Moulded fibreboard	35,000	2,000	26,000	0	63,000	1.9%	12%
PCPB[d] – Aseptic	29,000	5,000	12,000	2,000	49,000	1.4%	5%
PCPB – Gable top	9,000	2,000	4,000	1,000	15,000	0.4%	5%
PCPB – Cold cup	1,000	6,000	1,000	0	8,000	0.2%	20%
PCPB – Hot cup	3,000	13,000	2,000	1,000	18,000	0.5%	20%
PCPB – Other	3,000	0	0	0	4,000	0.1%	14%
Polymer coated paper	0	1,000	0	0	1,000	0.0%	20%
Other fibre packaging[e]	1,000	1,000	65,000	31,000	99,000	2.9%	8%
Total (tonnes)	**893,000**	**109,000**	**2,261,000**	**124,000**	**3,387,000**	**-**	**-**
Total (%)	**26.4%**	**3.2%**	**66.8%**	**3.7%**	**100.0%**	**26.4%**	**7%**

a) Business-to-consumer (B2C) – At home / Business-to-consumer (B2C) – Away-from-home (AfH).
b) Total values are calculated prior to rounding contributing values. See Section 1.4 for more details.
c) HWS – High wet strength carrierboard.
d) PCPB – Polymer coated paperboard.
e) Examples of other fibre packaging include paper bags and food wraps.

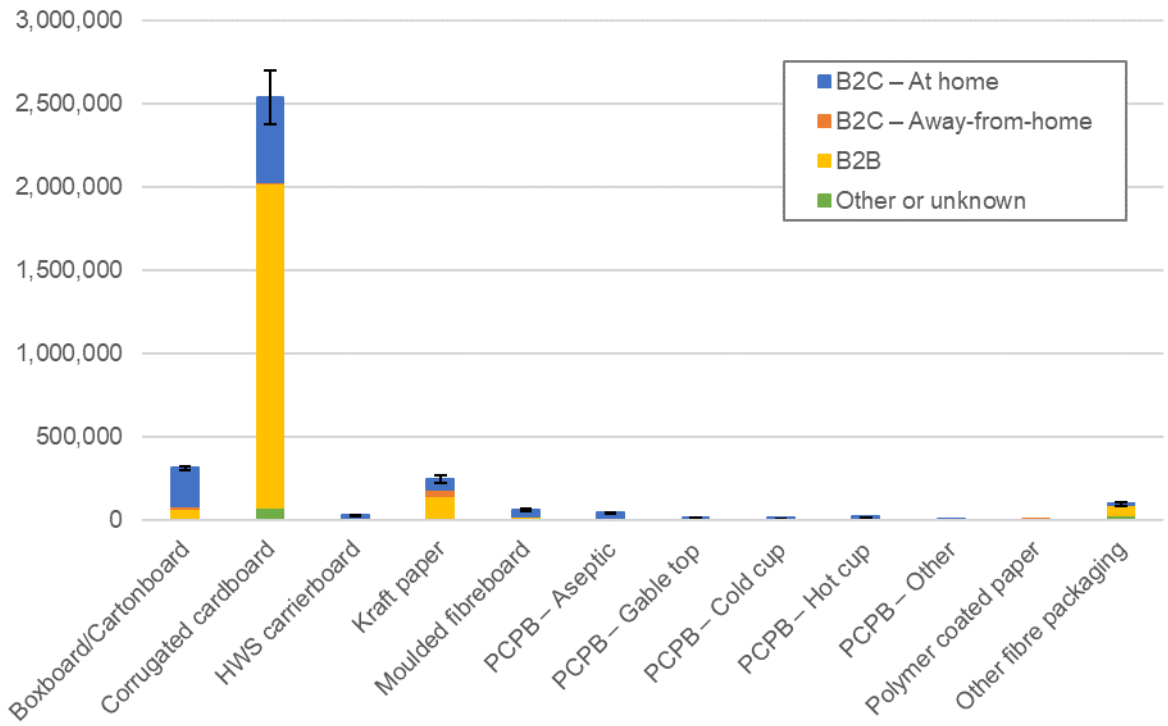

Figure 3 – Paper & paperboard packaging POM in 2020–21, by material type and sector of use (tonnes)

Glass packaging

Glass packaging POM in Australia in 2020–21 is estimated at 1.3 million tonnes (±12%), which was 19% of all packaging POM. Estimates for glass packaging POM by material type and sector of use are provided in **Table 8** and **Figure 4**.

Glass packaging consumption is determined for three main colours, which are amber, flint (clear) and green glass. Flint glass makes up 47.2% of glass POM, followed by green glass (34.6%) and amber glass (18.2%). All glass packaging was used in consumer applications, with none reported as POM for the B2B sector. There has been a significant shift from amber to green glass reported between 2019–20 and 2020–21.

Between 2019–20 and 2020–21 (**Table 6**) there was an increase in glass packaging POM of 127,000 tonnes (+3%).

Table 8 – Glass packaging POM in 2020–21, 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	155,000	78,000	0	0	233,000	18.2%	12%
Flint glass	456,000	150,000	0	0	605,000	47.2%	15%
Green glass[b]	299,000	145,000	0	0	445,000	34.6%	9%
Total (tonnes)	**910,000**	**373,000**	**0**	**0**	**1,283,000**	**-**	**-**
Total (%)	**70.9%**	**29.1%**	**0.0%**	**0.0%**	**100.0%**	**100.0%**	**12%**

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

b) Includes very small quantities of other glass colours (e.g., blue glass).

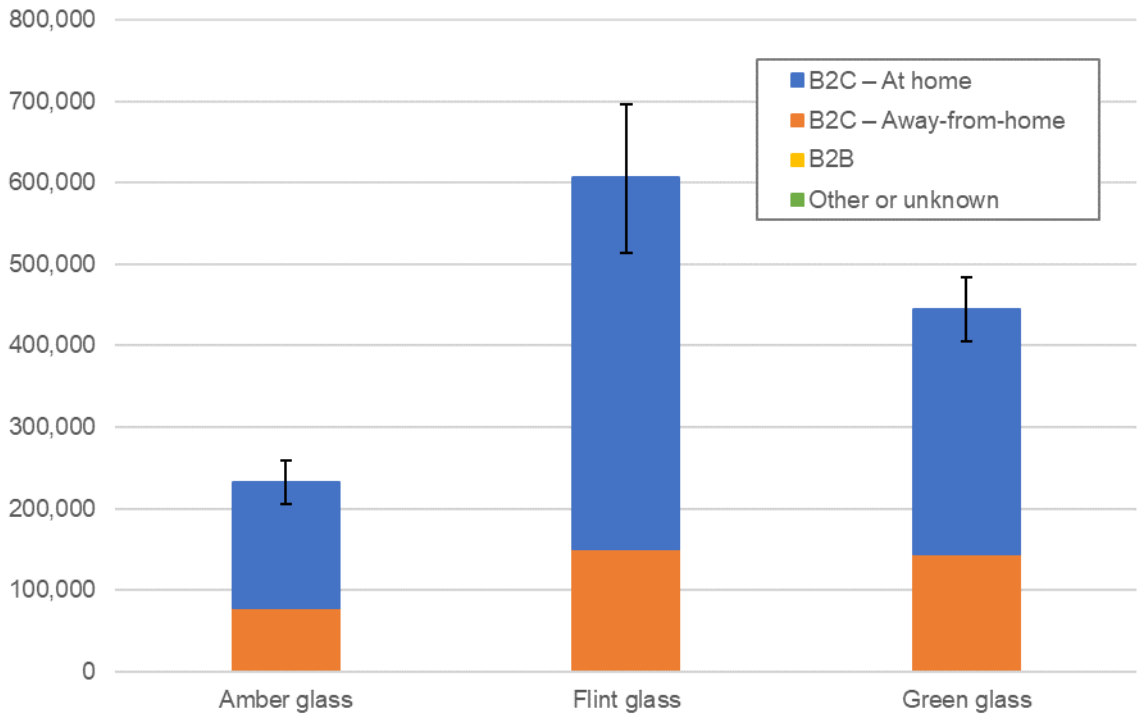

Figure 4 – Glass packaging POM in 2020–21, by material type and sector of use (tonnes)

Plastic packaging

Plastic packaging POM in Australia in 2020–21 is estimated at 1.2 million tonnes (±16%), which was 17.5% of all packaging POM. Estimates for plastic packaging POM by material type and sector of use are provided in **Table 9** and **Figure 5**.

Plastic packaging consumption is dominated by high-density polyethylene (HDPE) (24.3%), low-density polyethylene (LDPE) (28.1%), polypropylene (PP) (18.3%) and polyethylene terephthalate (PET) (12.7%). Around 77% of plastic packaging was used in the B2C sector, with another 23% used in the B2B sector (mainly LDPE films and HPDE or PP in rigid packaging applications).

Between 2019–20 and 2020–21 (**Table 6**) there was an increase in plastic packaging POM of 56,000 tonnes (+5%). The largest increase was in LDPE (+55,000 tonnes), mostly in the B2B sector.

Table 9 – Plastic packaging POM in 2020–21, 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)	129,000	12,000	8,000	0	149,000	12.7%	12%
HDPE (2)	225,000	2,000	59,000	0	287,000	24.3%	13%
PVC (3)	9,000	0	6,000	0	15,000	1.3%	20%
LDPE (4)	216,000	1,000	114,000	0	331,000	28.1%	16%
PP (5)	165,000	12,000	38,000	0	215,000	18.3%	10%
PS (6)	7,000	9,000	0	0	17,000	1.5%	17%
EPS (6)	13,000	3,000	14,000	0	29,000	2.5%	17%
Bioplastic (7)	1,000	2,000	0	0	4,000	0.3%	20%
Other (7)	3,000	0	17,000	0	21,000	1.7%	8%
Unidentified	96,000	0	13,000	2,000	111,000	9.4%	46%
Total (tonnes)	**864,000**	**43,000**	**270,000**	**2,000**	**1,179,000**	**-**	**-**
Total (%)	**73.3%**	**3.7%**	**22.9%**	**0.2%**	**100.0%**	**100.0%**	**16%**

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 that PIC – Plastic identification code. Also referred to as the resin identification code (RIC) in some other countries.

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

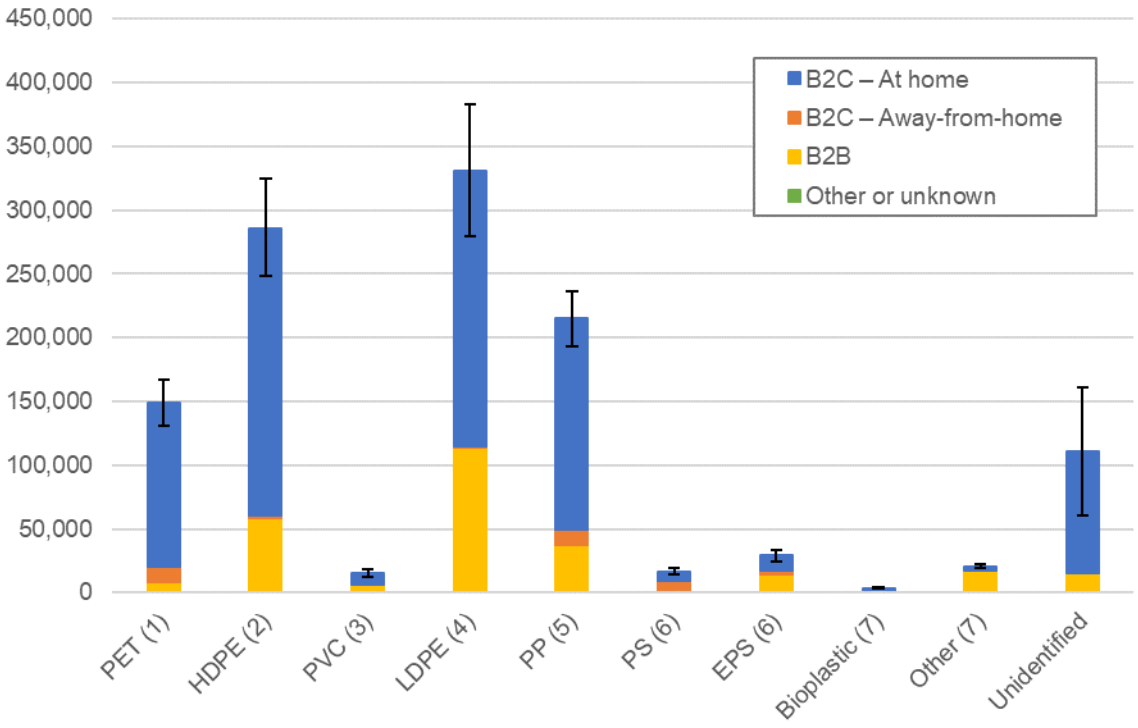

Figure 5 – Plastic packaging POM in 2020–21, by material type and sector of use (tonnes)

Metal packaging

Metal packaging POM in Australia in 2020–21 is estimated at 254,000 tonnes (±9%), which was 4% of all packaging POM. Estimates for metal packaging POM by material type and sector of use are provided in **Table 10** and **Figure 6**.

Metal packaging consumption is dominated by tin-plate steel can (49.3%) and aluminium beverage can (37.4%) consumption. An estimated 78% of metal packaging was used in the B2C sector, with the other 22% used in the B2B sector.

Between 2019–20 and 2020–21 (**Table 6**) there was an increase in metal packaging POM of 6,000 tonnes (+2%).

Table 10 – Metal packaging POM in 2020–21, 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	61,000	34,000	0	0	95,000	37.4%	7%
Non-beverage aluminium	7,000	0	0	0	7,000	2.8%	11%
Tin-plate steel	96,000	0	29,000	0	125,000	49.3%	10%
Mild steel	0	0	26,000	0	26,000	10.4%	7%
Stainless steel	0	0	0	0	0	0.1%	18%
Total (tonnes)	**164,000**	**34,000**	**56,000**	**0**	**254,000**	**-**	**-**
Total (%)	**64.6%**	**13.4%**	**22.1%**	**0.0%**	**100.0%**	**100.0%**	**9%**

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

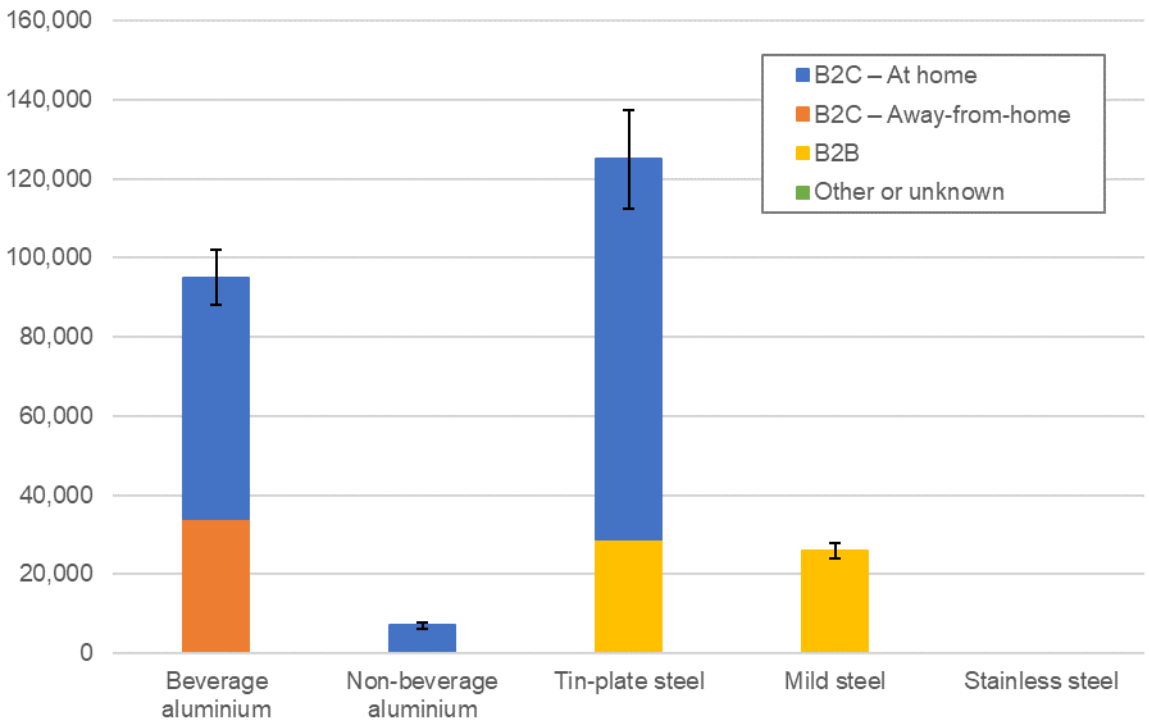

Figure 6 – Metal packaging POM in 2020–21, by material type and sector of use (tonnes)

Wood packaging

Wood packaging POM in Australia in 2020–21 was estimated at 638,000 tonnes (±34%), which was 9.5% of all packaging POM. This includes both single-use and reusable packaging types. Estimates for wood packaging POM by material type and sector of use are provided in **Table 11** and **Figure 7**.

Note that data on reusable wood pallet flows is also provided separately in **Section 6** of this report.

Wood packaging consumption was dominated by softwood use (69.9%). More than 99% of wood packaging was used in the B2B sector. The packaging components included are pallets, skids, crates, and cable reels.

Between 2019–20 and 2020–21 there was a reported large increase in wood packaging (176,000 tonnes). This was mostly due to increased survey coverage and does not reflect an actual strong trend.

Note that all estimates have large accuracy ranges due to the uncertainties associated with estimating imported single-use wood pallets and skids carrying goods.

Table 11 – Wood packaging POM in 2020–21, 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)	(%)	(±%)
Low-density fibreboard	0	0	94,000	0	94,000	14.8%	50%
Oriented strand board	0	0	37,000	0	37,000	5.8%	49%
Hardwood	0	0	60,000	0	60,000	9.5%	47%
Softwood	0	1,000	445,000	0	446,000	69.9%	28%
Total (tonnes)	**0**	**1,000**	**636,000**	**0**	**638,000**	**-**	**-**
Total (%)	**0.0%**	**0.2%**	**99.8%**	**0.0%**	**100.0%**	**100.0%**	**34%**

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

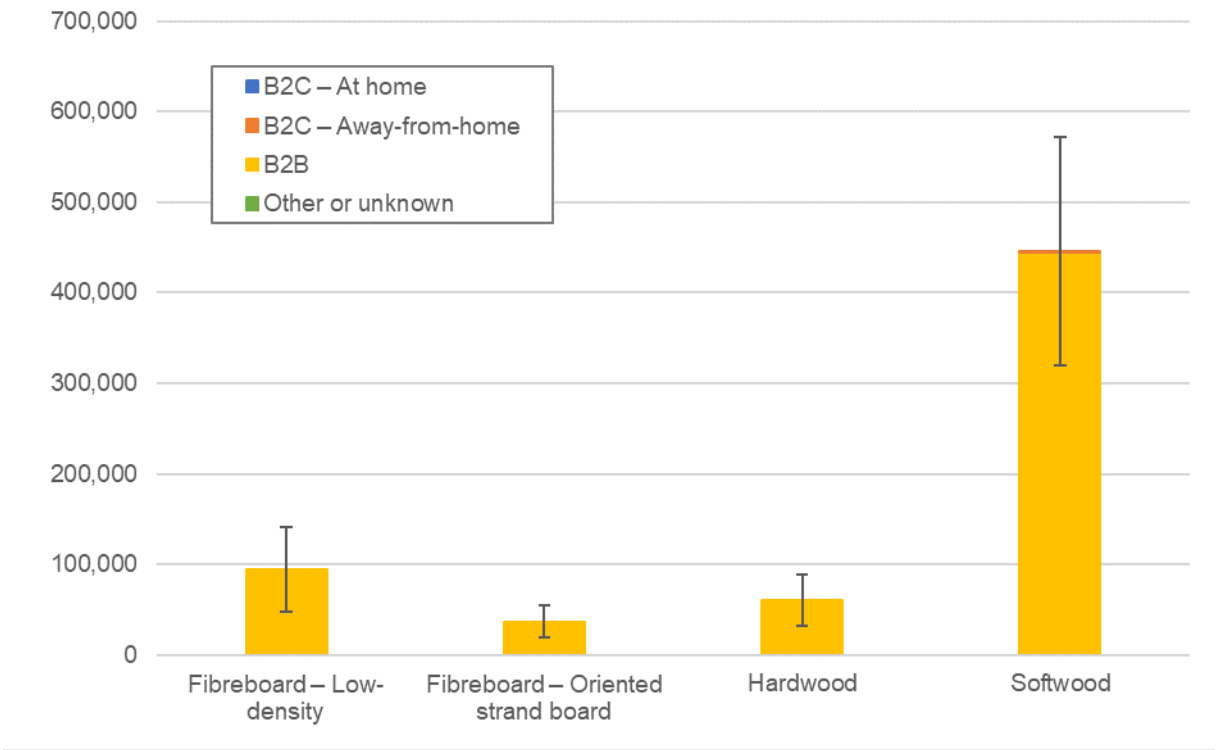

Figure 7 – Wood packaging POM in 2020–21, by material type and sector of use (tonnes)

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 supports the estimation of the quantities of rigid and flexible plastic packaging components onto the market (**Section 2.6**). It also supports the estimation of packaging recovery rates by component group (**Section 3.9**).

Estimates for packaging POM by material group and component group are provided in **Table 12** and **Figure 8**.

The major packaging component groups are cartons or boxes (44.8%), which are almost entirely paper & paperboard based, and bottles or jars (23.6%), which are split approximately 4:1 between glass and plastic containers POM on a mass basis.

Between 2019–20 and 2020–21 there was a reported shift from plastic tableware POM, which fell by 12,000 tonnes (-48%) to paper and paperboard tableware, which increased by 35,920 tonnes (+600%).

Table 12 – Packaging POM in 2020–21, by material group and component group

Component group	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Bag or pouch	130,000	0	360,000	0	0	489,000	7.3%
Barrel or drum	0	0	23,000	34,000	30,000	88,000	1.3%
Bottle or jar	0	1,283,000	306,000	0	0	1,589,000	23.6%
Can	0	0	0	214,000	0	214,000	3.2%
Carton or box	2,929,000	0	9,000	0	79,000	3,017,000	44.8%
Closure or label	0	0	58,000	2,000	0	61,000	0.9%
Pallet or bin	0	0	10,000	0	526,000	536,000	8.0%
Shopping bag	0	0	13,000	0	0	13,000	0.2%
Tableware	42,000	0	13,000	0	1,000	56,000	0.8%
Tub, tray or punnet	69,000	0	117,000	3,000	0	189,000	2.8%
Tube or cartridge	0	0	10,000	0	0	10,000	0.2%
Wrap	101,000	0	109,000	0	0	209,000	3.1%
Other	117,000	0	24,000	0	0	141,000	2.1%
Unknown	0	0	125,000	0	2,000	127,000	1.9%
Total	**3,387,000**	**1,283,000**	**1,179,000**	**254,000**	**638,000**	**6,740,000**	**100.0%**

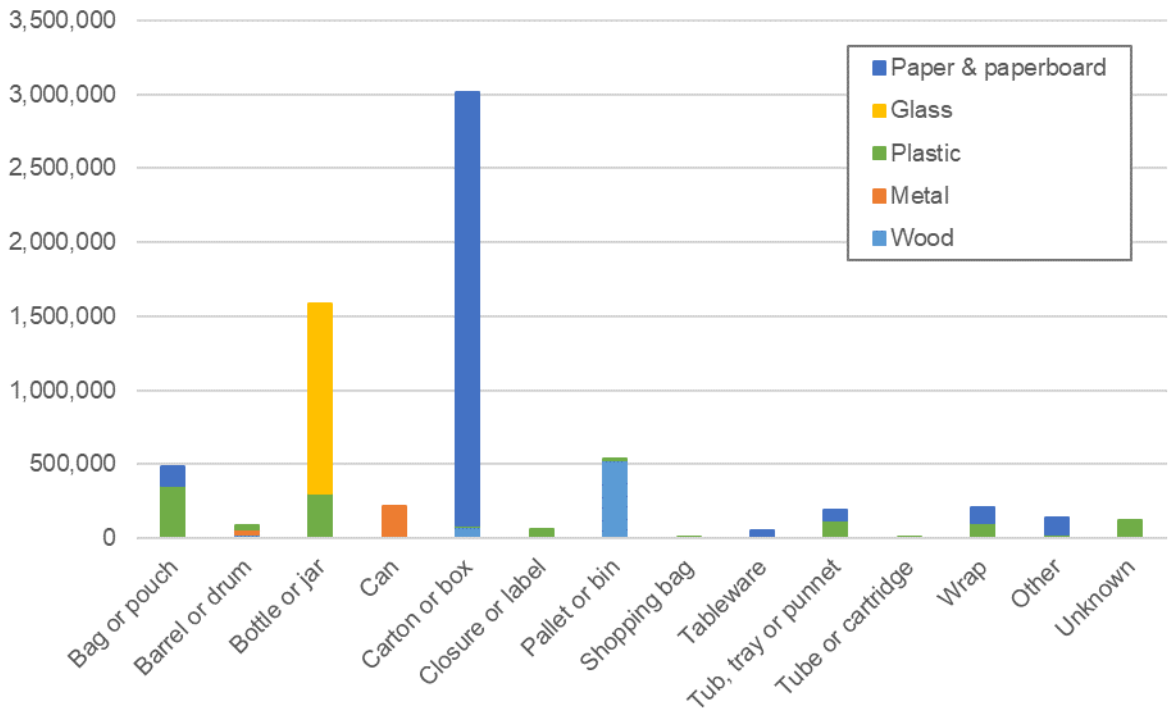

Figure 8 – Packaging POM in 2020–21, by material group and component group (tonnes)

2.4 Packaging count

In this section of the report, estimates are presented as packaging counts (number of units) of packaging POM by material group and packaging component group - across both B2C and B2B packaging applications. This is based on the packaging component group mass data presented in **Section 2.3** and extensive audits of packaging component weights, mostly undertaken as part of the 2018–19 iteration of this project with some minor updates for 2020–21.

It is important to note that the packaging weight audits in 2018–19 were 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 having been POM in 2018–19. For this reason, the data in this section of the report should be considered indicative only.

There are two key terms used in this section of the report, which are:

- **Packaging component** – A part of a packaging assembly that can be separated by hand or by using simple physical means (ISO, 2013a, p. 3).
- **Packaging assembly** – 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 assembly consisting of: a glass bottle, a metal or plastic closure and a paper or plastic label.

Estimates for packaging counts POM by material group and component group, across all sectors of use (B2C and B2B), are provided in **Table 13** and **Figure 9**.

Table 13 – Packaging counts POM in 2020–21, by material group and component group – B2C and B2B.

Component group	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	7,840	0	46,120	0	0	53,970	29.2%
Barrel or drum	0	0	7	7	2	16	0.0%
Bottle or jar	0	4,810	7,750	0	0	12,560	6.8%
Can	0	0	0	8,280	0	8,280	4.5%
Carton or box	18,410	0	30	0	8	18,440	10.0%
Closure or label	0	0	10,460	260	0	10,720	5.8%
Pallet or bin	0	0	0	0	17	17	0.0%
Shopping bag	0	0	1,010	0	0	1,010	0.5%
Tableware	3,820	0	2,560	0	0	6,380	3.5%
Tub, tray or punnet	2,210	0	5,080	610	0	7,900	4.3%
Tube or cartridge	0	0	160	20	0	180	0.1%
Wrap	35,100	0	6,730	0	0	41,830	22.7%
Other	14,190	0	650	0	0	14,840	8.0%
Total (million units)	**81,580**	**4,810**	**88,940**	**9,180**	**27**	**184,530**	**-**
Total (%)	**44.2%**	**2.6%**	**48.2%**	**5.0%**	**0.0%**	**100.0%**	**100.0%**

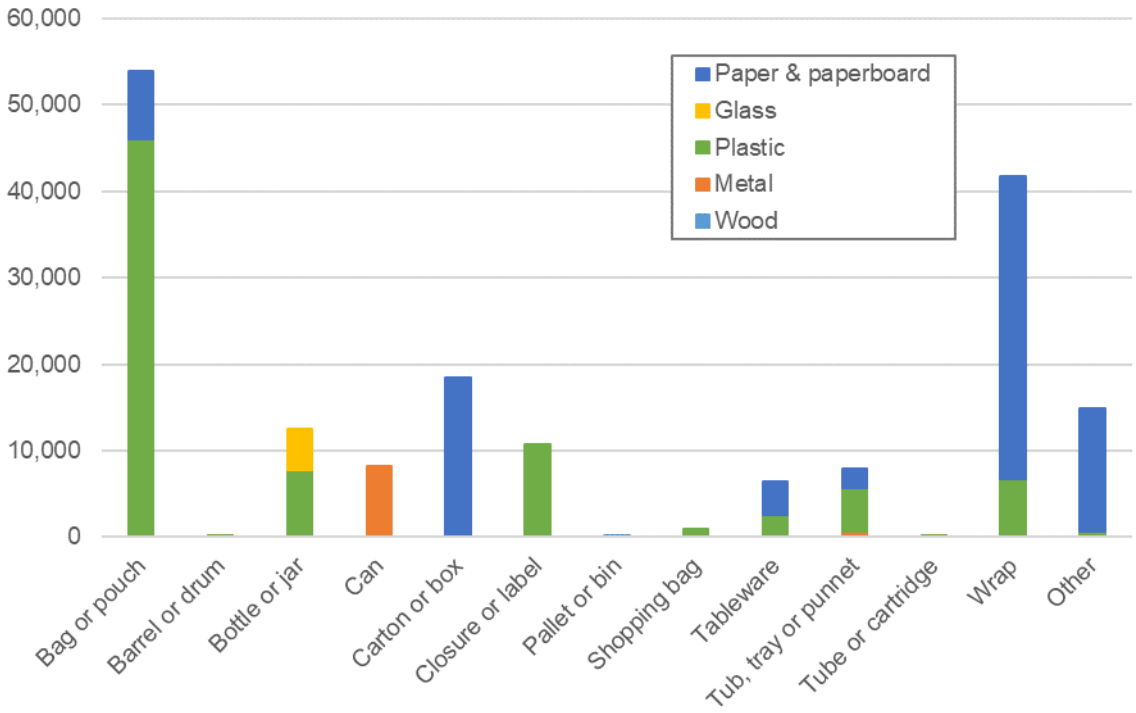

Figure 9 – Packaging counts POM in 2020–21, by material group and component group – B2C and B2B (million units).

Estimates for packaging counts POM by material group and component group, for the B2C (at home) sector of use, are provided on the following page in **Table 14** and **Figure 10**.

The Australian population was estimated at 25.7 million at June 2021 (ABS, 2022a), and the number of households estimated at 10.0 million for the same time (ABS, 2019), giving an average

of 2.58 persons per household. From this and the data in **Table 14,** the following high-level B2C (at home) packaging count POM estimates can be calculated for 2020–21:

- There were 3,500 packaging components per person used in the B2C (at home) sector, or 9.7 packaging components per person per day.
- There were 2,100 packaging assemblies per person used in the B2C (at home) sector, or 5.6 packaging assemblies per person per day.
- There were 5,300 packaging assemblies per household used in the B2C (at home) sector, or 14.6 packaging assemblies per household per day.

Note that it was determined for the 2018–19 study (APCO, 2020a, p. 38) that there are approximately 1.7 components per assembly on average.

Table 14 – Packaging counts POM in 2020–21, by material group and component group – B2C (at home).

Component group	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	1,820	0	31,320	0	0	33,140	36.5%
Barrel or drum	0	0	5	4	0	9	0.0%
Bottle or jar	0	3,410	6,250	0	0	9,660	10.6%
Can	0	0	0	5,600	0	5,600	6.2%
Carton or box	9,010	0	10	0	0	9,020	9.9%
Closure or label	0	0	7,270	200	0	7,470	8.2%
Pallet or bin	0	0	0	0	0	0	0.0%
Shopping bag	0	0	750	0	0	750	0.8%
Tableware	1,390	0	1,530	0	0	2,920	3.2%
Tub, tray or punnet	1,330	0	3,750	600	0	5,680	6.3%
Tube or cartridge	0	0	130	20	0	150	0.2%
Wrap	4,920	0	3,970	0	0	8,900	9.8%
Other	420	0	430	0	0	850	0.9%
Total (million units)	**18,890**	**3,410**	**62,080**	**6,430**	**0**	**90,810**	**-**
Total (%)	**20.8%**	**3.8%**	**68.4%**	**7.1%**	**0.0%**	**100.0%**	**100.0%**

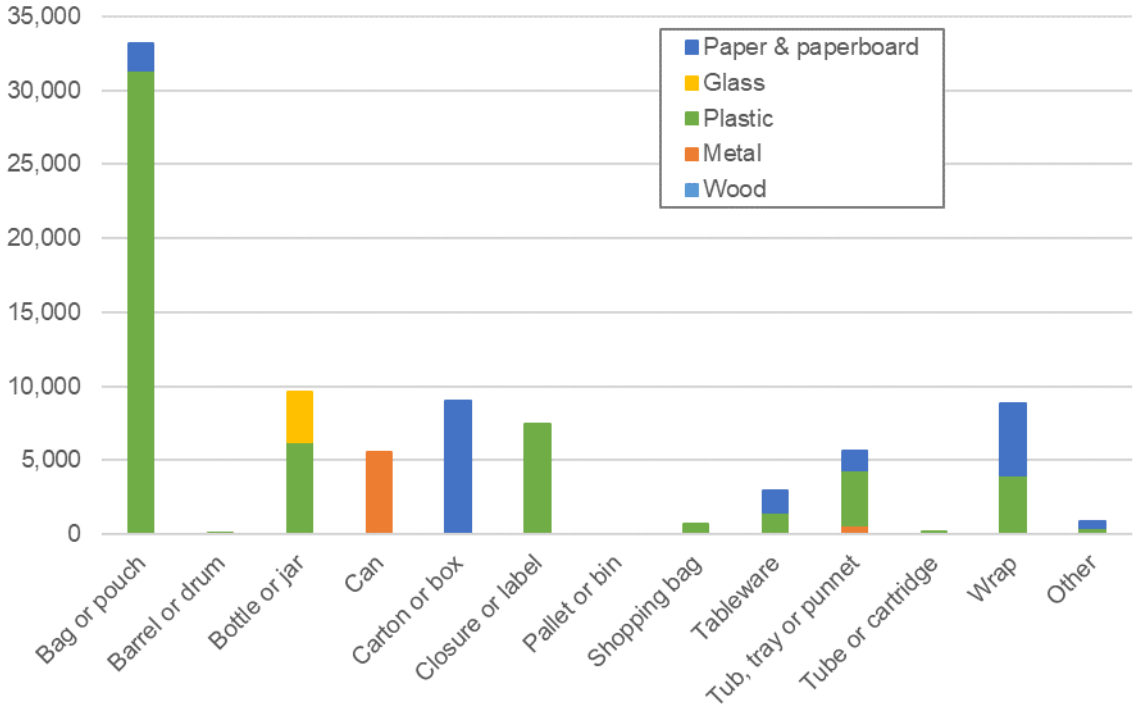

Figure 10 – Packaging counts POM in 2020–21, by material group and component group – B2C (at home) (million units).

Estimates for packaging counts POM by material group and component group, for the B2C (away-from-home) sector of use, are provided in **Table 15** and **Figure 11**.

From the available data the following high-level B2C (away-from-home) packaging count POM estimates can be calculated for 2020–21:

- There were 580 packaging components per person used in the B2C (away-from-home) sector, or 1.6 packaging components per person per day.
- There were 360 packaging assemblies per person used in the B2C (away-from-home) sector, or 1.0 packaging assemblies 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 2020–21:

- There were 4,100 packaging components per person used in the B2C sector, or 11.3 packaging components per person per day.
- There were 2,400 packaging assemblies per person used in the B2C sector, or 6.6 packaging assemblies per person per day.

Table 15 – Packaging counts POM in 2020–21, by material group and component group – B2C (away-from-home).

Component group	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	1,280	0	530	0	0	1,820	12.1%
Barrel or drum	0	0	0	0	0	0	0.0%
Bottle or jar	0	1,390	300	0	0	1,700	11.3%
Can	0	0	0	2,250	0	2,250	15.0%
Carton or box	890	0	0	0	0	890	5.9%
Closure or label	0	0	980	0	0	980	6.5%
Pallet or bin	0	0	0	0	0	0	0.0%
Shopping bag	0	0	10	0	0	10	0.0%
Tableware	1,810	0	690	0	0	2,500	16.6%
Tub, tray or punnet	100	0	620	10	0	730	4.9%
Tube or cartridge	0	0	0	0	0	0	0.0%
Wrap	3,400	0	90	0	0	3,490	23.3%
Other	340	0	50	0	0	390	2.6%
Total (million units)	**7,830**	**1,390**	**3,520**	**2,260**	**0**	**15,000**	**-**
Total (%)	**52.2%**	**9.3%**	**23.5%**	**15.1%**	**0.0%**	**100.0%**	**100.0%**

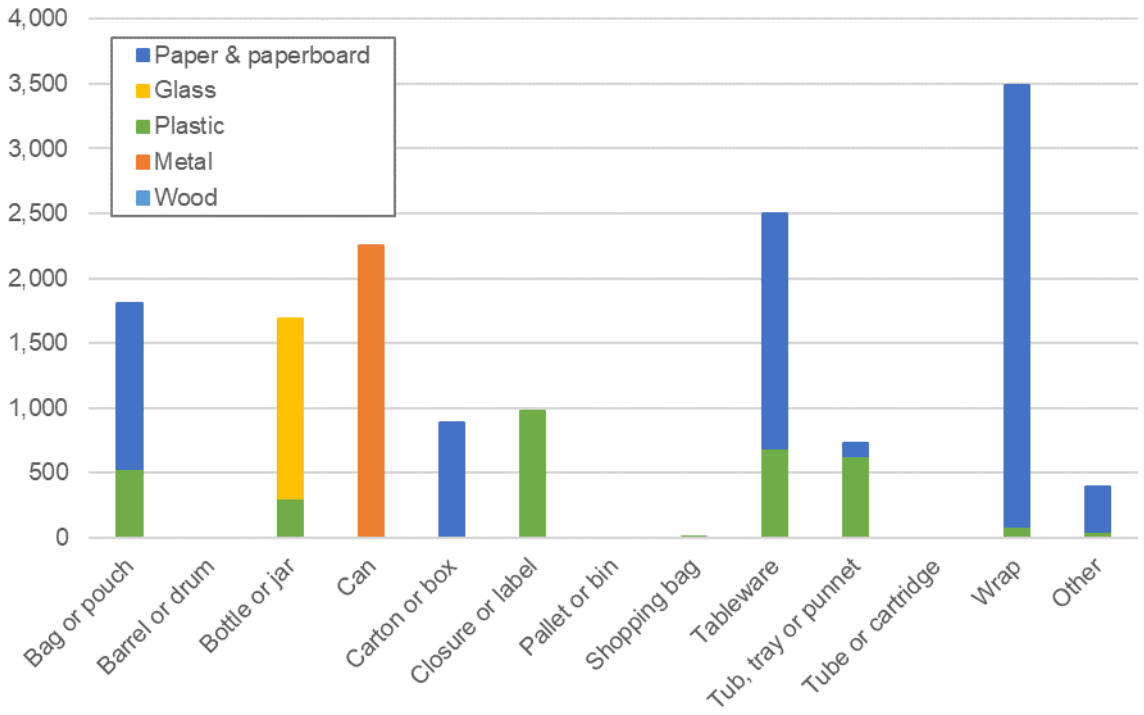

Figure 11 – Packaging counts POM in 2020–21, by material group and component group – B2C (away-from-home) (million units).

Estimates for packaging counts POM by material group and component group, for the B2B sector of use, are provided in **Table 16** and **Figure 12**.

Table 16 – Packaging counts POM in 2020–21, by material group and component group – B2B.

Component group	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(million units)	(million units)	(million units)	(million units)	(million units)	(million units)	(%)
Bag or pouch	4,610	0	14,270	0	0	18,880	27.4%
Barrel or drum	0	0	1	3	2	6	0.0%
Bottle or jar	0	0	1,190	0	0	1,190	1.7%
Can	0	0	0	420	0	420	0.6%
Carton or box	8,040	0	10	0	10	8,060	11.7%
Closure or label	0	0	2,210	60	0	2,270	3.3%
Pallet or bin	0	0	0	0	17	17	0.0%
Shopping bag	0	0	250	0	0	250	0.4%
Tableware	510	0	340	0	0	840	1.2%
Tub, tray or punnet	780	0	710	0	0	1,490	2.2%
Tube or cartridge	0	0	30	0	0	30	0.0%
Wrap	21,770	0	2,670	0	0	24,440	35.5%
Other	9,280	0	170	0	0	9,450	13.7%
Total (million units)	**44,990**	**0**	**23,310**	**490**	**30**	**68,810**	**-**
Total (%)	**65.4%**	**0.0%**	**33.9%**	**0.7%**	**0.0%**	**100.0%**	**100.0%**

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 earlier, the estimates in this section of the report are indicative only.

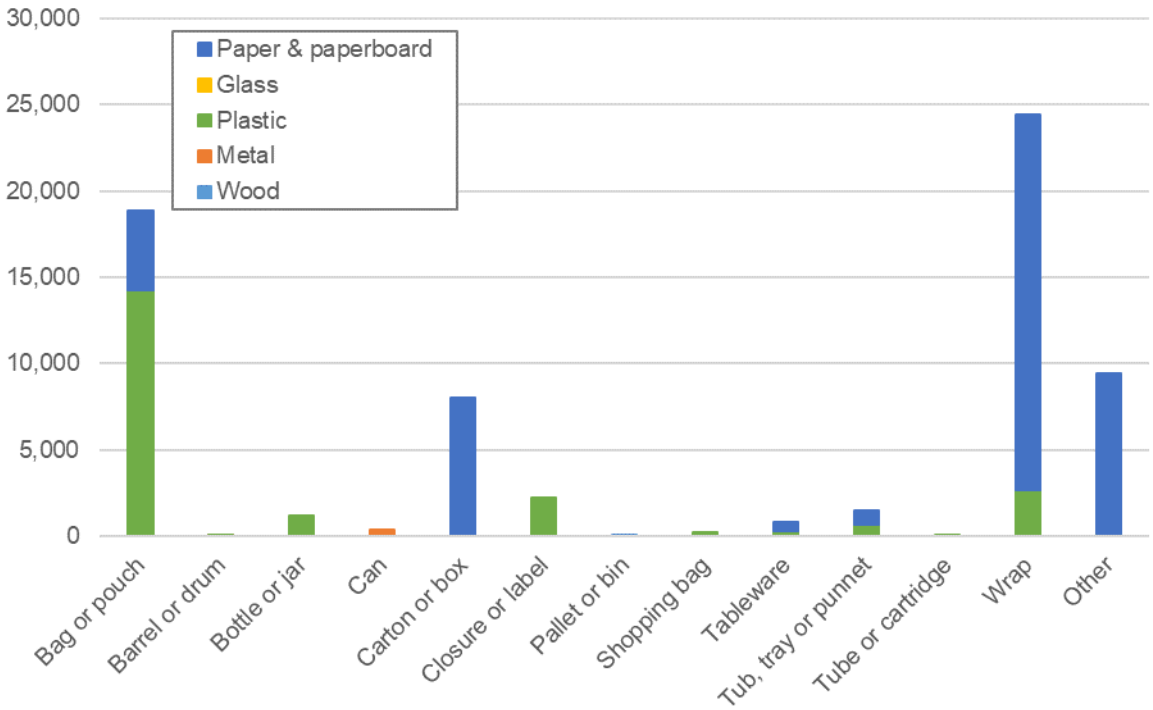

Figure 12 – Packaging counts POM in 2020–21, by material group and component group – B2B (million units).

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, 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 'imbalance' to be considered.

Estimates of the location of packaging material source, by local or overseas origin, are provided in **Table 17** and **Figure 13**. In 2020–21 around 62% of packaging was manufactured locally and 38% was imported. Local packaging manufacturing is effectively flat from the 63% reported in 2019–20.

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 17 – Packaging POM in 2020–21, by material group, location of manufacturing, and material source location

Material group	Locally manufactured packaging		Overseas manufactured packaging		Total
	Local source	Overseas source	Filled packaging	Empty packaging	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	1,540,000	433,000	1,253,000	161,000	3,387,000
Glass	833,000	57,000	215,000	177,000	1,283,000
Plastic	235,000	491,000	95,000	358,000	1,179,000
Metal	22,000	183,000	36,000	13,000	254,000
Wood	404,000	0	222,000	11,000	638,000
Total (tonnes)	**3,034,000**	**1,165,000**	**1,821,000**	**720,000**	**6,740,000**
Total (%)	**45.0%**	**17.3%**	**27.0%**	**10.7%**	**100.0%**

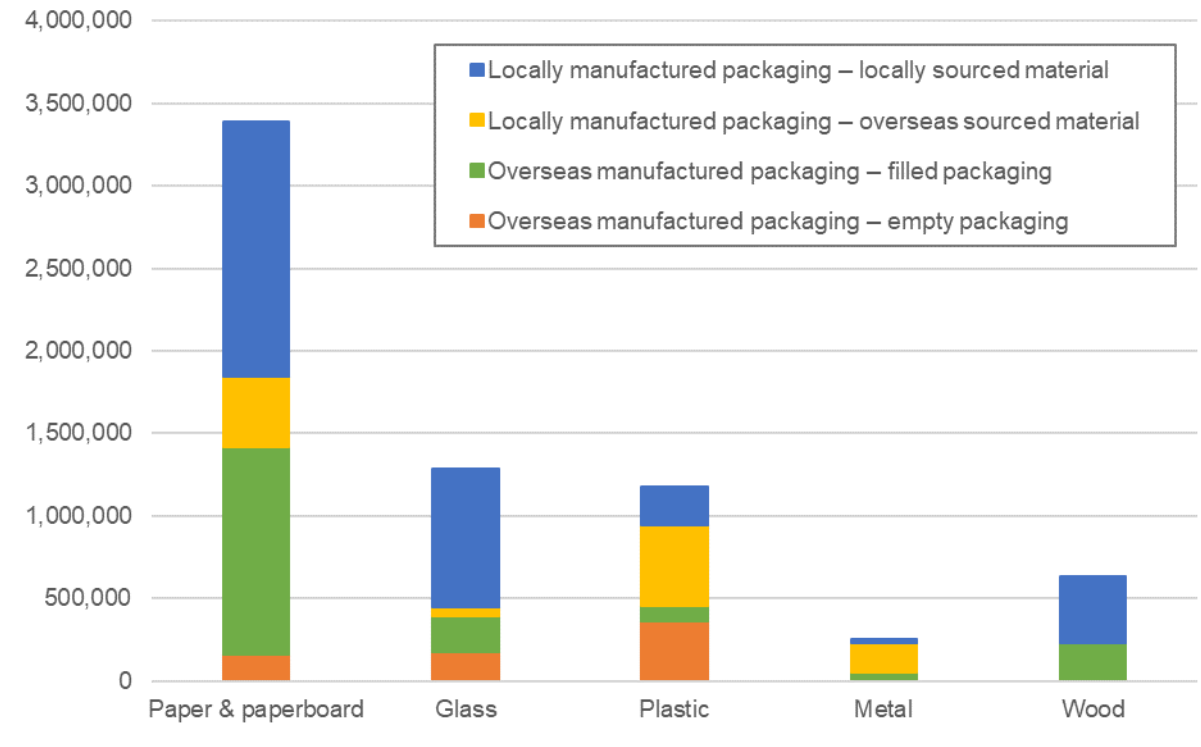

Figure 13 – Packaging POM in 2020–21, by material group, location of manufacturing, and location of packaging material source (tonnes)

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 18** 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 1.2 million tonnes of plastic packaging POM in 2020–21 an estimated 558,000 tonnes (47%) were identified as rigid plastic packaging, and 496,000 tonnes (42%) as flexible plastics. The format of the other 125,000 tonnes (11%) could not be identified in sufficient detail to classify this material as either rigid or flexible. These percentage classifications are almost the same as the 2019–20 estimates.

Most flexible packaging was made from LDPE (63%), followed by HDPE (13%), PP (8%) and PET (3%).

Most rigid packaging was made from HDPE (34%), followed by PP (24%) and PET (23%).

Between 2019–20 and 2020–21 there was a shift in flexible packaging away from PET (--19,000 tonnes) and PP (-31,000 tonnes) and towards LDPE (+52,000 tonnes) and HDPE (+7,000 tonnes).

Table 18 – Plastic packaging POM in 2020–21, by material type and rigid/flexible classification.

Format	Rigid	Flexible	Unknown	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
PET (1)	127,000	13,000	9,000	149,000
HDPE (2)	191,000	64,000	32,000	287,000
PVC (3)	NR[a]	NR[a]	NR[a]	15,000
LDPE (4)	10,000	313,000	8,000	331,000
PP (5)	135,000	40,000	41,000	215,000
PS (6)	17,000	0	1,000	17,000
EPS (6)	29,000	0	0	29,000
Bioplastic (7)	2,000	1,000	0	4,000
Other (7)	2,000	19,000	0	21,000
Unidentified	42,000	35,000	33,000	111,000
Total (tonnes)	**558,000**	**496,000**	**125,000**	**1,179,000**
Total (%)	**47.3%**	**42.0%**	**10.6%**	**100.0%**

a) NR – Not reported due to confidentiality considerations related to small number of respondents.

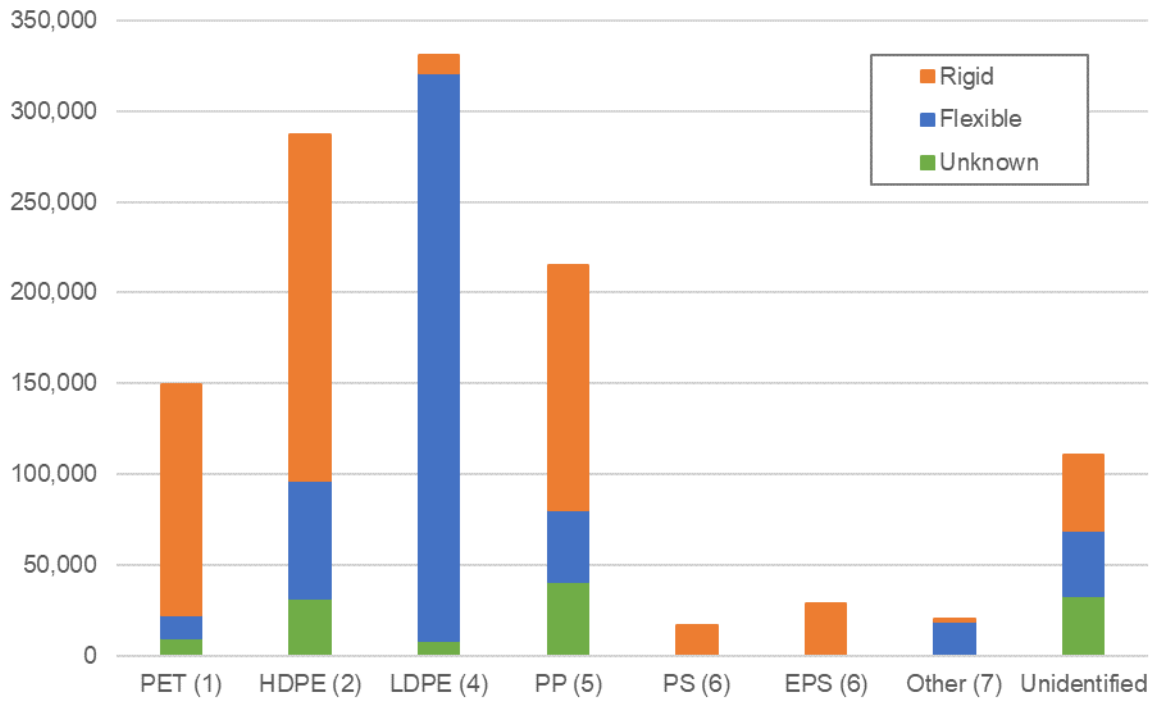

Figure 14 – Plastic packaging POM in 2020–21, by material type and rigid/flexible classification (tonnes)

2.7 Degradability rating

Estimates of packaging POM by degradability rating are provided in **Table 19** and **Figure 15**.

Due to the extensive use of wood-fibre based packaging, 3.8 million tonnes of packaging POM in 2020–21 (56.4% of packaging) is rated as certified compostable or non-certified but potentially biodegradable. Wood fibre based packaging (e.g. paper & paperboard and wood) is usually reported by survey respondents as biodegradable (but not certified compostable) unless it is a composite packaging format that includes plastics. Around 2.9 million tonnes (43.6%) were not considered degradable.

Table 19 – Packaging POM in 2020–21, 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	97,000[a]	3,000	3,286,000	0	3,387,000
Glass	1,283,000	0	0	0	1,283,000
Plastic	1,175,000	4,000	0	1,000	1,179,000
Metal	254,000	0	0		254,000
Wood	132,000	0	506,000	0	638,000
Total	**2,940,000**	**7,000**	**3,792,000**	**1,000**	**6,740,000**

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 2020–21, a decrease from 2,000 tonnes in the previous year. 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 mass.

All the identified oxo-degradable and photo-degradable packaging was imported, with no local manufacturer identified.

There was a fall in the quantity of certified compostable plastics POM, from 9,000 tonnes in 2019–20 to 4,000 tonnes in 2020–21.

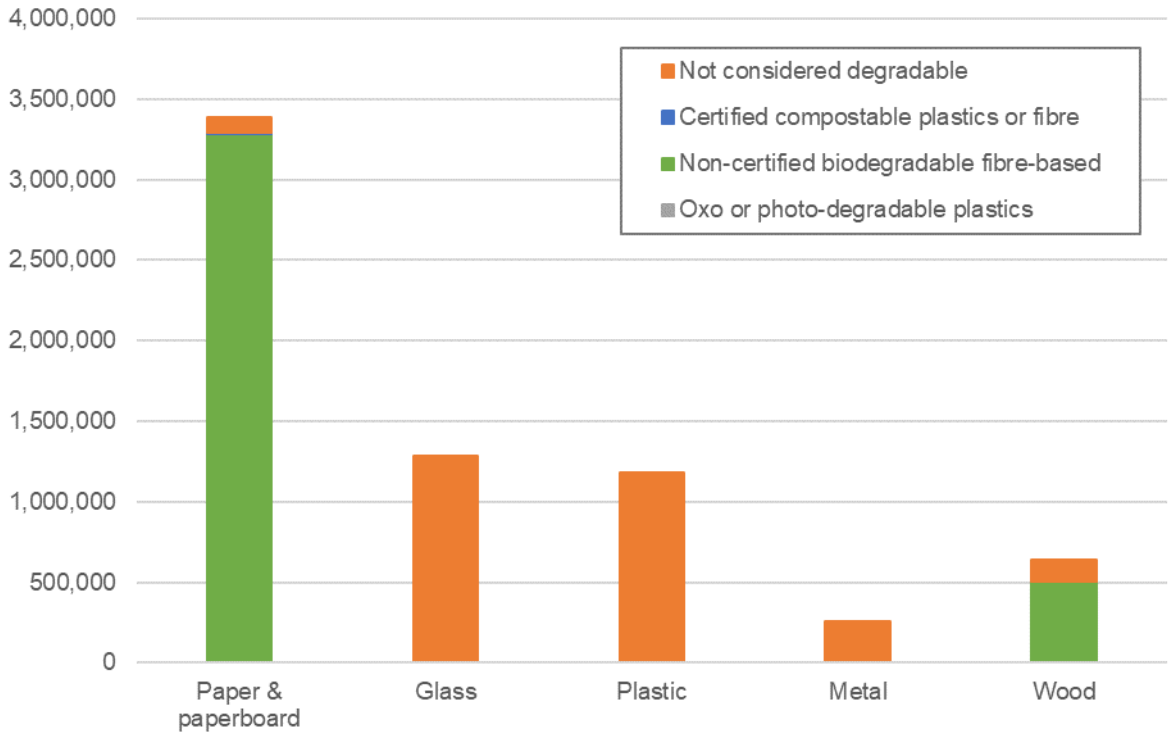

Figure 15 – Packaging POM in 2020–21, by material group and degradability rating (tonnes)

2.8 Recycled content

Material group

Estimates of the recycled content incorporated into packaging POM in 2020–21, by material group, are provided in **Table 20** and **Figure 16**. The post-consumer recycled (PCR) content across all packaging (excluding wood) was 2.4 million tonnes, or 39% of total packaging POM; the pre-consumer recycled content was 0.7 million tonnes (11%); and 3.1 million tonnes (50%) was sourced from virgin (primary) feedstocks.

Table 20 – Packaging POM in 2020–21, by material group (excluding wood) and content source.

Material group	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Paper & paperboard	1,801,000	53%	497,000	15%	1,089,000	32%	3,387,000
Glass	480,000	37%	114,000	9%	689,000	54%	1,283,000
Plastic	36,000	3%	22,000	2%	1,121,000	95%	1,179,000
Metal	37,000	15%	61,000	24%	156,000	61%	254,000
Total	**2,354,000**	**39%**	**695,000**	**11%**	**3,054,000**	**50%**	**6,103,000**

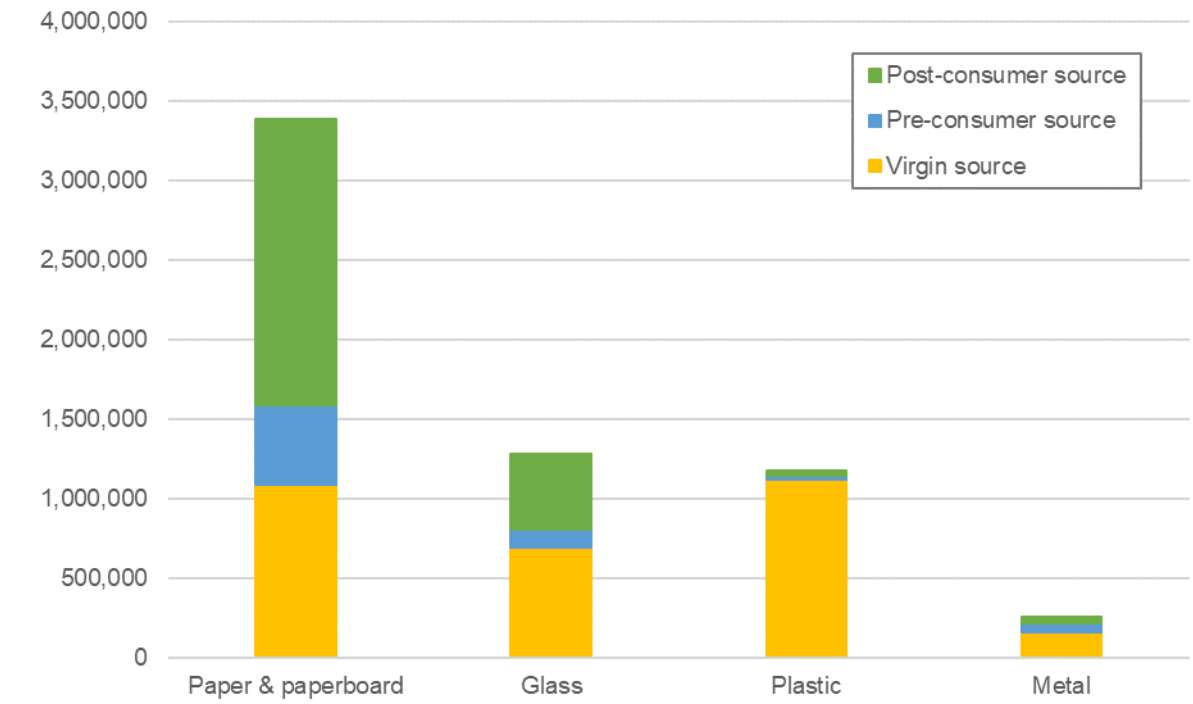

Figure 16 – Packaging POM in 2020–21, by material group (excluding wood) and content source (tonnes)

Table 21 and **Figure 17** compare the PCR content of packaging by material group from 2017–18 to 2020–21.

Table 21 – Packaging PCR content from 2017–18 to 2020–21, as a percentage of packaging POM, by material group (excluding wood).

Material group	2017–18		2018–19		2019–20		2020–21	
	(tonnes)	(% POM)	(tonnes)	(% POM)	(tonnes)	(% POM)	(tonnes)	(% POM)
Paper & paperboard	1,421,000	49%	1,667,000	51%	1,768,000	54%	1,801,000	53%
Glass	407,000	32%	474,000	37%	428,000	37%	480,000	37%
Plastic	23,000	2%	37,000	4%	36,000	3%	36,000	3%
Metal	64,000	30%	59,000	24%	28,000	11%	37,000	15%
Total	**1,915,000**	**35%**	**2,237,000**	**38%**	**2,260,000**	**39%**	**2,354,000**	**39%**

In 2020–21 the total quantity of PCR content in packaging increased by an estimated 94 kt (4%) compared to the previous year.

The PCR content of packaging, excluding wood, was steady at 39% in 2020–21 compared with 2019–20.

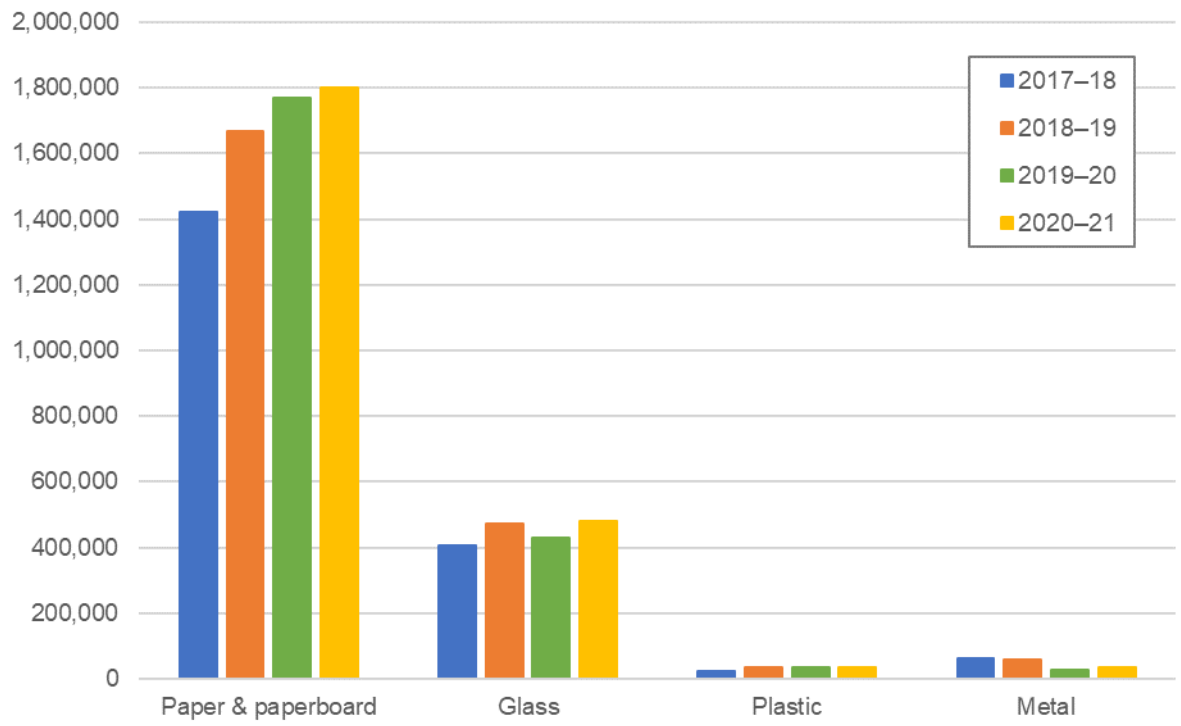

Figure 17 – Packaging PCR content from 2017–18 to 2020–21, by material group (tonnes)

Paper & paperboard packaging

Estimates of the recycled content incorporated into paper & paperboard packaging POM in 2020–21 and by material type are provided in **Table 22** and **Figure 18**.

The PCR content of paper & paperboard packaging was 1.8 million tonnes, or 53% of total paper & paperboard packaging POM, a small decrease from 54% in the previous year (**Table 21**)**.** The pre-consumer recycled content was 0.5 million tonnes (15%), and 1.1 million tonnes (32%) was sourced from virgin (primary) feedstocks.

Table 22 – Paper & paperboard packaging POM in 2020–21, by material type and content source.

Material type	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Boxboard/Cartonboard	136,000	43%	70,000	22%	108,000	34%	315,000
Corrugated cardboard	1,583,000	62%	378,000	15%	578,000	23%	2,539,000
HWS carrierboard	0	0%	2,000	8%	28,000	92%	31,000
Kraft paper	0	0%	30,000	12%	215,000	88%	246,000
Moulded fibreboard	56,000	88%	3,000	5%	4,000	7%	63,000
PCPB – Aseptic	0	0%	0	0%	49,000	100%	49,000
PCPB – Gable top	0	0%	0	0%	15,000	100%	15,000
PCPB – Cold cup	0	0%	1,000	6%	8,000	94%	8,000
PCPB – Hot cup	0	0%	2,000	8%	17,000	92%	18,000
PCPB – Other	0	1%	0	1%	4,000	98%	4,000
Polymer coated paper	0	0%	0	0%	1,000	100%	1,000
Other fibre packaging	27,000	27%	11,000	12%	61,000	61%	99,000
Total	**1,801,000**	**53%**	**497,000**	**15%**	**1,089,000**	**32%**	**3,387,000**

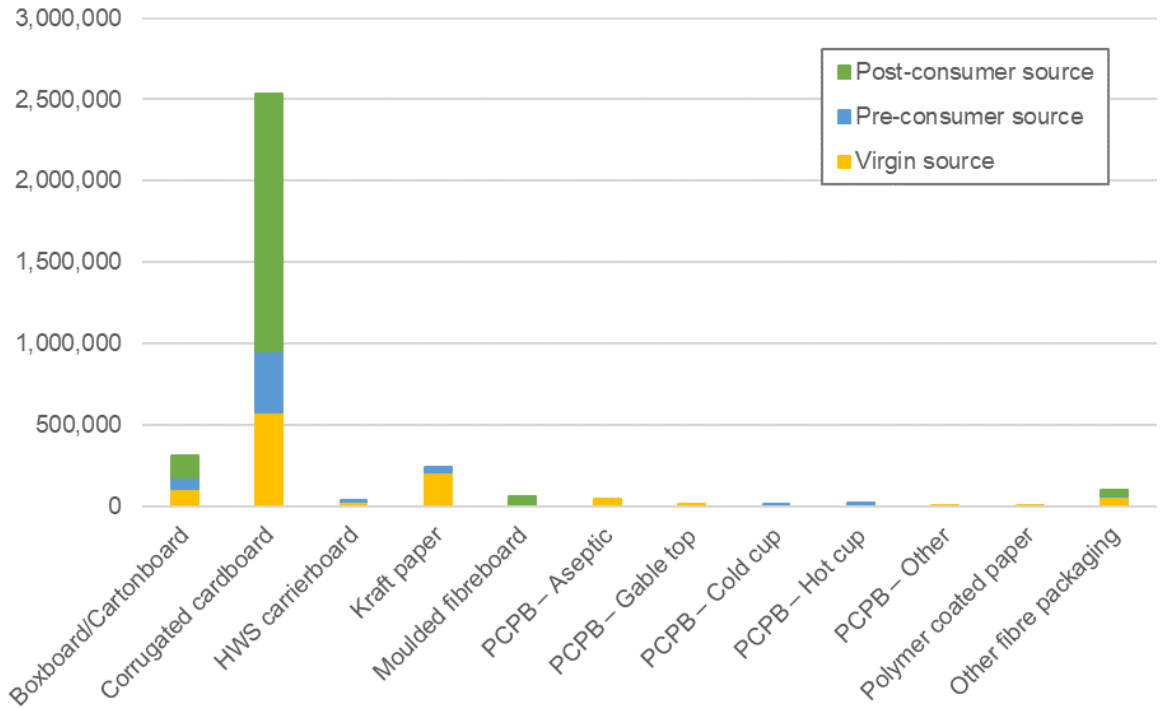

Figure 18 – Paper & paperboard packaging POM in 2020–21, by material type and content source (tonnes)

Glass packaging

Estimates of the recycled content incorporated into glass packaging POM in 2020–21 and by material type are provided in **Table 23** 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 0.1 million tonnes (9%) and 0.7 million tonnes (54%) was sourced from virgin (primary) feedstocks.

The proportion of PCR content remained unchanged from the previous year (**Table 21**).

Table 23 – Glass packaging POM in 2020–21, by material type and content source.

Material type	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Amber glass	95,000	41%	19,000	8%	119,000	51%	233,000
Flint glass	210,000	35%	53,000	9%	342,000	57%	605,000
Green glass	175,000	39%	43,000	10%	227,000	51%	445,000
Total	**480,000**	**37%**	**114,000**	**9%**	**689,000**	**54%**	**1,283,000**

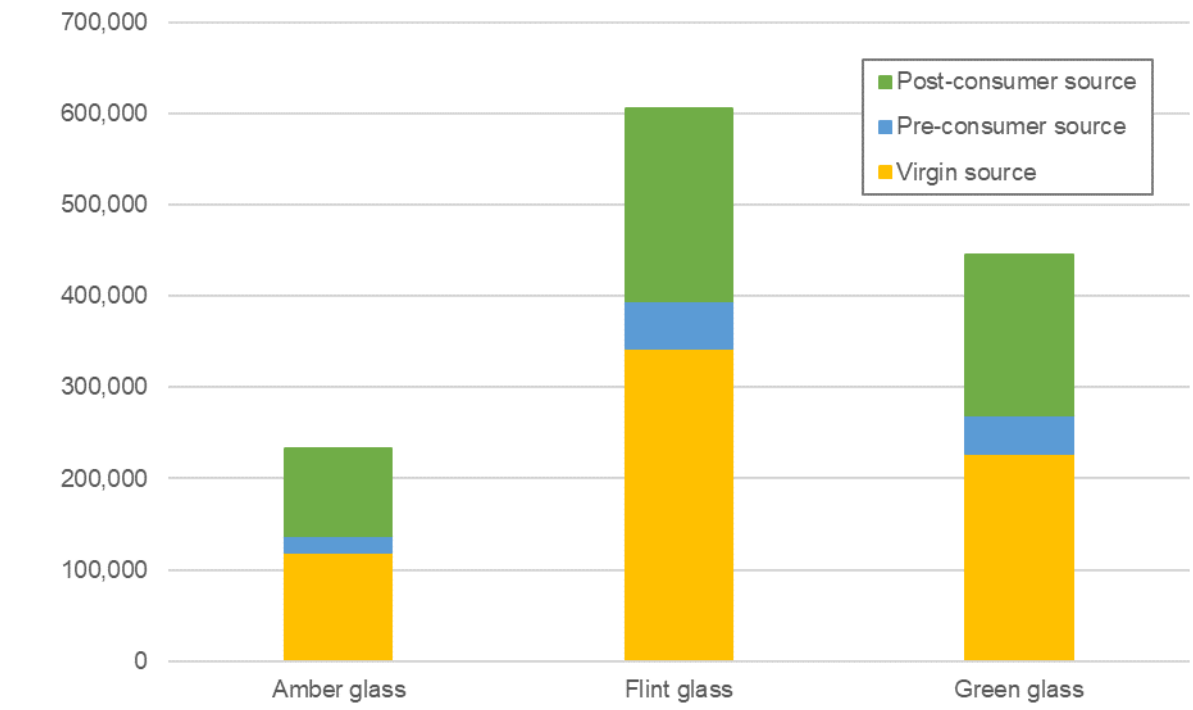

Figure 19 – Glass packaging POM in 2020–21, by material type and content source.(tonnes)

Plastic packaging

Estimates of the recycled content incorporated into plastic packaging POM in 2020–21 and by material type are provided in **Table 24** and **Figure 20**. The PCR content of plastic packaging was 36,000 tonnes, or 3% of total plastic packaging POM. The pre-consumer recycled content was 22,000 tonnes (2%), and virgin (primary) resin feedstock dominated supply at 1.1 million tonnes or 95% of source material.

These figures are similar to those reported in the 2019–20 report (36,000 tonnes of PCR and 16,000 tonnes of pre-consumer resin).

Table 24 – Plastic packaging POM in 2020–21, by material type and recycled content source

Material type	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
PET (1)	16,000	11%	5,000	3%	128,000	86%	149,000
HDPE (2)	9,000	3%	3,000	1%	274,000	96%	287,000
PVC (3)	0	3%	0	1%	14,000	97%	15,000
LDPE (4)	3,000	1%	10,000	3%	319,000	96%	331,000
PP (5)	7,000	3%	4,000	2%	204,000	95%	215,000
PS (6)	0	0%	0	2%	17,000	98%	17,000
EPS (6)	0	0%	0	0%	29,000	99%	29,000
Bioplastic (7)	0	0%	0	0%	4,000	100%	4,000
Other (7)	0	0%	0	0%	21,000	100%	21,000
Unidentified	0	0%	0	0%	111,000	100%	111,000
Total	**36,000**	**3%**	**22,000**	**2%**	**1,121,000**	**95%**	**1,179,000**

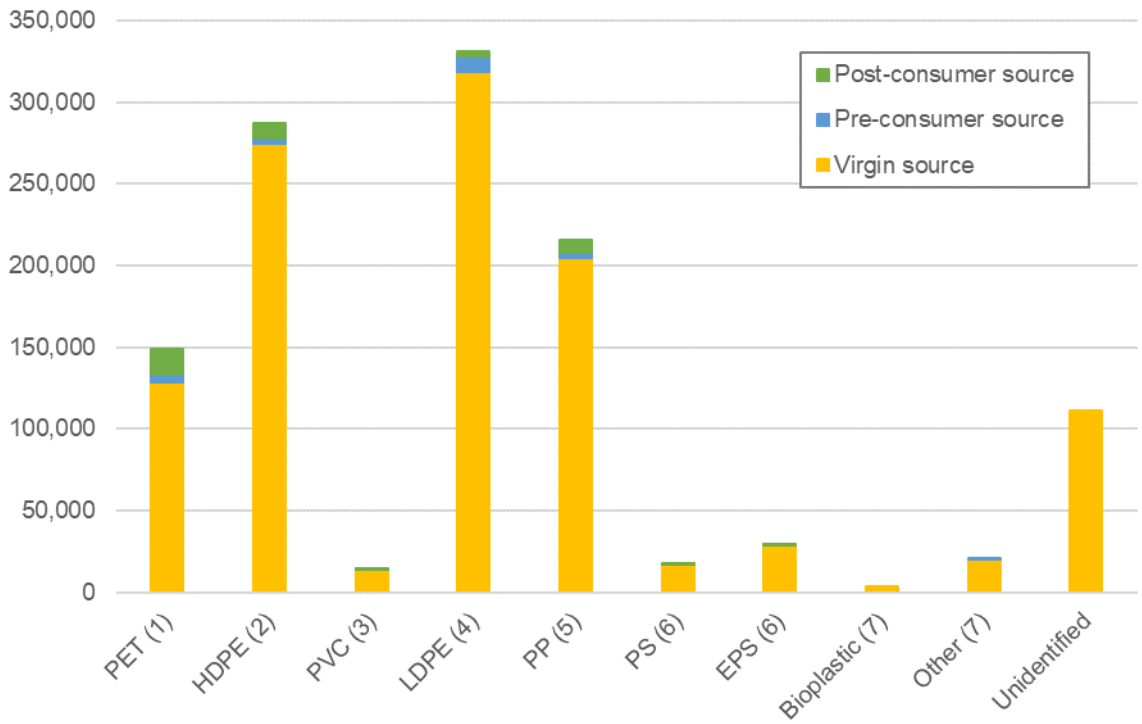

Figure 20 – Plastic packaging POM in 2020–21, by material type and content source(tonnes)

Metal packaging

Estimates of the recycled content incorporated into metal packaging POM in 2020–21 and by material type are provided in **Table 25** and **Figure 21**. The PCR content of metal packaging was 37,000 tonnes, or 15% of total metal packaging POM, the pre-consumer recycled content was 61,000 tonnes (24%), and 156,000 tonnes (61%) was sourced from virgin (primary) feedstocks.

Between 2019–20 and 2020–21 PCR content increased from 11% to 15%, largely due to a shift from pre-consumer recycled content to PCR.

Table 25 – Metal packaging POM in 2020–21, by material type and content source.

Material type	Post-consumer source		Pre-consumer source		Virgin source		Total
	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Beverage aluminium	22,000	23%	33,000	35%	40,000	42%	95,000
Non-beverage aluminium	1,000	14%	3,000	48%	3,000	37%	7,000
Tin-plate steel	10,000	8%	23,000	18%	92,000	74%	125,000
Mild steel	4,000	14%	1,000	4%	22,000	82%	26,000
Stainless steel	0	5%	0	7%	0	88%	0
Total (tonnes)	**37,000**	**15%**	**61,000**	**24%**	**156,000**	**61%**	**254,000**

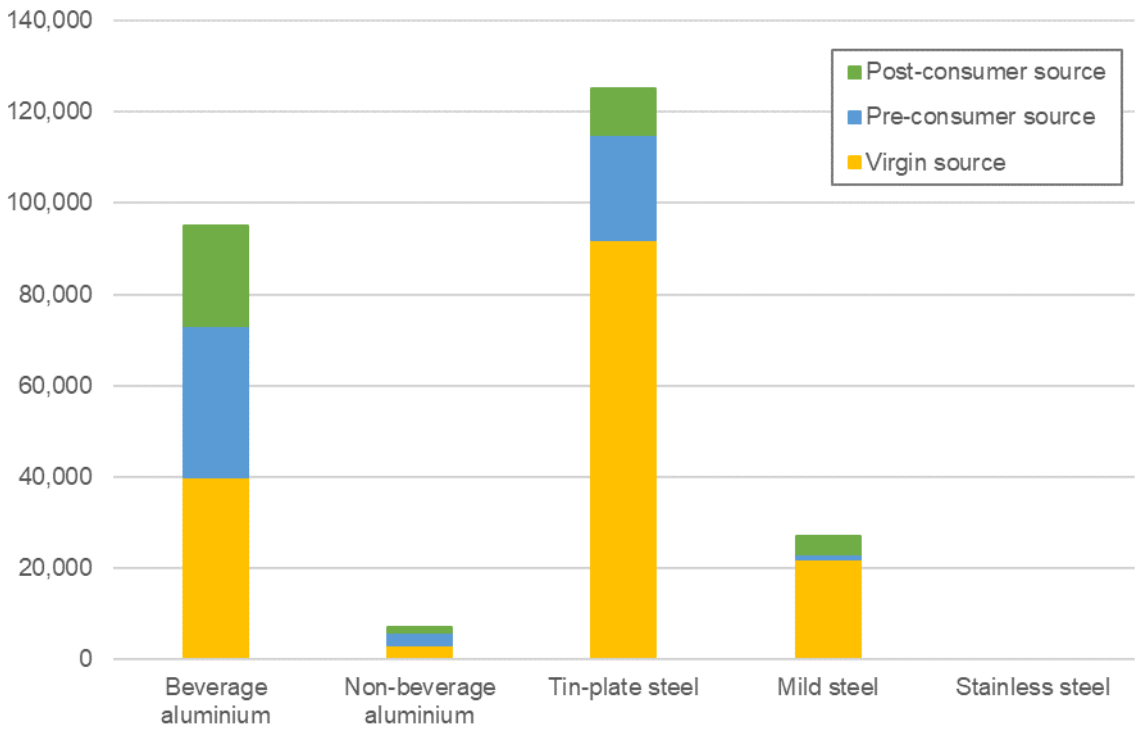

Figure 21 – Metal packaging POM in 2020–21, by material type and content source (tonnes).

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 present in wood packaging, which was made from 100% virgin (primary) feedstocks.

2.9 ANZSIC division

Indicative estimates of packaging POM by ANZSIC division and material group are provided in **Table 26** and **Figure 22**.

Nearly 3.3 million tonnes (49%) of packaging were used by the 'S – Other services' division, into which packaging used by households has been allocated. This was followed by 'G – Retail trade' at 1.0 million tonnes (14%), 'F – Wholesale trade' division at 0.9 million tonnes (14%) and 'H – Accommodation and food services' at 0.5 million tonnes (8%). Accommodation and food services was 12% of the total in 2019–20, with the fall (225,000 tonnes) possibly due to the COVID-19 pandemic.

Two sectors increased their share of packaging consumption (i.e., they have a greater level of packaging POM):

- Construction increased by 55,000 tonnes while remaining a small percentage of the total (increasing from 0.6% to 1.4%) – possibly linked to a robust housing market during this period.
- Transport, postal and warehousing increased by 80,000 tonnes (from 2.7% to 3.7%) – possibly due to growth in online shopping.

Table 26 – Packaging POM in 2020–21, 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	26,000	6,000	81,000	112,000	1.7%
B – Mining	0	0	0	3,000	0	3,000	0.0%
C – Manufacturing	290,000	0	4,000	10,000	139,000	442,000	6.6%
D – Electricity, gas, water and waste services	0	0	0	0	0	0	0.0%
E – Construction	0	0	5,000	10,000	81,000	96,000	1.4%
F – Wholesale trade	626,000	0	223,000	13,000	58,000	920,000	13.6%
G – Retail trade	933,000	0	14,000	9,000	0	956,000	14.2%
H – Accommodation and food services	413,000	95,000	17,000	12,000	1,000	538,000	8.0%
I – Transport, postal and warehousing	19,000	0	5,000	5,000	220,000	249,000	3.7%
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	1,018,000	1,188,000	883,000	185,000	0	3,275,000	48.6%
X – Mixed SMEs (other)	5,000	0	0	0	0	5,000	0.1%
X – Other	84,000	0	0	0	0	84,000	1.2%
X – Unknown	0	0	2,000	0	58,000	60,000	0.9%
Total	**3,387,000**	**1,283,000**	**1,179,000**	**254,000**	**638,000**	**6,740,000**	**100.0%**

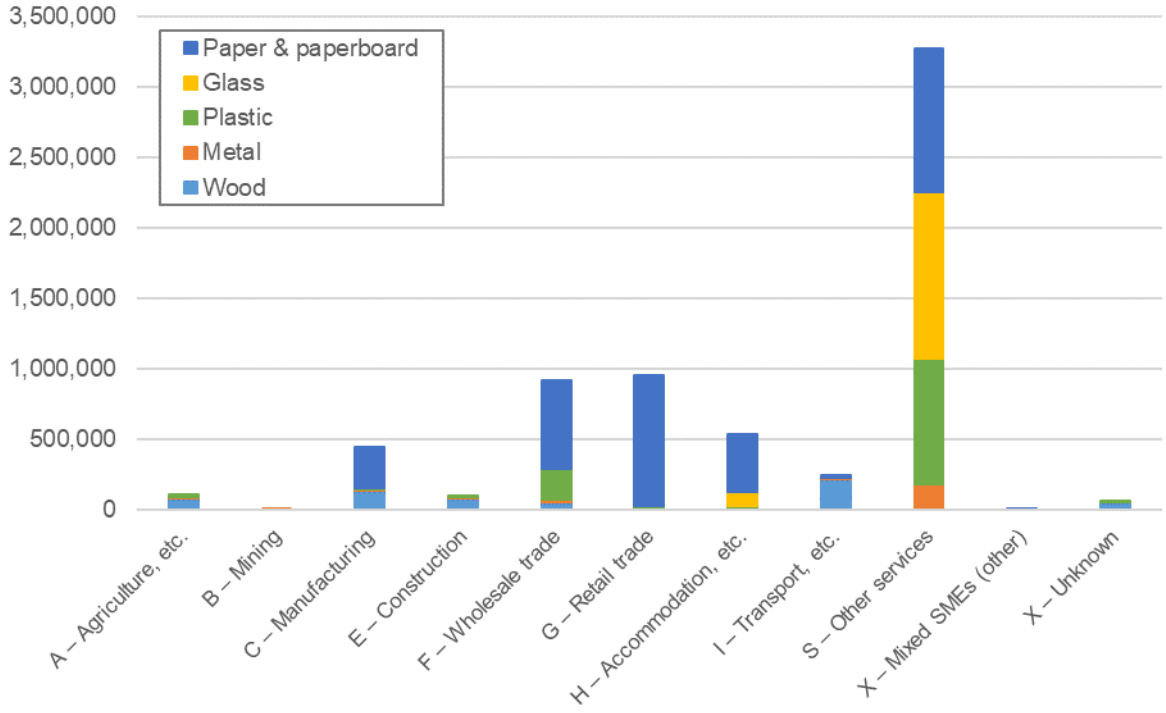

Figure 22 – Packaging POM in 2020–21, by material group and ANZSIC division (tonnes) (ANZSIC divisions with no reported consumption not shown).

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, p. 4). **Table 27** compares the available POM data for five of these priority items.

Single-use HDPE shopping bag consumption has fallen by >99% since 2016–17, likely driven by the state/territory bans coming into force over the last five years.

The reported changes in PS, EPS and PVC need to be treated with caution because of the low numbers and a large accuracy range and high year-on-year reporting volatility.

Between 2019–20 and 2020–21 packaging component data (**Section 2.3**) showed some positive trends for specific items targeted by government policy:

- Plastic shopping bags in total (single-use and reusable) fell from 20,000 tonnes in 2019–20 to 13,000 tonnes in 2020–21.
- Consumption of plastic tableware (plates, bowls, cups, straws, etc.) fell from 25,000 tonnes in 2019-20 to 13,000 tonnes in 2020–21.

The quantity of single-use bags avoided by the use of reusable bags has been estimated at around 80,000 tonnes (**Section 6.4**).

Table 27 – Priority single-use plastics POM in 2016–17 to 2020–21, including a change percentage between 2019-20 and 2020-21.

Priority item	2016–17	2017–18	2018–19	2019–20	2020–21	% change 2019–20 to 2020–21
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	
Single-use HDPE shopping bags[a]	30,700	-	7,000	200	100	-49%
Rigid PS[b]	-	11,400	10,900	17,100	17,200	1%
EPS[b,c]	-	22,000	16,400	22,700	29,000	28%
PVC[b,d]	-	20,400	15,300	16,900	14,800	-12%
Oxo-degradable plastics[b]	-	1,500	1,100	2,100	800	-64%
Plastic tableware[e]	-	-	-	25,200	13,200	-48%

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 Blue Environment (2022b).

b) These estimates are subject to a large accuracy range and high year-on-year reporting volatility.

c) The most significant contributing packaging formats to EPS are void fill and crates for fresh produce (mostly into B2B applications).

d) The current priority is to phase out rigid PVC only, but this data cannot be reported for confidentiality reasons.

e) Includes certified compostable plastics.

3 PACKAGING RECOVERY IN 2020–21

This section of the report provides estimates of post-consumer packaging recovery in Australia in 2020–21, 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.
- Packaging component group.
- Recovered material use application (packaging/non-packaging).
- Recovered material use destination (local/overseas).
- Rigid/flexible plastic packaging.
- 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 2020–21 is estimated at 3.79 million tonnes (±13%).

Of the packaging recovered in 2020–21, nearly two thirds was paper & paperboard packaging (62.6%), followed by glass packaging (21.2%), wood packaging (6.9%), plastic packaging (5.5%) and metal packaging (3.9%).

Estimates for post-consumer packaging recovery by material group are provided in **Table 28** 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 29** and **Figure 24**.

Table 28 – Post-consumer packaging recovery in 2020–21, by material group.

Material group	Recovery			Accuracy range
	(tonnes)	(%)[a]	(kg/person)	(±%)
Paper & paperboard	2,370,000	62.6%	92	12%
Glass	805,000	21.2%	31	10%
Plastic	207,000	5.5%	8	14%
Metal	147,000	3.9%	6	17%
Wood	260,000	6.9%	10	21%
Total	**3,788,000**	**100.0%**	**147**	**13%**

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

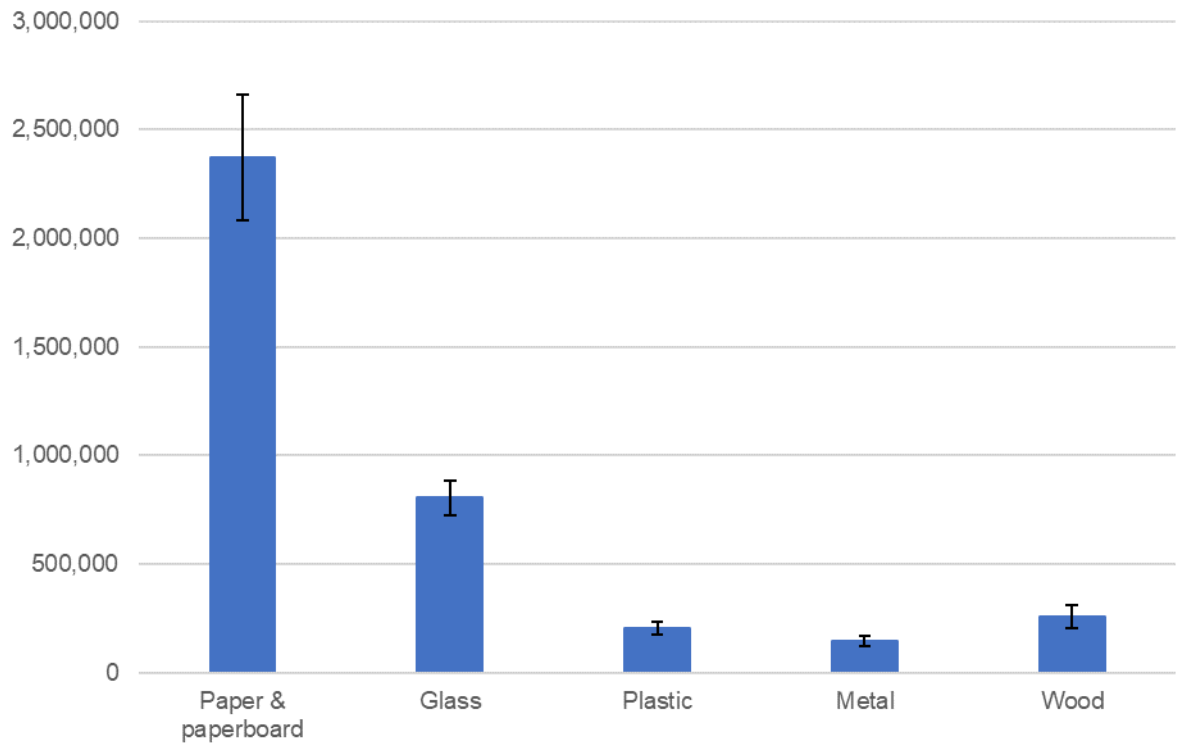

Figure 23 – Post-consumer packaging recovery in 2020–21, by material group (tonnes)

There was yet another notable increase in the quantity collected through CDS services in 2020–21, reflecting the continuing maturity of the schemes. The total amount collected through separate CDS collection systems (e.g., depots and reverse vending machines) increased from 171,000 tonnes in 2018–19, to 241,000 tonnes in 2019–20, and to 324,000 tonnes in 2020–21. This growth is due to the increasing rollout and maturity of schemes in NSW (2017), ACT (2018), QLD (2018) and WA (2020). More CDS data is provided in Appendix E.

Table 29 – Post-consumer packaging recovery in 2020–21, by material group and collection service

Material group	Collection service					Total
	MSW[a]	C&I[a]	C&D[a]	CDS[a]	Other	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	1,034,000	1,310,000	0	2,000	23,000	2,370,000
Glass	540,000	2,000	0	263,000	0	805,000
Plastic	116,000	58,000	0	28,000	5,000	207,000
Metal	98,000	18,000	0	31,000	0	147,000
Wood	0	260,000	0	0	0	260,000
Total (tonnes)	**1,788,000**	**1,648,000**	**0**	**324,000**	**28,000**	**3,788,000**
Total (%)	**47.2%**	**43.5%**	**0.0%**	**8.5%**	**0.7%**	**100.0%**

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

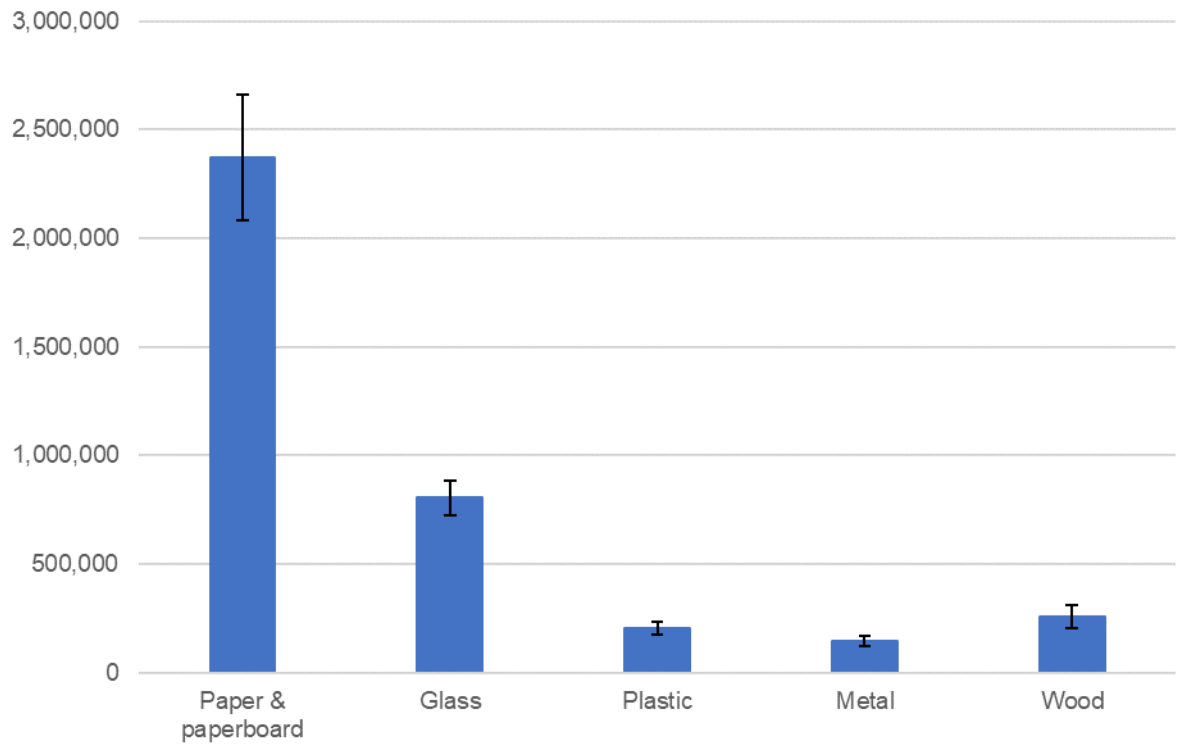

Figure 24 – Post-consumer packaging recovery in 2020–21, by material group and collection service (tonnes)

Table 30 and **Figure 25** compare recovery data by material group from 2017–18 to 2020–21. Packaging recovery in 2020–21 was 3.79 million tonnes, which was an 11% increase on the 2019–20 packaging recovery estimate of 3.42 million tonnes.

The increase in recovery is primarily due to solid growth in recovery of paper & cardboard and glass, which also occurred between 2018–19 and 2019–20.

Excluding wood, 3.53 million tonnes of packaging were recovered in 2020–21, a 9% increase on the 2019–20 estimate of 3.25 million tonnes. The per capita increase, excluding wood, was also 9%.

Table 30 – Post-consumer packaging recovery from 2017–18 to 2020–21, by material group, including a change percentage between 2019-20 and 2020-21.

Material group	2017–18	2018–19	2019–20	2020–21	Change 2019–20 to 2020–21
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Paper & paperboard	1,817,000	2,045,000	2,229,000	2,370,000	6%
Glass	582,000	574,000	699,000	805,000	15%
Plastic	173,000	182,000	179,000	207,000	16%
Metal	102,000	137,000	139,000	147,000	5%
Wood[a]	NR[b]	44,000	171,000	260,000	52%
Total (tonnes)	**2,673,000**	**2,982,000**	**3,416,000**	**3,788,000**	**11%**
Total (kg/person)	**107**	**118**	**133**	**147**	**10%**

a) The apparent large year-on-year increases in wood packaging is due to improvements in survey coverage.
b) NR – Not reported.

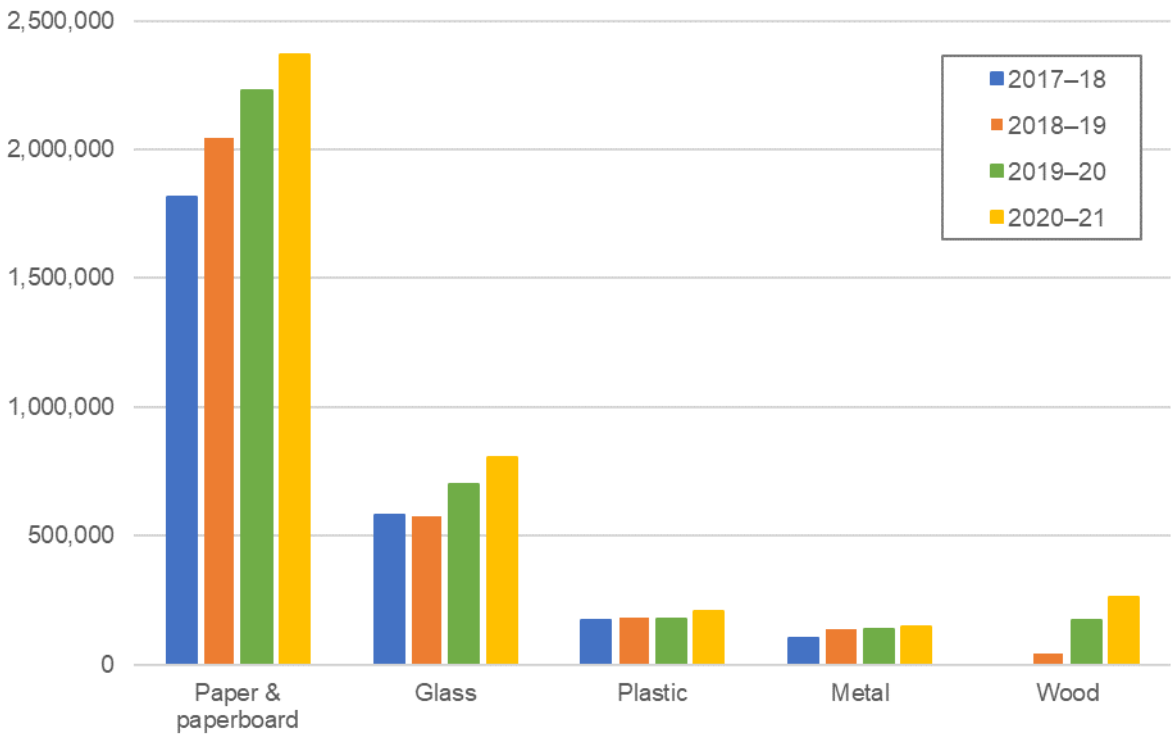

Figure 25 – Post-consumer packaging recovery from 2017–18 to 2020–21, by material group (tonnes).

3.2 Material type

Paper & paperboard packaging

Post-consumer paper & paperboard packaging recovery in Australia in 2020–21 is estimated at 2.4 million tonnes (±12%), which was 62.6% of all post-consumer packaging recovery. Estimates for paper & paperboard packaging recovery, by material type and collection service, are provided in **Table 31** and **Figure 26**.

Around 2.1 million tonnes (89%) of recovered paper & paperboard packaging were corrugated cardboard. It is estimated that around 1.2 million tonnes (55%) of this corrugated cardboard recovery were from C&I collections, and 0.9 million tonnes (44%) from municipal collections.

Between 2019–20 and 2020–21 there was a significant increase in recovery of corrugated cardboard (+126,000 tonnes or 6%) from both MSW and C&I sources.

Table 31 – Paper & paperboard packaging recovery in 2020–21, 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	68,000	40,000	0	0	108,000	4.6%	13%
Corrugated cardboard	885,000	1,206,000	0	23,000	2,114,000	89.2%	12%
PCPB[a]	0	0	2,000	0	2,000	0.1%	35%
Other fibre packaging	81,000	64,000	0	0	145,000	6.1%	14%
Total (tonnes)	**1,034,000**	**1,310,000**	**2,000**	**23,000**	**2,370,000**	**-**	-
Total (%)	**43.7%**	**55.3%**	**0.1%**	**1.0%**	**100.0%**	**100.0%**	**12%**

a) PCPB – Polymer coated paperboard.

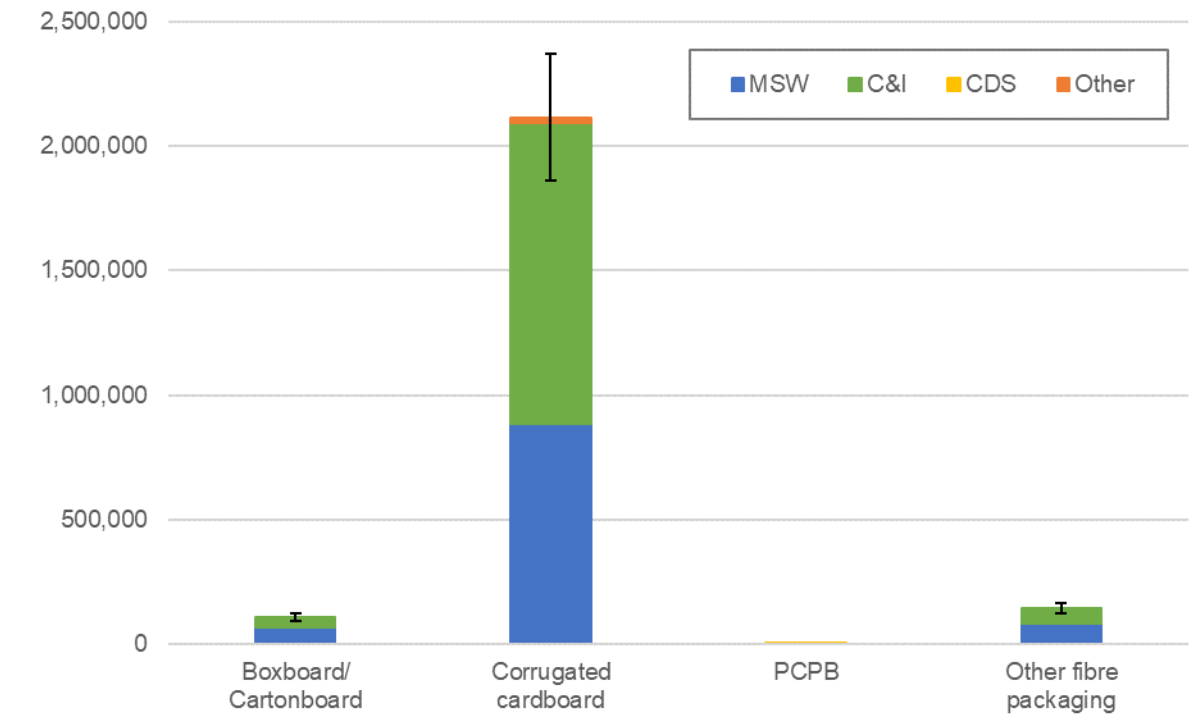

Figure 26 – Paper & paperboard packaging recovery in 2020–21, by material type and collection service (tonnes).

Glass packaging

Post-consumer glass packaging recovery in Australia in 2020–21 is estimated at around 0.81 million tonnes (±10%), which was 21.2% of all post-consumer packaging recovery. Estimates for glass packaging recovery, by material type and collection service, are provided in **Table 32** 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), and this type of end-use has grown from 2018–19 to 2020–21. See **Section 3.4** for estimates of recovered packaging materials use applications.

An estimated 540,000 tonnes (67%) of glass packaging was recovered through kerbside collections, with another 263,000 tonnes (33%) recovered through separate CDS collections. Less than 1% was reported as recovered through C&I related collections.

The kerbside collections (MSW) do include significant quantities of CD eligible glass, which is subsequently redeemed through CDS systems directly by MRF operators. However, the collection system for this CDS glass is the kerbside recycling system.

Table 32 – Glass packaging recovery in 2020–21, 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	109,000	0	92,000	0	202,000	25.1%	10%
Flint glass	269,000	1,000	105,000	0	374,000	46.5%	10%
Green glass	162,000	1,000	66,000	0	228,000	28.4%	10%
Total (tonnes)	**540,000**	**2,000**	**263,000**	**0**	**805,000**	**-**	-
Total (%)	**67.2%**	**0.2%**	**32.6%**	**0.0%**	**100.0%**	**100.0%**	**10%**

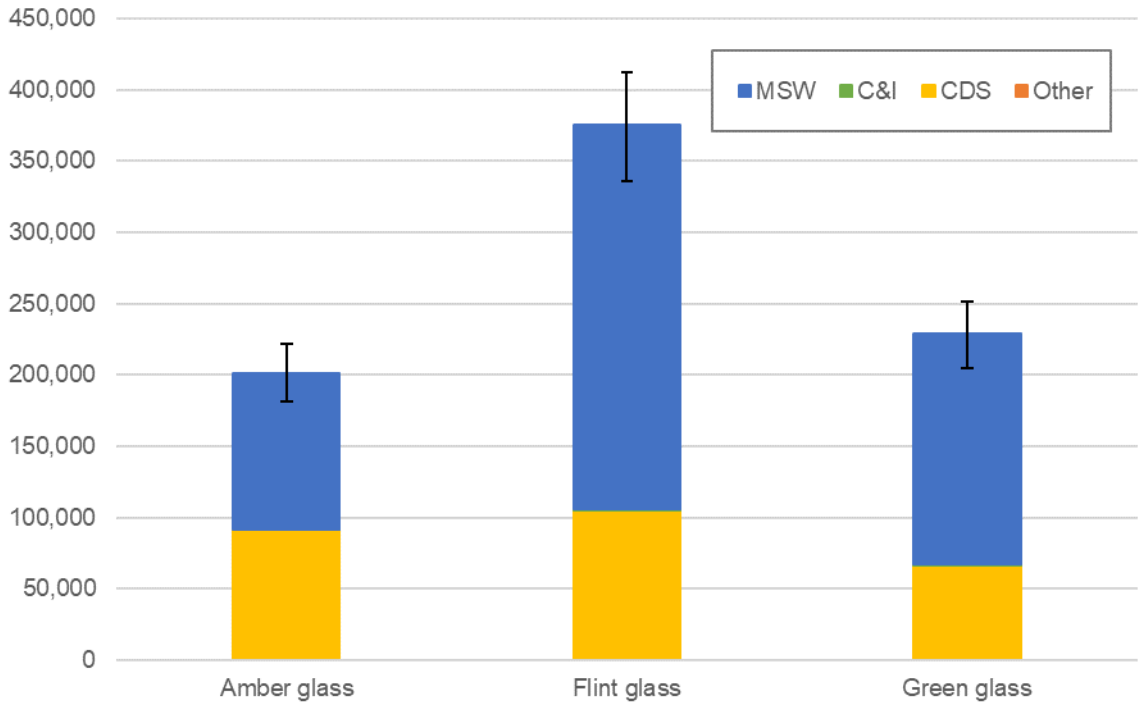

Figure 27 – Glass packaging recovery in 2020–21, by material type and collection service tonnes.

Plastic packaging

Post-consumer plastic packaging recovery in Australia in 2020–21 is estimated at 207,000 tonnes (±14%), which was 5.5% of all post-consumer packaging recovery. Estimates for plastic packaging recovery, by material type and collection service, are provided in **Table 33** and **Figure 28**. This is a 16% increase on the 179,000 tonnes of plastic packaging recovered in 2019–20. The largest increases in recovery by polymer were for LDPE (+17,000 tonnes) and PP (+10,000 tonnes).

Around 116,000 tonnes (56%) of plastic packaging were recovered through kerbside collections, with another 58,000 tonnes (28%) recovered through C&I collections and 28,000 tonnes (14%) recovered through separate CDS related collections.

Table 33 – Plastic packaging recovery in 2020–21, by material type and collection service

Material type	Collection service				Total		Accuracy range
	MSW	C&I[a]	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
PET (1)	31,000	0	27,000	0	58,000	27.9%	15%
HDPE (2)	53,000	10,000	2,000	1,000	66,000	31.8%	12%
PVC (3)	0	0	0	0	0	0.0%	10%
LDPE (4)	4,000	26,000	0	2,000	32,000	15.5%	13%
PP (5)	24,000	5,000	0	1,000	30,000	14.4%	12%
PS (6)	2,000	0	0	0	2,000	0.9%	17%
EPS (6)	0	8,000	0	1,000	9,000	4.3%	8%
Bioplastic (7)	0	0	0	0	0	0.1%	100%
Other (7)	0	0	0	0	0	0.0%	5%
Unidentified	2,000	9,000	0	0	10,000	5.0%	43%
Total (tonnes)	**116,000**	**58,000**	**28,000**	**5,000**	**207,000**	-	-
Total (%)	**55.9%**	**28.1%**	**13.7%**	**2.2%**	**100.0%**	**100.0%**	**14%**

a) 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.

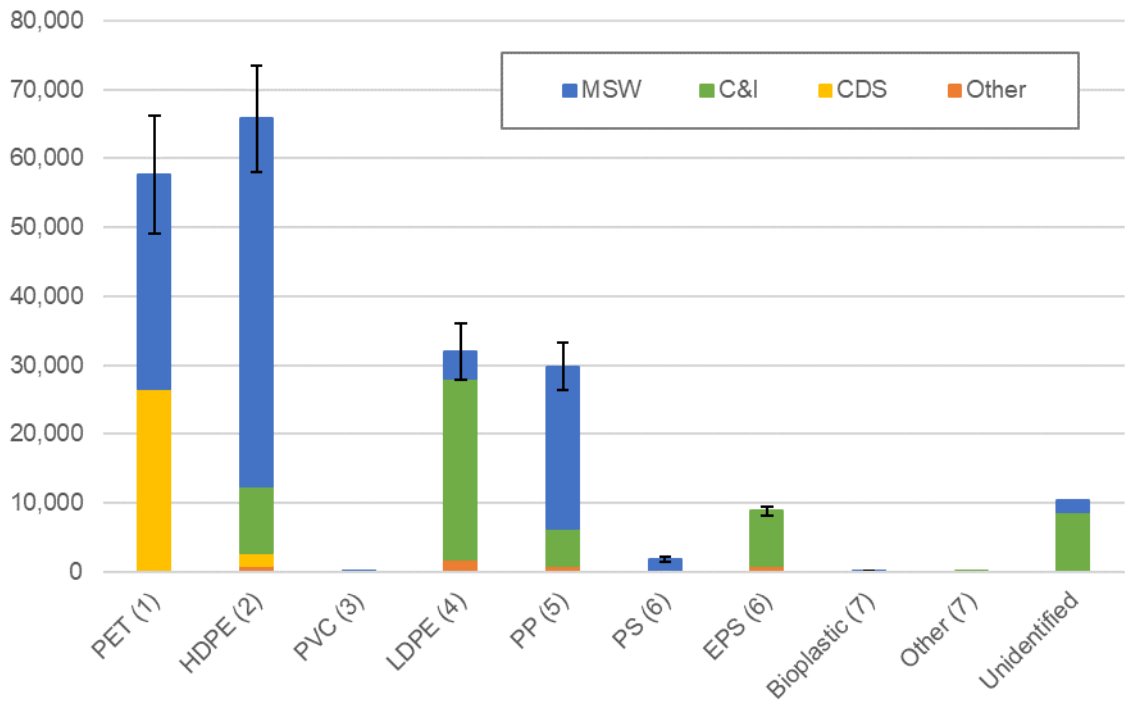

Figure 28 – Plastic packaging recovery in 2020–21, by material type and collection service (tonnes).

Metal packaging

Post-consumer metal packaging recovery in Australia in 2020–21 is estimated at around 147,000 tonnes (±17%), which was 3.9% of all post-consumer packaging recovery. Estimates for metal packaging recovery, by material type and collection service, are provided in **Table 34** and **Figure 29**. This is a 6% increase on the 139,000 tonnes of metal packaging recovered in 2019–20. This was due to an increase in the recovery of aluminium beverage cans, possibly driven by the continuing rollout of CDS across the country.

Around 98,000 tonnes (67%) of metal packaging were recovered through kerbside collections, with another 18,000 tonnes (12%) recovered through C&I collections, and 31,000 tonnes (21%) recovered through separate CDS collections.

Table 34 – Metal packaging recovery in 2020–21, 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	42,000	0	31,000	0	73,000	49.6%	10%
Non-beverage aluminium	3,000	0	0	0	3,000	2.1%	10%
Tin-plate steel	53,000	0	0	0	53,000	36.2%	17%
Mild steel	0	18,000	0	0	18,000	12.1%	49%
Stainless steel	0	0	0	0	0	0.0%	0%
Total (tonnes)	**98,000**	**18,000**	**31,000**	**0**	**147,000**	-	-
Total (%)	**66.8%**	**12.2%**	**21.0%**	**0.0%**	**100.0%**	**100.0%**	**17%**

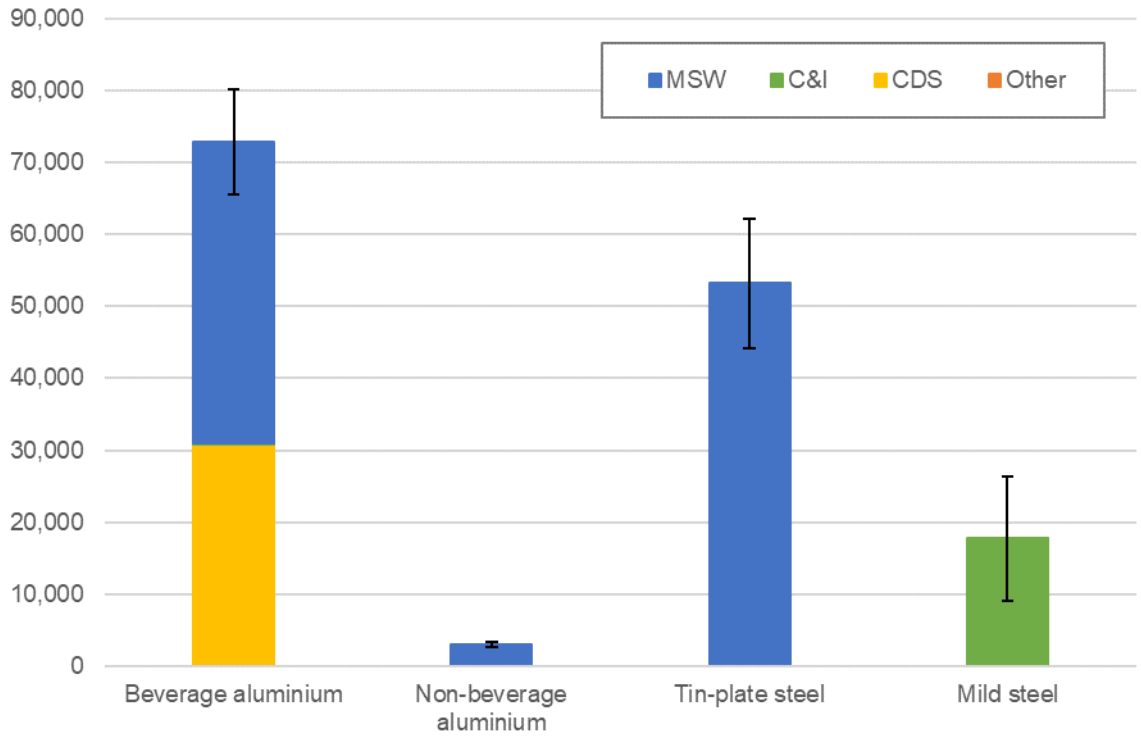

Figure 29 – Metal packaging recovery in 2020–21, by material type and collection service (tonnes).

Wood packaging

Post-consumer wood packaging recovery in Australia in 2020–21 is estimated at around 260,000 tonnes (±21%), which accounted for 6.9% of all post-consumer packaging recovery. Estimates for wood packaging recovery, by material type and collection service, are provided in **Table 35** and **Figure 30**. All identified recovery of wood packaging was through C&I collections.

Table 35 – Wood packaging recovery in 2020–21, by material type and collection service

Material type	Collection service				Total		Accuracy range
	MSW	C&I	CDS	Other			
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)	(±%)
Fibreboard	0	5,000	0	0	5,000	1.9%	50%
Hardwood	0	36,000	0	0	36,000	14.0%	20%
Softwood	0	219,000	0	0	219,000	84.1%	20%
Total (tonnes)	**0**	**260,000**	**0**	**0**	**260,000**	-	-
Total (%)	**0.0%**	**100.0%**	**0.0%**	**0.0%**	**100.0%**	**100.0%**	**21%**

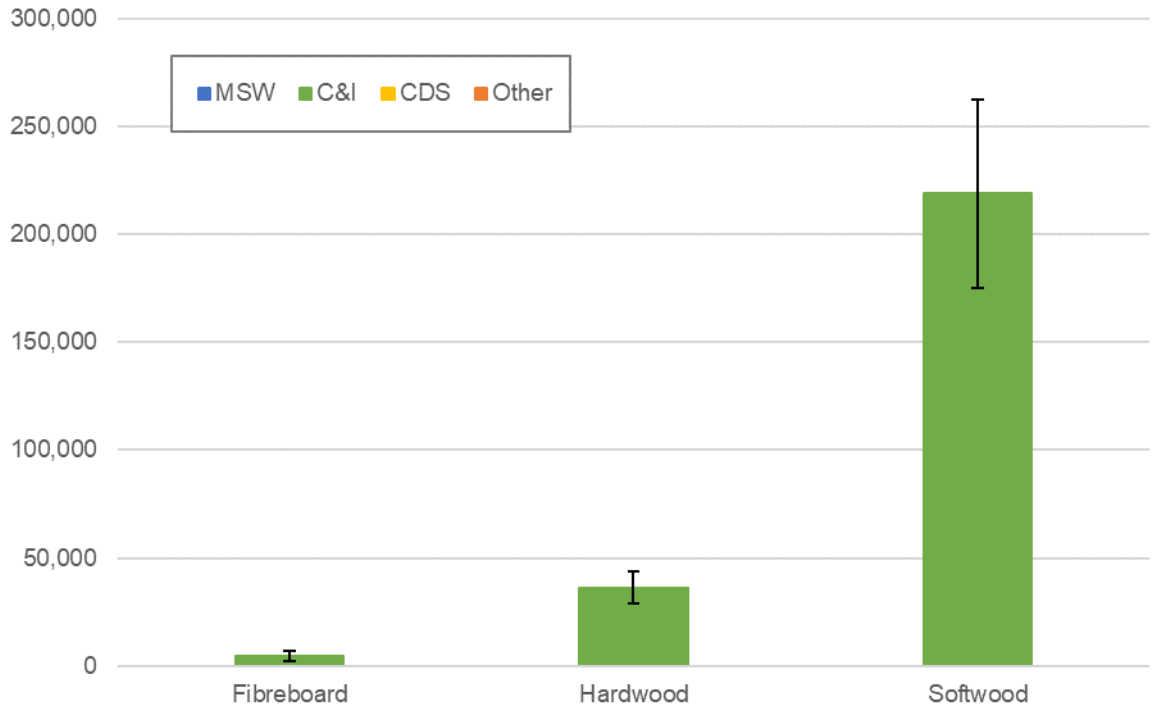

Figure 30 – Wood packaging recovery in 2020–21, by material type and collection service (tonnes).

3.3 Packaging component group

In this section of the report, estimates of packaging recovery by packaging component group are presented for the first time this year. Information at the packaging component group level is useful as it is related to the recyclability of the material and supports the estimation of packaging recovery rates by component group (**Section 3.9**).

Estimates for packaging recovery by material group and component group are provided in **Table 36** and **Figure 31**.

The major recovered packaging component groups are cartons or boxes (59.7%), which are almost entirely paper & paperboard based, and bottles or jars (24.0%), which are split approximately 8:1 between glass and plastic containers recovered on a mass basis.

Table 36 – Packaging recovery in 2020–21, by material group and component group

Component group	Paper & paperboard	Glass	Plastic	Metal	Wood	Total	
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
Bag or pouch	42,000	0	23,000	0	0	65,000	1.7%
Barrel or drum	0	0	6,000	18,000	10,000	34,000	0.9%
Bottle or jar	0	805,000	106,000	0	0	911,000	24.0%
Can	0	0	0	129,000	0	129,000	3.4%
Carton or box	2,232,000	0	3,000	0	28,000	2,263,000	59.7%
Closure or label	0	0	3,000	0	0	3,000	0.1%
Pallet or bin	0	0	2,000	0	222,000	224,000	5.9%
Shopping bag	0	0	1,000	0	0	1,000	0.0%
Tableware	1,000	0	0	0	0	1,000	0.0%
Tub, tray or punnet	20,000	0	31,000	0	0	51,000	1.3%
Tube or cartridge	0	0	0	0	0	0	0.0%
Wrap	31,000	0	15,000	0	0	46,000	1.2%
Other	43,000	0	10,000	0	0	53,000	1.4%
Unknown	0	0	8,000	0	0	8,000	0.2%
Total	**2,370,000**	**805,000**	**207,000**	**147,000**	**260,000**	**3,788,000**	**100.0%**

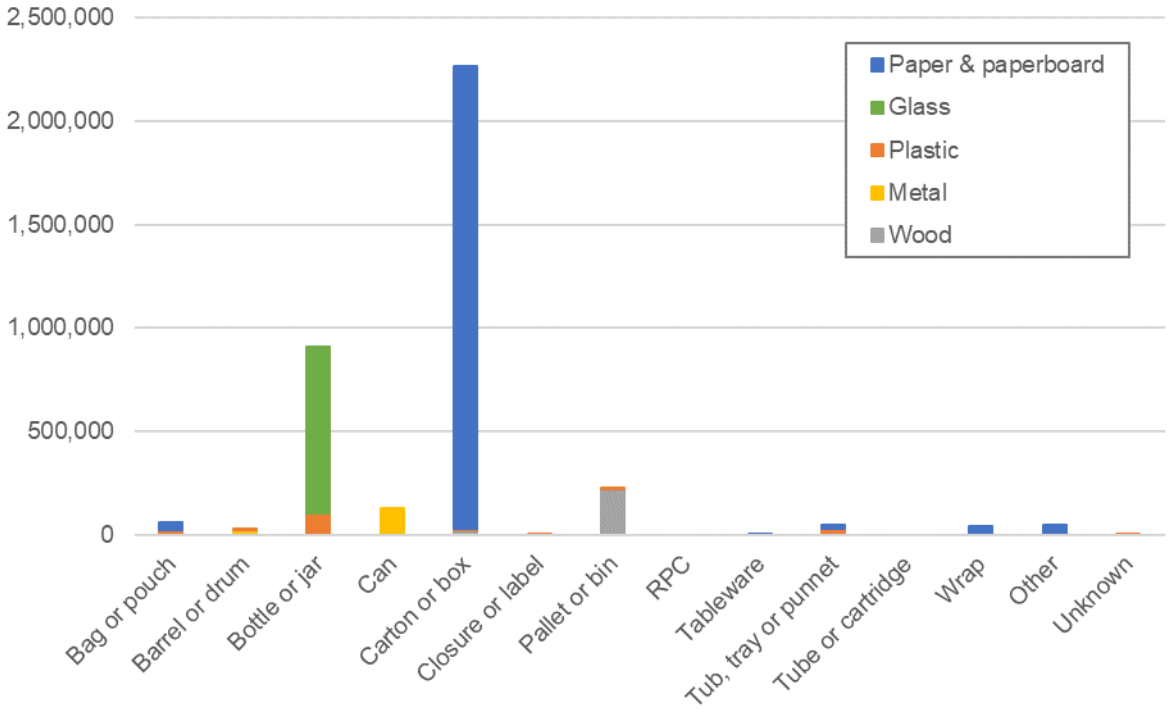

Figure 31 – Packaging recovery in 2020–21, by material group and component group (tonnes).

3.4 Material use application

Estimates of recovered post-consumer packaging material use in 2020–21, by packaging or non-packaging end-use application, are provided in **Table 37** and **Figure 32**. An estimated 1.95 million tonnes (51.5%) were used to manufacture new packaging, compared to 1.90 million tonnes (55.6%) in 2019–20.

It's likely that the majority of the paper & paperboard going into unknown applications was returned into packaging applications, and the plastic was returned into non-packaging applications.

Table 37 – Packaging recovery in 2020–21, by material group and material use application

Material group	Packaging applications	Non-packaging applications	Unknown applications	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	1,534,000	11,000	824,000	2,370,000
Glass	371,000	434,000	0	805,000
Plastic	34,000	42,000	131,000	207,000
Metal	11,000	135,000	1,000	147,000
Wood	0	260,000	0	260,000
Total (tonnes)	**1,950,000**	**882,000**	**955,000**	**3,788,000**
Total (%)	**51.5%**	**23.3%**	**25.2%**	**100.0%**

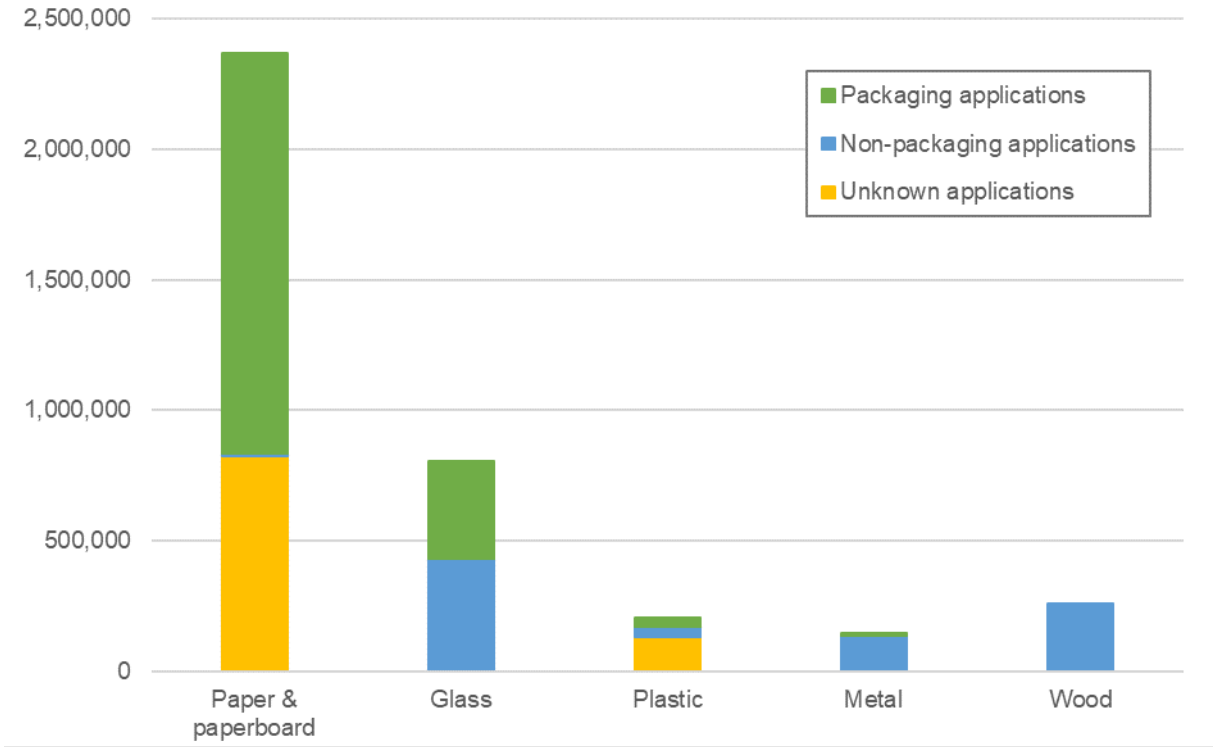

Figure 32 – Packaging recovery in 2020–21, by material group and material use application (tonnes).

Recovered paper & paperboard are 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.

Recovered glass packaging is returned in fairly even proportions back into packaging and non-packaging applications. For non-packaging applications large quantities of packaging glass are crushed and used in civil construction. The major application of this crushed glass is as a substitute 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 glass into construction has grown strongly across 2018–19 to 2020–21.

The use of recovered plastic packaging is dependent in large part on the polymer type. Many of the typical applications are summarised in **Table 38**.

Table 38 – 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	Milk bottles, 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	Industrial and garden hose, profiles, pipes and conduit.	Gumboots, mats, resilient flooring, mudflaps and coving (decorative building mouldings).
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 7% of recovered metal packaging is known to be put 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 markets.

The major identified applications for recovered 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.

There was also some recovery of wood packaging into energy recovery applications, which is discussed in the following section.

Packaging recovery through energy recovery

Packaging recovery includes small quantities of post-consumer scrap plastic packaging sent to energy recovery in 2020–21. This is estimated to have been 9,000 tonnes in 2020–21, compared with 16,000 tonnes in 2019–20 and 2018–19, and 2,000–4,000 tonnes in 2017–18.

In addition, it is estimated that around 30,000 tonnes of wood packaging were sent to energy recovery in 2020–21.

Note that the quantities estimated here are included in the data presented in **Section 3.1** and **Section 3.2**, and in **Table 37**.

Packaging recovery through composting

It is estimated that around 12,000 tonnes of fibre-based packaging (mostly cardboard) were disposed into organics collections in 2020–21. This estimate is based on a small survey of composters nationally and is indicative only.

It is estimated that around 100–200 tonnes of compostable plastic-based packaging were disposed into organics collections in 2020–21. This estimate is based on the composter survey and is indicative only.

As stated above, the major identified applications for recovered 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 is estimated that around 260,000 tonnes of wood packaging were recovered via this pathway in 2020–21.

Note that the quantities estimated here are included in the data presented in **Section 3.1** and **Section 3.2**, and in **Table 37**.

3.5 Material use destination

Estimated destinations of recovered post-consumer packaging material use in 2020–21, by local or overseas destination, are provided in **Table 39** and **Figure 33**. An estimated 64% of recovered packaging was used locally in Australia and 36% exported for recycling.

The use of recovered paper & paperboard is almost evenly split between local manufacturers (52%) and export (48%). Recovered glass packaging was entirely used locally, with none exported in 2020–21. More than half of the recovered plastic packaging was exported in 2020–21, with 58% sent offshore. Nearly 90% of aluminium beverage and tin-plate steel metal packaging was exported, with local reprocessing mostly consisting of mild-steel drums from the B2B sector.

Table 39 – Packaging recovery in 2020–21, by material group and location of material use

Material group	Local	Overseas	Unknown	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	1,239,000	1,131,000	0	2,370,000
Glass	804,000	0	0	805,000
Plastic	86,000	120,000	0	207,000
Metal	18,000	129,000	0	147,000
Wood	260,000	0	0	260,000
Total (tonnes)	**2,407,000**	**1,380,000**	**0**	**3,788,000**
Total (%)	**63.6%**	**36.4%**	**0.0%**	**100.0%**

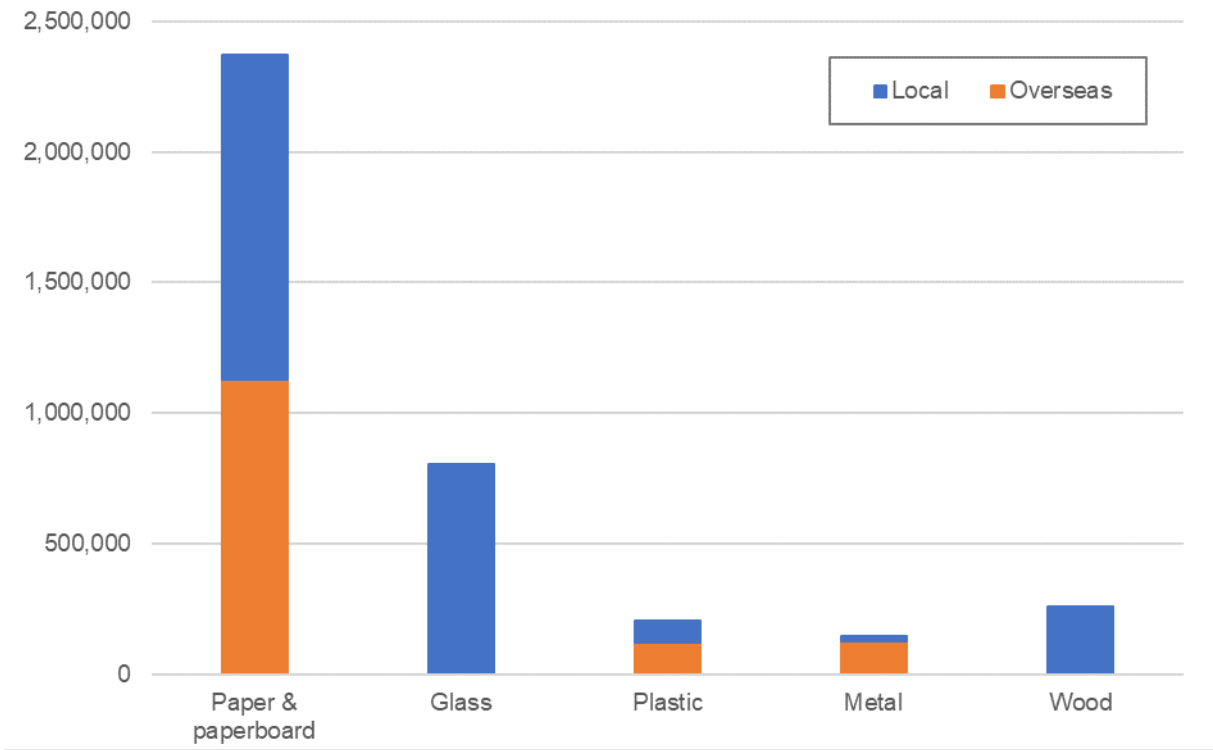

Figure 33 – Packaging recovery in 2020–21, by material group and location of material use (tonnes).

3.6 Rigid/flexible plastic packaging

Estimates of plastic packaging post-consumer recovery by rigid/flexible format are provided in **Table 40** and **Figure 34**.

Of the 207,000 tonnes of plastic packaging recovered in 2020–21 around 167,000 tonnes (81%) were rigid, and 40,000 tonnes (20%) were flexible. Recovery of flexible plastic packaging is dominated by LDPE film recovery from B2B applications.

The estimate for 2020–21 flexible plastic packaging recovery is a significant increase on the 20,000 tonnes reported for 2019–20, but is still only a minor proportion of flexible plastic packaging POM.

Table 40 – Plastic packaging recovery in 2020–21, by material type and rigid/flexible classification

Material type	Rigid	Flexible	Total
	(tonnes)	(tonnes)	(tonnes)
PET (1)	58,000	0	58,000
HDPE (2)	65,000	1,000	66,000
PVC (3)	0	0	0
LDPE (4)	3,000	29,000	32,000
PP (5)	29,000	1,000	30,000
PS (6)	2,000	0	2,000
EPS (6)	9,000	0	9,000
Bioplastic (7)	<100	<100	100
Other (7)	0	0	0
Unidentified	1,000	9,000	10,000
Total (tonnes)	**167,000**	**40,000**	**207,000**
Total (%)	**80.6%**	**19.4%**	**100.0%**

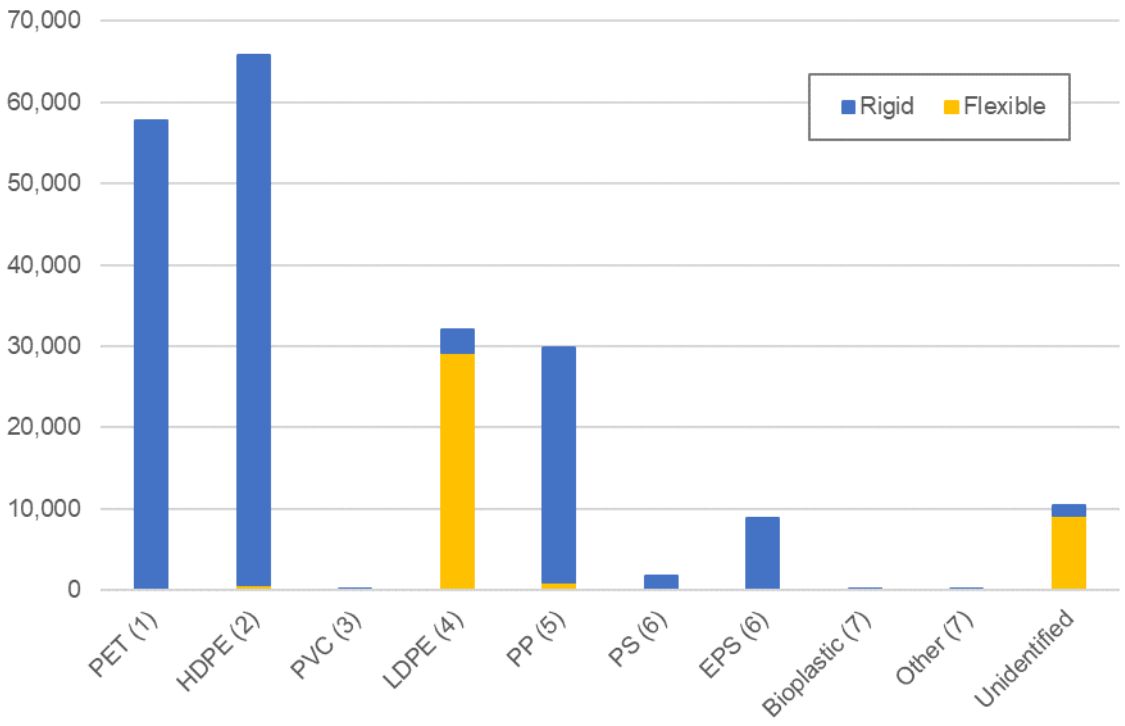

Figure 34 – Plastic packaging recovery in 2020–21, by material type and rigid/flexible classification (tonnes).

3.7 Recovery rates by material group

Estimates for post-consumer packaging recovery rates by material group are provided in **Table 41** and **Figure 35**.

The post-consumer packaging recovery rate for all packaging in 2020–21 is estimated to be 56%. This is based on recovery as measured at the out-going gate of the secondary processing facility for the used packaging as a percentage of packaging POM in the same year.

Paper & paperboard had the highest recovery rate at 70%, followed by glass packaging (63%), metal packaging (58%), wood packaging (41%), and plastic packaging (18%).

Table 41 – Post-consumer packaging recovery rates in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	3,387,000	2,370,000	70%
Glass	1,283,000	805,000	63%
Plastic	1,179,000	207,000	18%
Metal	254,000	147,000	58%
Wood	638,000	260,000	41%
Total	**6,740,000**	**3,788,000**	**56%**

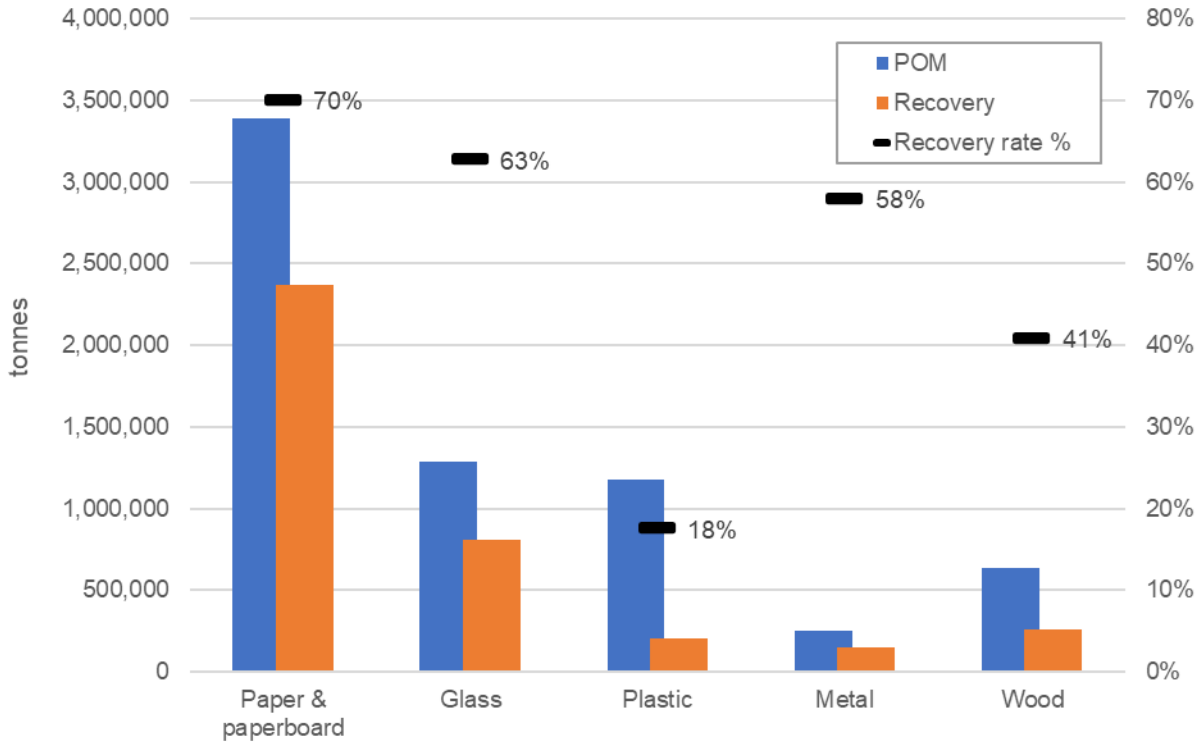

Figure 35 – Comparison of packaging POM, packaging recovery and post-consumer packaging recovery rates in 2020–21, by material group.

Table 42 and **Figure 36** compare recovery rates by material group from 2017–18 to 2020–21. In 2020–21 there were consistent increases in packaging recovery rates across all material groups compared to 2019–20.

The underlying accuracy ranges for the POM and recovery estimates mean that it is not possible to state with certainty whether real changes in the recovery rates have occurred between the two years. However, the increases since 2017–18 are generally significant, with the exception of plastic packaging, which fluctuated between 16% and 18%.

Table 42 – Post-consumer packaging recovery rates from 2017–18 to 2020–21, by material group, including a change percentage between 2019-20 and 2020-21.

Material group	2017–18	2018–19	2019–20	2020–21	% change[a] 2019–20 to 2020–21
	(%)	(%)	(%)	(%)	(%)
Paper & paperboard	63%	63%	68%	70%	2%
Glass	46%	45%	60%	63%	2%
Plastic	16%	18%	16%	18%	2%
Metal	48%	56%	56%	58%	2%
Wood	NR[b]	36%	37%	41%	4%
Total (kg/person)	**49%**	**50%**	**55%**	**56%**	**2%**

a) % change values are calculated prior to rounding the annual values.
b) NR – Not reported.

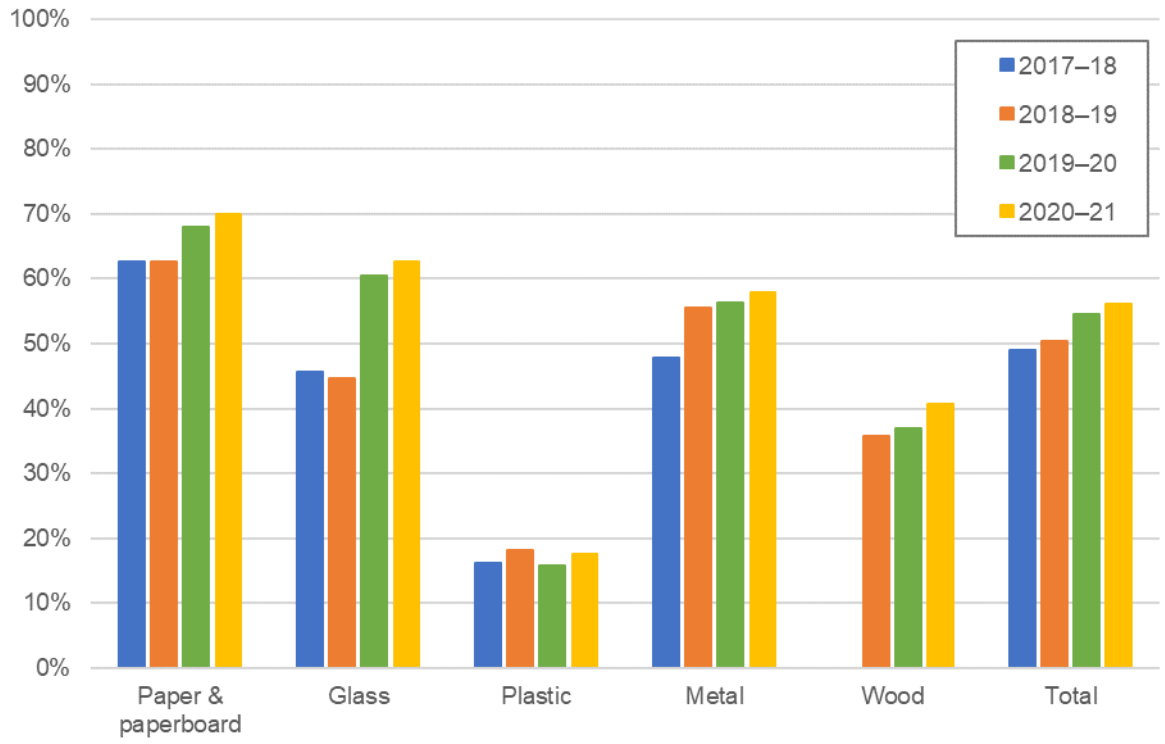

Figure 36 – Post-consumer packaging recovery rates (%) from 2017–18 to 2020–21, by material group.

3.8 Recovery rates by material type

Paper & paperboard packaging

Estimates for post-consumer paper & paperboard packaging recovery rates in 2020–21, by material type, are provided in **Table 43** and **Figure 37**.

The relatively high post-consumer paper & paperboard packaging recovery rate of 70% is underpinned by the recovery of corrugated cardboard (83% recovery rate), most of which is B2B material collected through C&I collections.

Between 2019-20 and 2020-21 there was a significant increase in the recovery and recovery rate for corrugated cardboard, from 79% to 83%.

Table 43 – Post-consumer paper & paperboard packaging recovery rates in 2020–21, by material type.

Material type	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Boxboard/Cartonboard	315,000	108,000	34%
Corrugated cardboard	2,539,000	2,114,000	83%
Polymer coated paperboard	95,000	2,000	2%
Other fibre packaging	438,000	145,000	33%
Total	**3,387,000**	**2,370,000**	**70%**

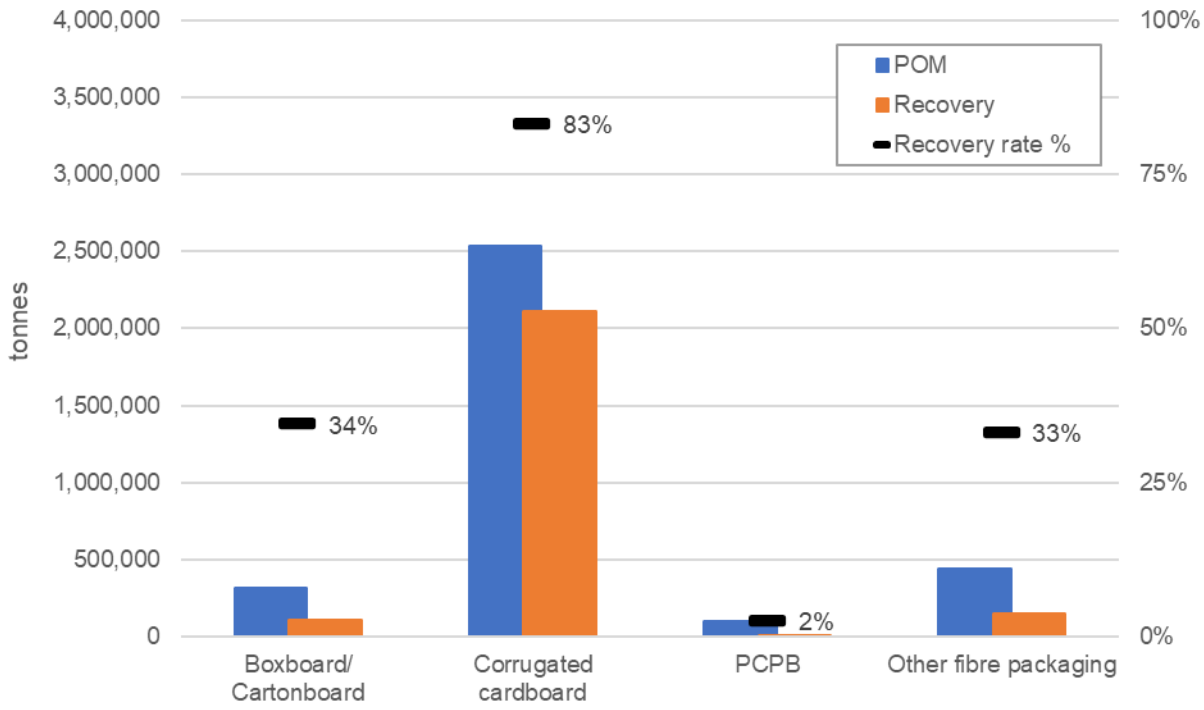

Figure 37 – Post-consumer paper & paperboard packaging recovery rates in 2020–21, by material type.

Glass packaging

Estimates for post-consumer glass packaging recovery rates in 2020–21, by material type, are provided in **Table 44** and **Figure 38**. The overall recovery rate for glass is 63%.

Recovery rates vary across the standard glass colours. Rates for amber and clear glass are higher, possibly due to good coverage of amber glass (beer bottles) under CDS nationally, and clear glass being more sought after for recovery into new packaging. A large proportion of green glass is used in wine bottles, which are not covered under CDS nationally.

Table 44 – Post-consumer glass packaging recovery rates in 2020–21, by material type.

Material type	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Amber glass	233,000	202,000	87%
Flint glass	605,000	374,000	62%
Green glass	445,000	228,000	51%
Total	**1,283,000**	**805,000**	**63%**

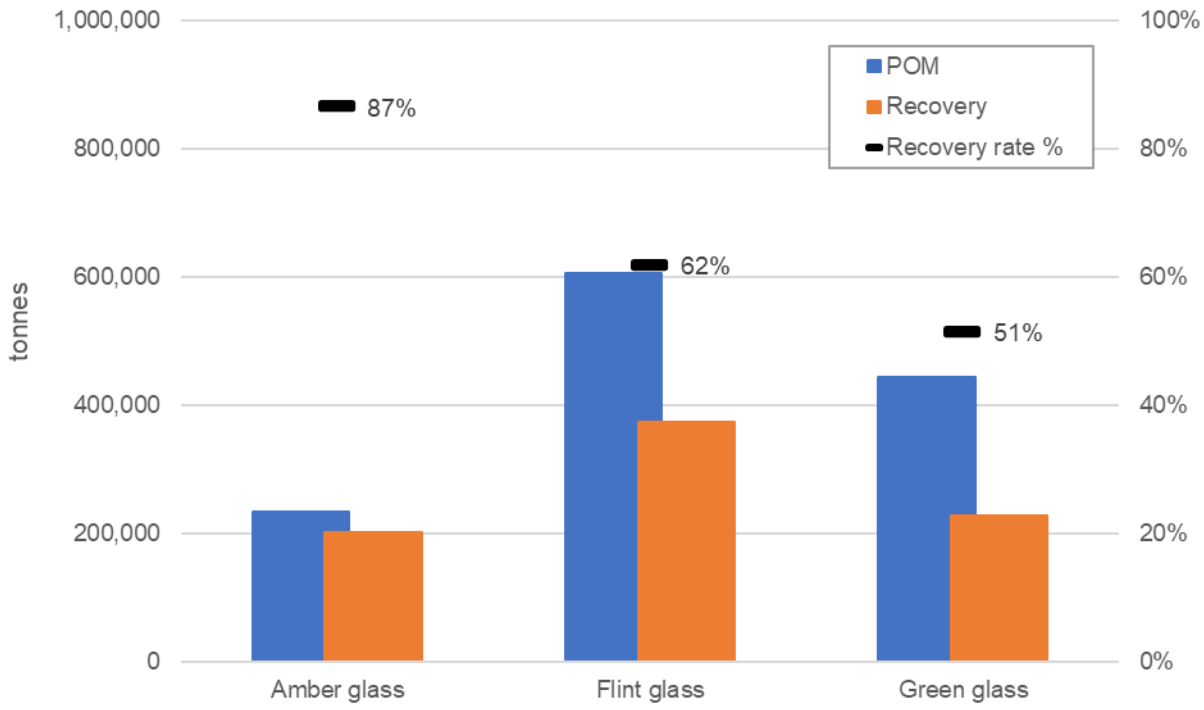

Figure 38 – Post-consumer glass packaging recovery rates in 2020–21, by material type.

Plastic packaging

Estimates for post-consumer plastic packaging recovery rates in 2020–21, by material type, are provided in **Table 45** and **Figure 39.** The packaging material group recovery rate is estimated at 18%.

The post-consumer PET packaging recovery rate (39%) continues to be the highest by a large margin, reflecting the concentration of use in beverage packaging, with high levels of recovery through both 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 39% recovery rate for PET was an increase on the 34% for 2019–20.

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 45 – Post-consumer plastic packaging recovery rates in 2020–21, by material type.

Material type	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
PET (1)	149,000	58,000	39%
HDPE (2)	287,000	66,000	23%
PVC (3)	15,000	0	0%
LDPE (4)	331,000	32,000	10%
PP (5)	215,000	30,000	14%
PS (6)	17,000	2,000	11%
EPS (6)	29,000	9,000	30%
Bioplastic (7)	4,000	0	3%
Other (7)	21,000	0	0%
Unidentified	111,000	10,000	9%
Total	**1,179,000**	**207,000**	**18%**

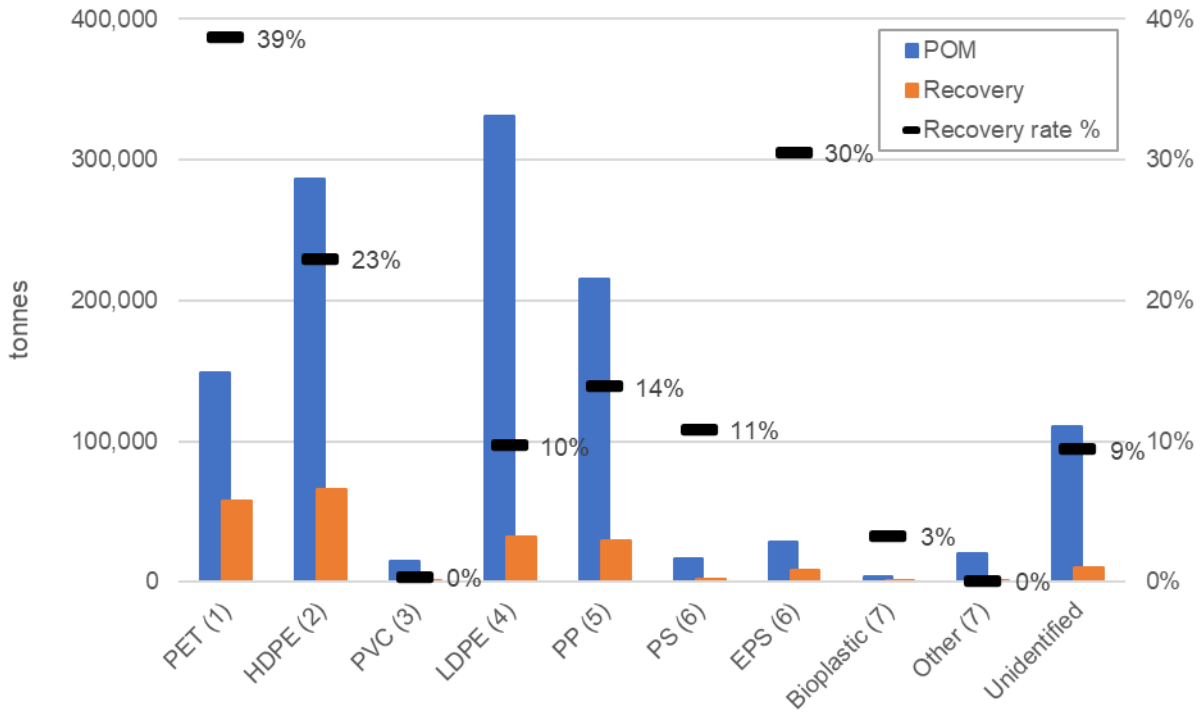

Figure 39 – Post-consumer plastic packaging recovery rates in 2020–21, by material type.

Table 46 provides more detailed data on the recovery of plastic packaging at the rigid/flexible classification level.

Table 46 – Post-consumer plastic packaging recovery rates in 2020–21, by material type and rigid/flexible classification.

Material type	Rigid plastics			Flexible plastics		
	POM	Recovery	Recovery rate	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
PET (1)	135,000	58,000	43%	14,000	0	0%
HDPE (2)	214,000	65,000	30%	72,000	1,000	1%
PVC (3)	NR[a]	NR[a]	1%	NR[a]	NR[a]	0%
LDPE (4)	10,000	3,000	28%	321,000	29,000	9%
PP (5)	166,000	29,000	17%	49,000	1,000	2%
PS (6)	17,000	2,000	11%	0	0	0%
EPS (6)	29,000	9,000	30%	0	0	0%
Bioplastic (7)	2,000	0	3%	1,000	0	3%
Other (7)	2,000	0	1%	19,000	0	0%
Unidentified	60,000	1,000	2%	51,000	9,000	18%
Total	**641,000**	**167,000**	**26%**	**538,000**	**40,000**	**7%**

a) 'The 'Unknown' rigidity classification quantities reported in Table 18 (a total of 125,000 tonnes) have been allocated to the rigid or flexible quantities on a polymer level pro-rata basis.

b) NR – Not reported due to confidentiality considerations.

An estimated 43% (58,000 tonnes) of rigid PET packaging was recovered in 2020–21, followed most significantly by rigid HDPE packaging at 30% (65,000 tonnes). The overall rigid plastic packaging recovery rate is estimated at 26% (the same result as both 2018–19 and 2019–20).

The flexible plastic packaging recycling rate is estimated at only 7% across both the consumer and B2B sectors. Flexible plastic packaging recovery was dominated by LDPE recovery from the B2B sector (e.g., pallet wrap). The recovery rate for this material increased from 4% in 2019–20.

Metal packaging

Estimates for post-consumer metal packaging recovery rates in 2020–21, by material type, are provided in **Table 47** and **Figure 40**. The packaging material group recovery rate is 58%. This is a small increase on the 2019–20 recovery rate of 56%.

Aluminium beverage cans have the highest recovery rate 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.

Larger (mild) steel drums have the next 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 tin-plate steel can recovery rate increased from 38% in 2019–20 to 43% in 2020–21, but remains relatively low, even though this material is highly recyclable and easily separated from kerbside commingled recyclables.

Table 47 – Post-consumer metal packaging recovery rates in 2020–21, by material type.

Material type	POM	Recovery	Recovery rate[a]
	(tonnes)	(tonnes)	(%)
Beverage aluminium	95,000	73,000	77%
Non-beverage aluminium	7,000	3,000	43%
Tin-plate steel	125,000	53,000	43%
Mild steel	26,000	18,000	67%
Stainless steel	0	0	0%
Total	**254,000**	**147,000**	**58%**

a) Percentage values are calculated prior to rounding contributing values.

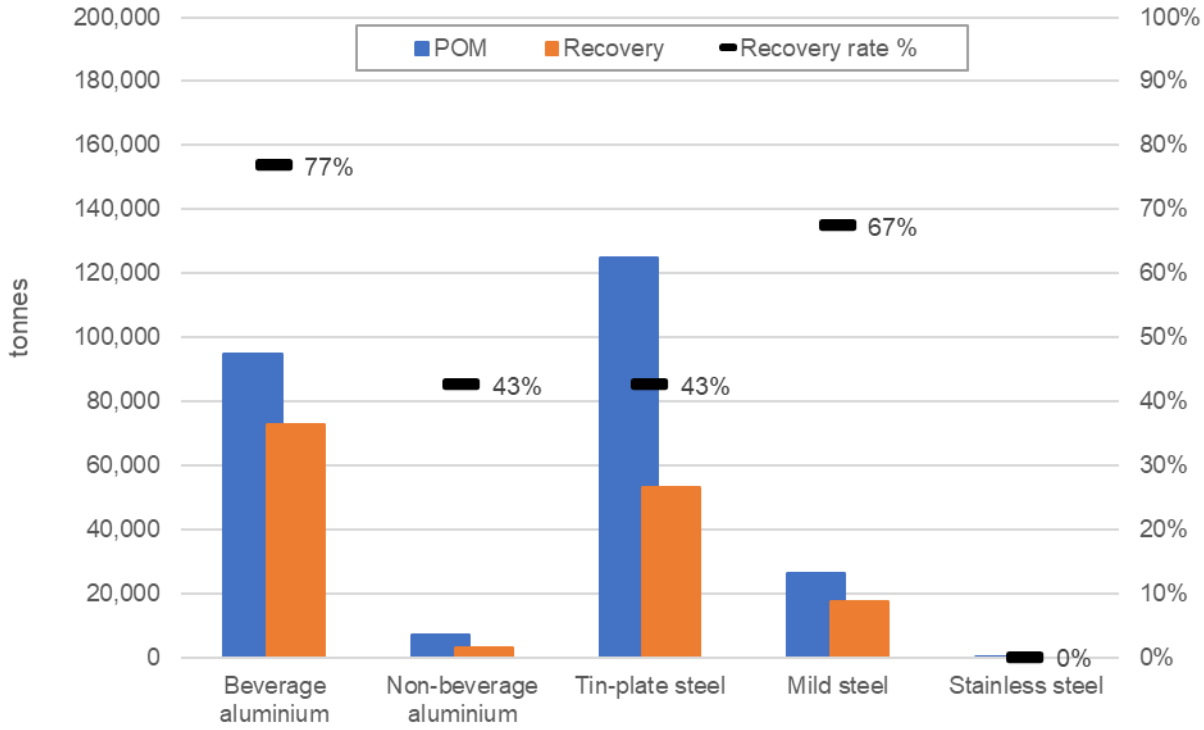

Figure 40 – Post-consumer metal packaging recovery rates in 2020–21, by material type.

Wood packaging

Estimates for wood packaging recovery rates in 2020–21, by material type, are provided in **Table 48** and **Figure 41**. The packaging material group recovery rate is 41%.

The major identified end-markets for end-of-life hardwood and softwood 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 and animal bedding products. The only identified end-market destination for fibreboard packaging is energy recovery.

Table 48 – Post-consumer wood packaging recovery rates in 2020–21, by material type.

Material type	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Fibreboard	132,000	5,000	4%
Hardwood	60,000	36,000	60%
Softwood	446,000	219,000	49%
Total	**638,000**	**260,000**	**41%**

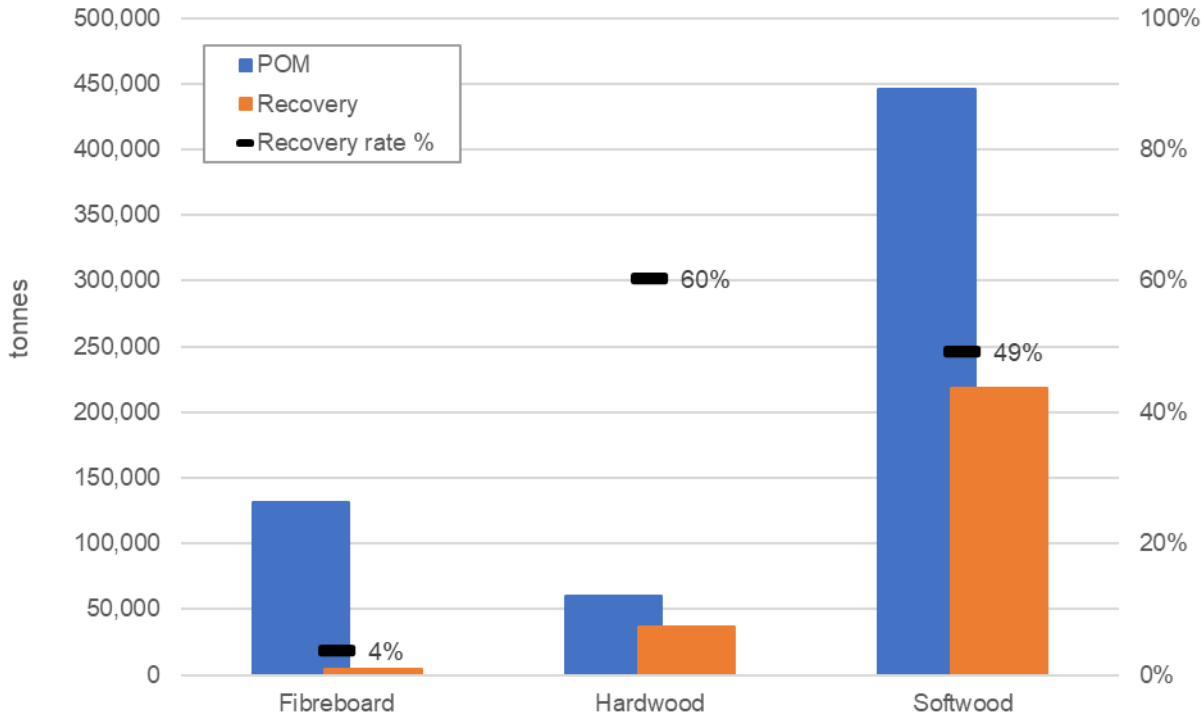

Figure 41 – Post-consumer wood packaging recovery rates in 2020–21, by material type.

3.9 Recovery rates by component group

Estimates for packaging recovery rates in 2020–21, by component group, are provided in **Table 49** and **Figure 42**.

The highest recovery rate is for cartons or boxes (75%), which are almost mostly fibre-based B2B packaging. This is followed by metal cans (60%) from B2C sources, and bottles or jars (mostly glass), also from B2C sources.

Table 49 – Post-consumer packaging recovery rates in 2020–21, by packaging component group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Bag or pouch	489,000	65,000	13%
Barrel or drum	88,000	34,000	39%
Bottle or jar	1,589,000	911,000	57%
Can	214,000	129,000	60%
Carton or box	3,017,000	2,263,000	75%
Closure or label	61,000	3,000	4%
Pallet or bin	536,000	224,000	42%
Shopping bag	13,000	1,000	7%
Tableware	56,000	1,000	1%
Tub, tray or punnet	189,000	51,000	27%
Tube or cartridge	10,000	0	0%
Wrap	209,000	46,000	22%
Other	141,000	53,000	37%
Unknown	127,000	8,000	6%
Total	**6,740,000**	**3,788,000**	**56%**

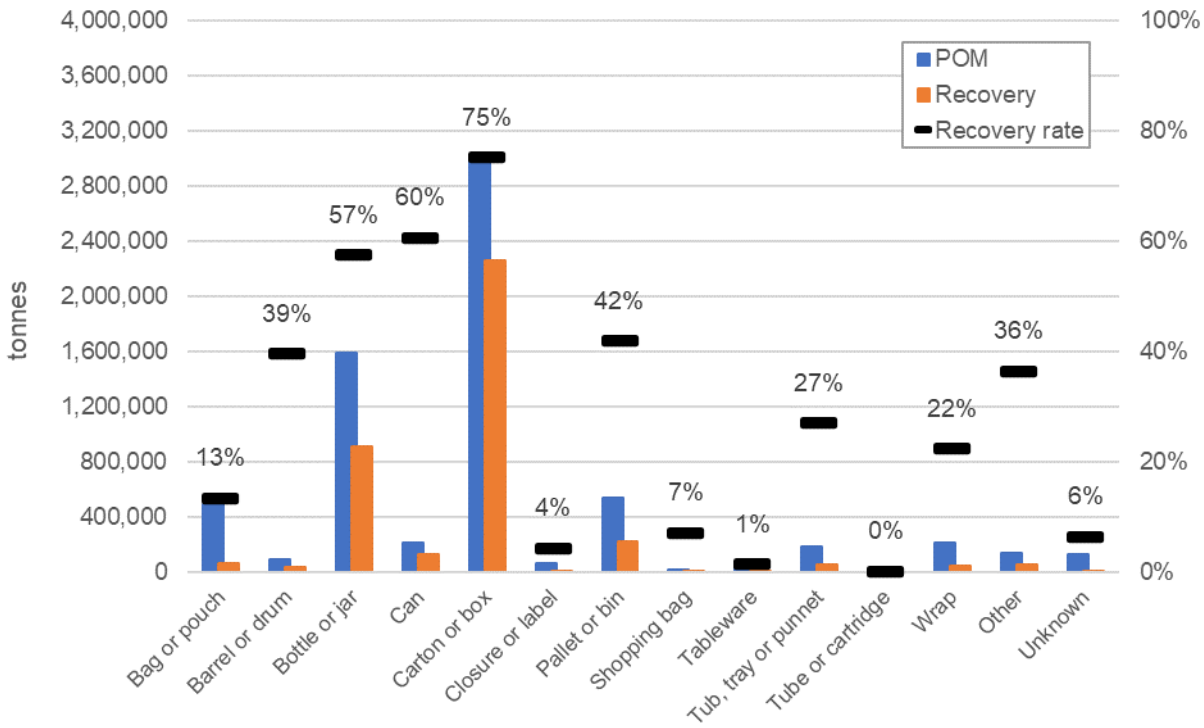

Figure 42 – Post-consumer packaging recovery rates in 2020–21, by packaging component group.

3.10 Packaging recyclability

In this section of the report packaging POM in 2020–21 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 reusable, recyclable or compostable packaging.

Packaging recyclability by material group is provided in **Table 50, Table 51** and **Figure 43**. It is estimated that 5.8 million tonnes (86%) of packaging POM in 2020–21 had good recyclability. This was dominated by paper & paperboard (of which 93% had good recyclability) and glass (of which 100% had good recyclability). Effectively all metal packaging (99.9%) was classified as having good recyclability, but only 60% of plastic packaging was classified as having good recyclability (steady from the 60% in 2019–20). Wood packaging had 67% classified as having good recyclability.

Around 0.8 million tonnes (12%) of packaging was classified as having poor recyclability or not being recyclable. Around 42% of this was plastic packaging, and another 31% was paper & paperboard packaging.

The recyclability status of another 0.1 million tonnes of packaging, almost entirely plastic packaging, could not be determined. It is likely that most of this packaging would tend towards having poor recyclability or not being recyclable.

Table 50 – Packaging POM in 2020–21, by recyclability classification and material group.

Material group	Good recyclability	Poor recyclability	Not recyclable	Unknown	Total
	(%)	(%)	(%)	(%)	(%)
Paper & paperboard	92.9%	5.3%	1.8%	0.0%	92.9%
Glass	100.0%	0.0%	0.0%	0.0%	100.0%
Plastic	60.2%	14.3%	13.5%	12.0%	60.2%
Metal	99.9%	0.1%	0.0%	0.0%	99.9%
Wood	66.9%	12.4%	20.6%	0.0%	66.9%
Total (%)	**86.3%**	**6.3%**	**5.2%**	**2.1%**	**100.0%**
Total (tonnes)	**5,820,000**	**428,000**	**351,000**	**141,000**	**6,740,000**

Table 51 – Packaging POM in 2020–21, by recyclability classification and material group tonnes.

Material group	Good recyclability	Poor recyclability	Not recyclable	Unknown	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	3,147,000	180,000	60,000	0	**3,387,000**
Glass	1,283,000	0	0	0	**1,283,000**
Plastic	710,000	168,000	159,000	141,000	**1,179,000**
Metal	253,000	0	0	0	**254,000**
Wood	427,000	79,000	132,000	0	**638,000**
Total (%)	**86.3%**	**6.3%**	**5.2%**	**2.1%**	**100.0%**
Total (tonnes)	**5,820,000**	**428,000**	**351,000**	**141,000**	**6,740,000**

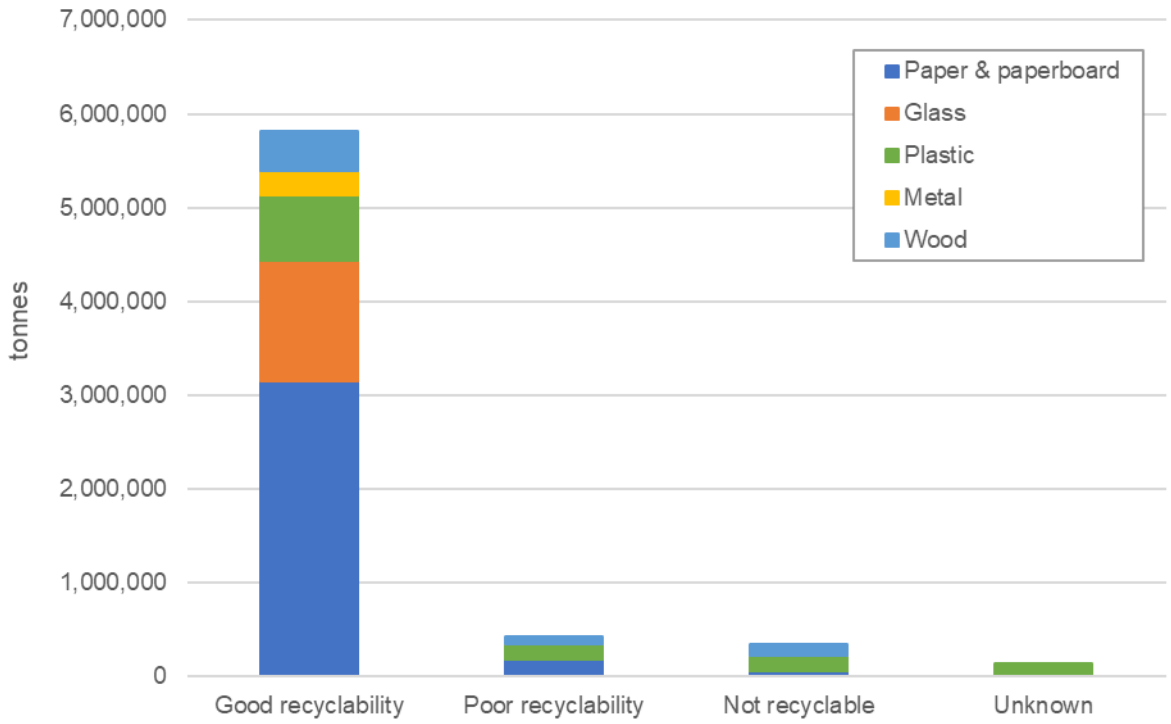

Figure 43 – Packaging POM in 2020–21, by recyclability classification and material group.

Table 52 and **Figure 44** compare the 2017–18 to 2020–21 quantities of packaging with a 'Good recyclability' classification. There were some changes in the percentages of packaging with good recyclability between 2019–20 and 2020–21, with the most noteworthy being an increase in the paper & paperboard good recyclability percentage value, due in most part to an update in the recyclability classification of kraft paper.

Table 52 – Packaging POM with a 'good recyclability' classification from 2017–18 to 2020–21, including a percentage of the total tonnes of the material group POM, by material group.

Material group	2017–18		2018–19		2019–20		2020–21	
	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)
Paper & paperboard	2,682,000	92%	2,962,000	91%	2,961,000	90%	3,147,000	93%
Glass	1,273,000	100%	1,283,000	100%	1,156,000	100%	1,283,000	100%
Plastic	627,000	59%	663,000	66%	676,000	60%	710,000	60%
Metal	201,000	95%	243,000	99%	240,000	97%	253,000	100%
Wood	NR[a]	NR[a]	121,000	98%	359,000	78%	427,000	67%
Total	**4,783,000**	**88%**	**5,273,000**	**89%**	**5,392,000**	**86%**	**5,820,000**	**86%**

a) NR – Not reported.

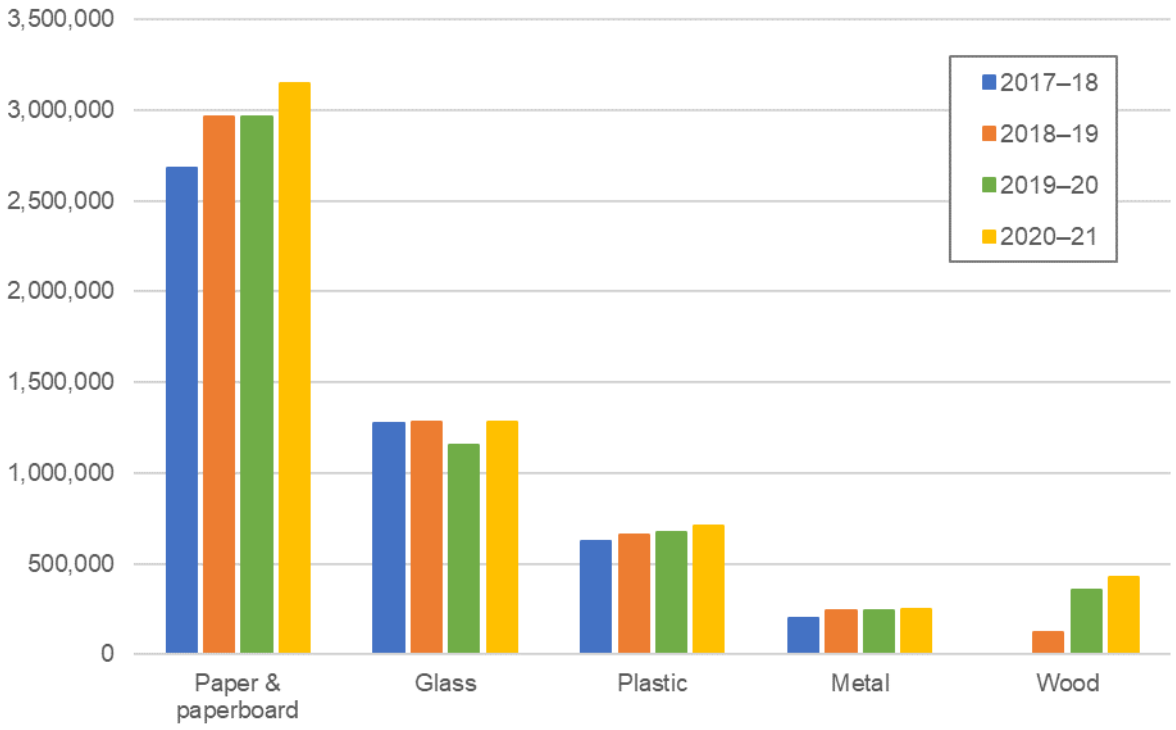

Figure 44 – Packaging POM with a 'good recyclability' classification from 2017–18 to 2020–21, by material group (tonnes).

4 PACKAGING LOSSES AND IMPACTS IN 2020–21

4.1 Packaging losses to landfill

Estimates of post-consumer packaging to landfill by material group are provided in **Table 53** and **Figure 45**. In total there were almost 3 million tonnes of post-consumer packaging disposed to landfill, which was 44% of packaging POM. This compares to 2.9 million tonnes in 2019–20 (45% of packaging POM).

This packaging to landfill consisted of 1.0 million tonnes (34%) paper & paperboard-based packaging, 1.0 million tonnes of plastic packaging (33%), 0.5 million tonnes of glass packaging (16%), 0.1 million tonnes of metal packaging (4%) and 0.4 million tonnes of wood-based single-use packaging (13%).

Table 53 – Post-consumer packaging to landfill in 2020–21, by material group.

Material group	POM	Landfill		Landfill rate
	(tonnes)	(tonnes)	(%)	(%)
Paper & paperboard	3,387,000	1,017,000	34%	30%
Glass	1,283,000	478,000	16%	37%
Plastic	1,179,000	972,000	33%	82%
Metal	254,000	107,000	4%	42%
Wood	638,000	377,000	13%	59%
Total	**6,740,000**	**2,952,000**	**100%**	**44%**

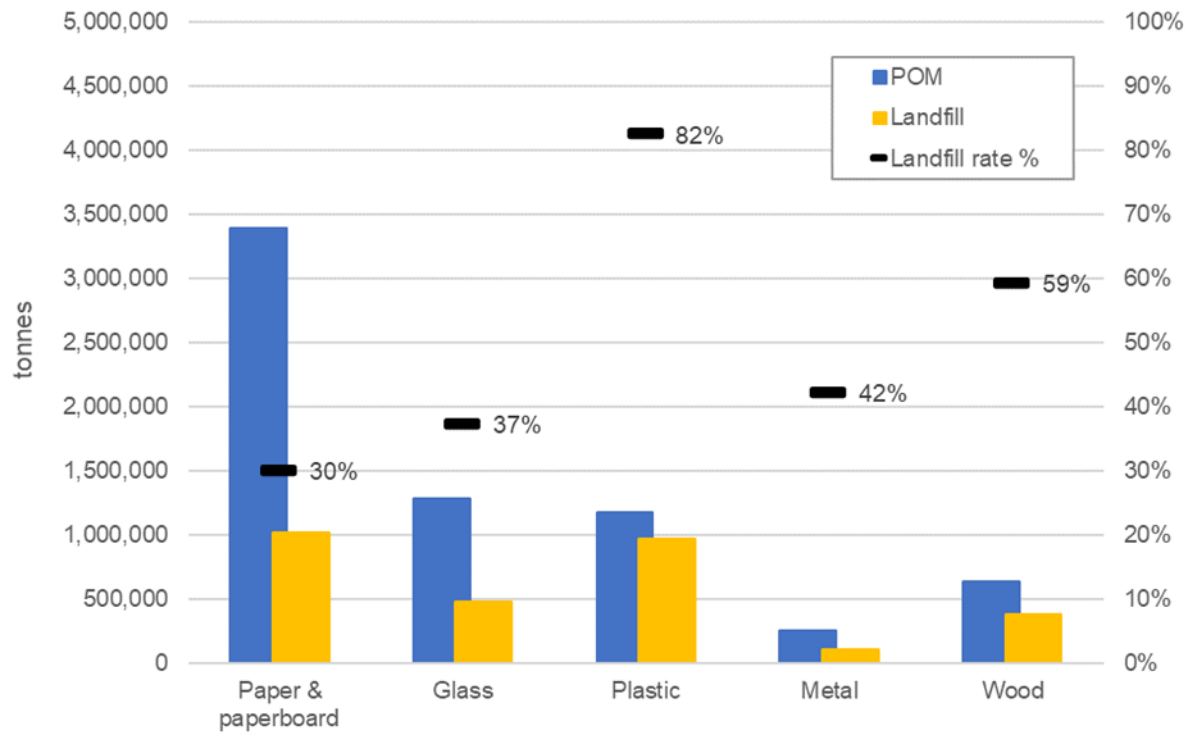

Figure 45 – Post-consumer packaging to landfill in 2020–21, by material group.

4.2 Lost value of landfilled packaging

This section provides indicative estimates of the value (in Australian Dollars - AUD) of packaging material sent to landfill in 2020–21. These are theoretical estimates based on the following attributes and assumptions:

- Commodity values have been estimated at 30 June 2021.
- 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 (e.g., CDS, C&I).
- Packaging to composting is allocated a value of $0 per 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 (see point above) can vary widely but are of a similar magnitude.
- 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 54 presents the indicative estimates of the lost value (AUD) of packaging landfilled in 2020-21. The national sorted value is estimated at $630 million, at a weighted average value of $213 per tonne. This was a significant increase on the 2019–20 weighted average value of $125 per tonne, reflecting the much improved commodity prices occurring in June 2021, and more generally, the volatility of the prices of these commodities.

Table 54 – Quantity and lost value of landfilled packaging in 2020–21, by material group.

Material group	Landfill	Value of landfilled packaging	
	(tonnes)	(AUD/tonne)	(AUD million)
Paper & paperboard	1,017,000	$115	$120
Glass	478,000	$75	$40
Plastic	972,000	$403	$390
Metal	107,000	$785	$80
Wood	377,000	$0	$0
Total	**2,952,000**	**$213**	**$630**

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 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 GHG 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 typically 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 more 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 55 presents the indicative estimates of the reduction in GHG emissions if all landfilled packaging had been recycled in 2020–21.

The national reduction that could have been achieved is estimated at 2.2 million tonnes of CO_2 emissions, at a weighted average of 0.7 tonnes CO_2 per tonne diverted to recycling. This compares with the 2019–20 estimate of 1.9 million tonnes of CO_2 of emissions.

Assuming the average car emits 2.93 tonnes CO_2/year[1], these 2020–21 emissions, if avoided, would be equivalent to removing 740,000 cars from the road for a year.

Table 55 – GHG emission reduction through diverting landfilled packaging to recycling in 2020–21, by material group.

Material group	Landfill	Emission factor	Avoided emissions
	(tonnes)	(t CO2-e /t)	(t CO2-e)
Paper & paperboard	1,017,000	0.169	171,920
Glass	478,000	0.528	252,620
Plastic	972,000	0.671	652,040
Metal	107,000	5.441	581,050
Wood	377,000	1.350	509,500
Total	**2,952,000**	**0.734**	**2,167,130**

[1] Average passenger vehicle emissions based on a travel distance in 2019–20 of 11,100 km (latest available data published by ABS), with an average fuel consumption of 11.1 L/100 km (ABS, 2020). Assumed petrol vehicle. Petrol emission factor of 2.38 kg $CO_{2\text{-}e}$/L adopted (DISER, 2020, p. 16). This gives fuel consumption of 1,232 L/vehicle.yr, and emissions of 2,930 kg $CO_{2\text{-}e}$/vehicle.yr.

5 PACKAGING PROJECTIONS TO 2024–25

5.1 Introduction

Provided in this section of the report are baseline projections of:

- **Annual estimates of packaging POM from 2019–20 to 2024–25 by material type** – These projections are generally based on manufacturer reported market growth estimates by packaging material type and component group. Population growth estimates have been adopted where survey data was not available.
- **Annual reprocessing capacity estimates from 2019–20 to 2024–25 by material type** – These projections are based on reprocessor reported (spare) capacity and committed new capacity.

These baseline packaging POM and reprocessing capacity projections quantify the impact of planned infrastructure changes reported by packaging manufacturers and reprocessors during the surveys undertaken for this project.

It is important to note that there are other potential system changes that are not incorporated into the data provided in this section of the report, these include:

- Improvements in packaging design with respect to packaging recyclability and end-market demand.
- Deselection of packaging material types with poor recyclability, or that are not recyclable.
- Improvements in packaging labelling and consumer education, increasing packaging diversion to recovery pathways.
- Additional new sorting and reprocessing infrastructure (beyond that reported by surveyed reprocessors).
- The Council of Australian Governments (COAG) bans on the exports of targeted forms of waste plastic, paper and glass.
- Kerbside system changes (e.g., four bin system in Victoria, including a separate glass bin)
- Expansion of CDS scope.
- Expansion of other source segregated collections.
- Updates/improvements in standards and specifications.
- End-market growth in demand for recycled content in packaging and other applications (e.g., construction).

5.2 Packaging POM projections to 2024–25

Packaging POM from 2019–20 to 2024–25 has been estimated by multiplying 2020–21 survey data by market growth percentage estimates (% per year). These percentage values have been determined by material type and packaging component combination, and are drawn from the following sources in order of preference:

1. Manufacturer reported growth estimates by material type and packaging component group. These market growth estimates have been calculated where reported by manufacturers representing >10% of packaging POM by material type/component group combination.

2. Manufacturer reported growth estimates by material type (aggregated estimate for the material type).
3. Average forecast annual Australian population growth (per capita growth) over the three years from 30-06-2021 to 30-06-2024 (ABS, 2018).

Presented in **Table 56** and **Figure 46** are actual annual packaging POM estimates for 2019–20 and 2020-21 and projections for 2021-22 to 2024–25 by material group. The compound annual growth rate (CAGR) for packaging POM over this period is 23.6% per year. Growth per capita is lower with a CAGR of 1.9%. This suggests that packaging POM will continue to grow in both absolute and per capita terms over the next four years.

Table 56 – Estimated annual packaging POM from 2019–20 to 2024–25, by material group.

Material group	2019–20[a]	2020–21[a]	2021–22	2022–23	2023–24	2024–25	5-year CAGR[b]
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%/yr)
Paper & paperboard	3,277,000	3,387,000	3,492,000	3,600,000	3,711,000	3,826,000	3.1%
Glass	1,156,000	1,283,000	1,313,000	1,345,000	1,377,000	1,409,000	4.0%
Plastic	1,124,000	1,179,000	1,202,000	1,226,000	1,251,000	1,277,000	2.6%
Metal	248,000	254,000	259,000	265,000	270,000	276,000	2.2%
Wood	462,000	638,000	653,000	669,000	687,000	705,000	8.8%
Total (tonnes)	**6,266,000**	**6,740,000**	**6,919,000**	**7,104,000**	**7,295,000**	**7,493,000**	**3.6%**
Total (kg/person)[c]	**244**	**262**	**259**	**262**	**265**	**268**	**1.9%**

a) 2019–20 and 2020–21 data is actual year data. Data for 2021–22 to 2024–25 are projections.

b) CAGR – Compound annual growth rate.

c) Population data for 2019–20 and 20–21 sourced from ABS (2022a). Population data for 2021–22 to 2024–25 sourced from ABS (2018).

Between 2019–20 and 2024–25 there is projected to be 1,227 kt (19.6%) growth in packaging POM, based largely on packaging manufacturer estimates of prospective market growth. Of this, 549 kt (45%) is projected to be paper & paperboard packaging, 253 kt (21%) glass packaging, 153 kt (13%) plastic packaging, 28 kt (2%) metal packaging and 243 kt (20%) wood packaging.

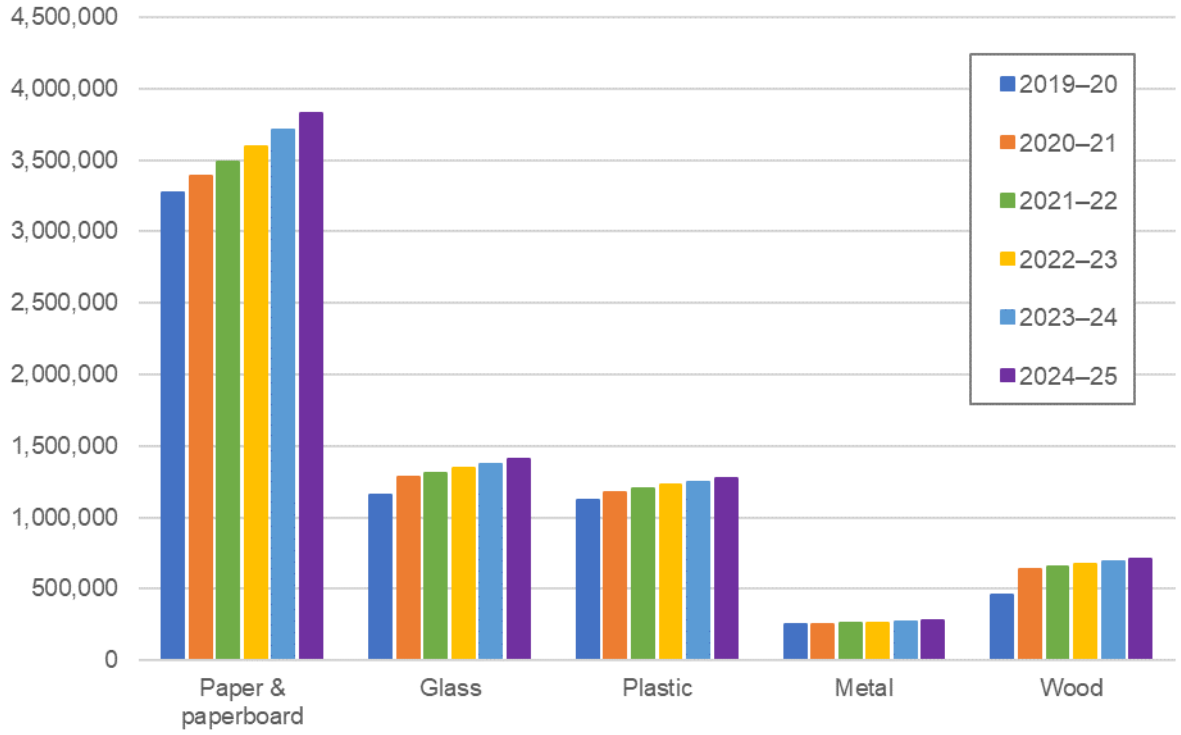

Figure 46 – Annual packaging POM in 2019–20 and 2020-21, and estimated annual packaging POM from 2021-22 to 2024–25, by material group (tonnes).

Presented in **Table 57** are annual packaging POM estimates from 2019–20 to 2024–25 by material type.

Table 57 – Annual packaging POM from 2019–20 to 2024–25, by material type.

Material type	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	5-year CAGR[a]
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%/yr)
Boxboard/Cartonboard	316,000	315,000	324,000	335,000	345,000	356,000	2.4%
Corrugated cardboard	2,513,000	2,539,000	2,617,000	2,697,000	2,780,000	2,866,000	2.7%
HWS carrierboard	25,000	31,000	31,000	32,000	33,000	34,000	6.7%
Kraft paper	180,000	246,000	253,000	260,000	268,000	276,000	8.9%
Moulded fibreboard	56,000	63,000	65,000	68,000	71,000	74,000	5.8%
PCPB – Aseptic	40,000	49,000	51,000	53,000	55,000	57,000	7.4%
PCPB – Gable top	12,000	15,000	16,000	16,000	17,000	17,000	7.1%
PCPB – Cold cup	13,000	8,000	8,000	8,000	9,000	9,000	-7.2%
PCPB – Hot cup	23,000	18,000	19,000	20,000	20,000	21,000	-1.1%
PCPB – Other	4,000	4,000	4,000	4,000	4,000	4,000	-0.3%
Polymer coated paper	1,000	1,000	1,000	1,000	1,000	1,000	1.9%
Other fibre packaging	95,000	99,000	102,000	105,000	108,000	111,000	3.1%
Amber glass	334,000	233,000	238,000	244,000	250,000	256,000	-5.2%
Flint glass	606,000	605,000	620,000	635,000	650,000	665,000	1.9%
Green glass	216,000	445,000	455,000	466,000	477,000	488,000	17.8%
PET (1)	163,000	149,000	152,000	154,000	157,000	159,000	-0.5%
HDPE (2)	275,000	287,000	290,000	293,000	296,000	299,000	1.7%
PVC (3)	17,000	15,000	14,000	14,000	13,000	13,000	-5.7%
LDPE (4)	276,000	331,000	344,000	358,000	371,000	386,000	7.0%
PP (5)	218,000	215,000	219,000	222,000	225,000	229,000	1.0%
PS (6)	17,000	17,000	17,000	16,000	16,000	16,000	-1.6%
EPS (6)	23,000	29,000	28,000	27,000	26,000	26,000	2.6%
Bioplastic (7)	9,000	4,000	4,000	4,000	5,000	5,000	-8.8%
Other (7)	20,000	21,000	21,000	22,000	22,000	23,000	2.5%
Unidentified plastic	107,000	111,000	114,000	116,000	119,000	122,000	2.7%
Beverage aluminium	82,000	95,000	97,000	99,000	101,000	103,000	4.7%
Non-bev. aluminium	7,000	7,000	7,000	7,000	8,000	8,000	1.8%
Tin-plate steel	139,000	125,000	128,000	130,000	133,000	136,000	-0.4%
Mild steel	19,000	26,000	27,000	28,000	28,000	29,000	8.5%
Stainless steel	1,000	0	0	0	0	0	-12.3%
Low-density fibreboard	50,000	94,000	97,000	99,000	101,000	104,000	15.6%
Oriented strand board	50,000	37,000	38,000	39,000	40,000	41,000	-3.9%
Hardwood	81,000	60,000	62,000	63,000	65,000	66,000	-3.9%
Softwood	281,000	446,000	457,000	468,000	481,000	494,000	12.0%
Plywood	0	0	0	0	0	0	1.9%
Total	**6,266,000**	**6,740,000**	**6,919,000**	**7,104,000**	**7,295,000**	**7,493,000**	**3.6%**

a) CAGR – Compound annual growth rate.

As the use of certified compostable bioplastics is topical, it is worth noting that the fall in bioplastics consumption between 2019–20 and 2020–21 has likely been due to:

- a significant shift away from bioplastic based tableware (i.e. cutlery) to substitute materials (e.g. wood based cutlery),

- a notable shift away from the use of bioplastics as a layer in composite (laminated) rigid packaging, and
- a reduction in the use of bioplastic based shopping bags.

These reductions have been offset somewhat by an increase in the use of bioplastic based bags in food organics / garden organics (FOGO) applications (i.e. kitchen organics bin (caddy) liners), and some minor growth in the use of bioplastics in other packaging applications, such as single serve sachets and magazine mail protection bags.

Also of note given the planned phase out of PVC, PS and EPS formats is the fact that both PVC and PS consumption are projected to fall between 2020–21 and 2024–25, but EPS is projected to increase based on the survey data. However, it is anticipated that this growth in EPS packaging POM will be revised downwards in future years as brand-owners are likely to take action to substitute this form of packaging.

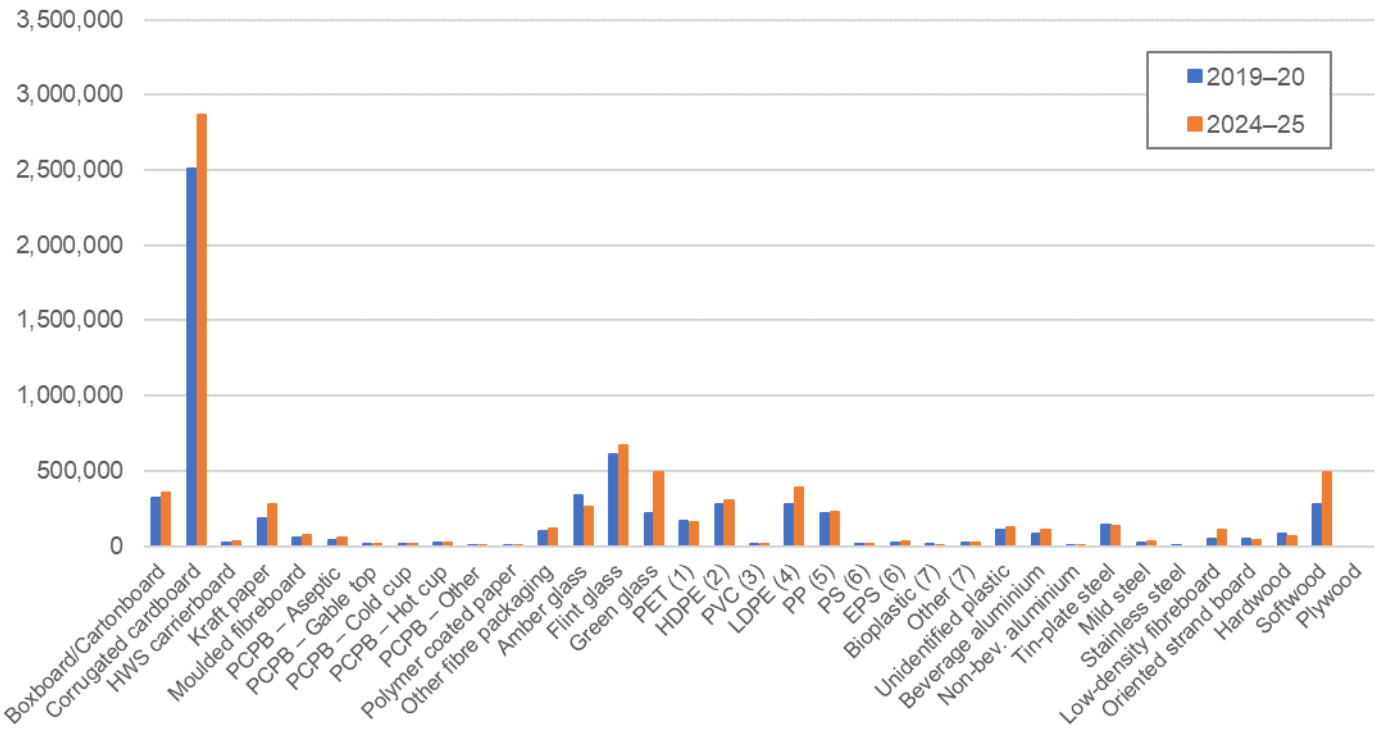

Figure 47 – Packaging POM in 2019–20 and 2024–25, by material type (tonnes).

5.3 Packaging reprocessing capacity projections to 2024–25

Packaging reprocessing capacity projections from 2019–20 to 2024–25 have been estimated at the material type level, based on reprocessor reported existing (spare) capacity (Appendix D 2.2) and committed new capacity (Appendix D 2.3). No other system changes or interventions have been assumed. The following modelling conditions have been adopted:

- Reprocessing capacity projections for 2024–25 are assumed to be 2020–21 reprocessing figures, plus spare capacity in 2020–21 (assuming an optimal outcome in which this capacity can be fully utilised by 2024–25) and reported new capacity (funded and approved) by 2024–25.

- Reprocessing capacity projections between 2020–21 and 2024–25 are simple straight-line interpolations of estimated reprocessing and reprocessing capacity between those two years. This gives the appearance in **Figure 48** that reprocessing capacity will increase linearly over the projected timeframe. However, it will be somewhat uneven.

Presented in

Table 58 and **Figure 48** are baseline capacity projections from 2019–20 to 2024–25 by material group. The 5-year CAGR for baseline reprocessing growth over this period is 8.5% per year, compared with the 2.8% estimate for 2019–20, with the increase due to committed new capacity between the two years. For the first time this year the reprocessing CAGR is significantly higher than the CAGR for packaging POM.

It is now projected that by the end of 2024–25 local reprocessing capacity will be 5.1 million tonnes, representing around 69% of the projected amount of packaging POM of 7.5 million tonnes in 2024–25. For plastics, projected reprocessing capacity represents approximately 46% of the projected quantity of plastic packaging POM in 2024–25.

Table 58 – Annual packaging reprocessing capacity projections from 2019–20 to 2024–25, by material group

Material group	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	5-year CAGR[a]
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%/yr)
Paper & paperboard	2,229,000	2,370,000	2,439,000	2,509,000	2,579,000	2,649,000	3.5%
Glass	699,000	805,000	976,000	1,147,000	1,318,000	1,489,000	16.3%
Plastic	179,000	207,000	303,000	399,000	496,000	592,000	27.1%
Metal	139,000	147,000	147,000	148,000	148,000	148,000	1.2%
Wood	171,000	260,000	260,000	260,000	260,000	260,000	8.8%
Total	**3,416,000**	**3,788,000**	**4,126,000**	**4,463,000**	**4,801,000**	**5,139,000**	**8.5%**

a) CAGR – Compound Annual Growth Rate.

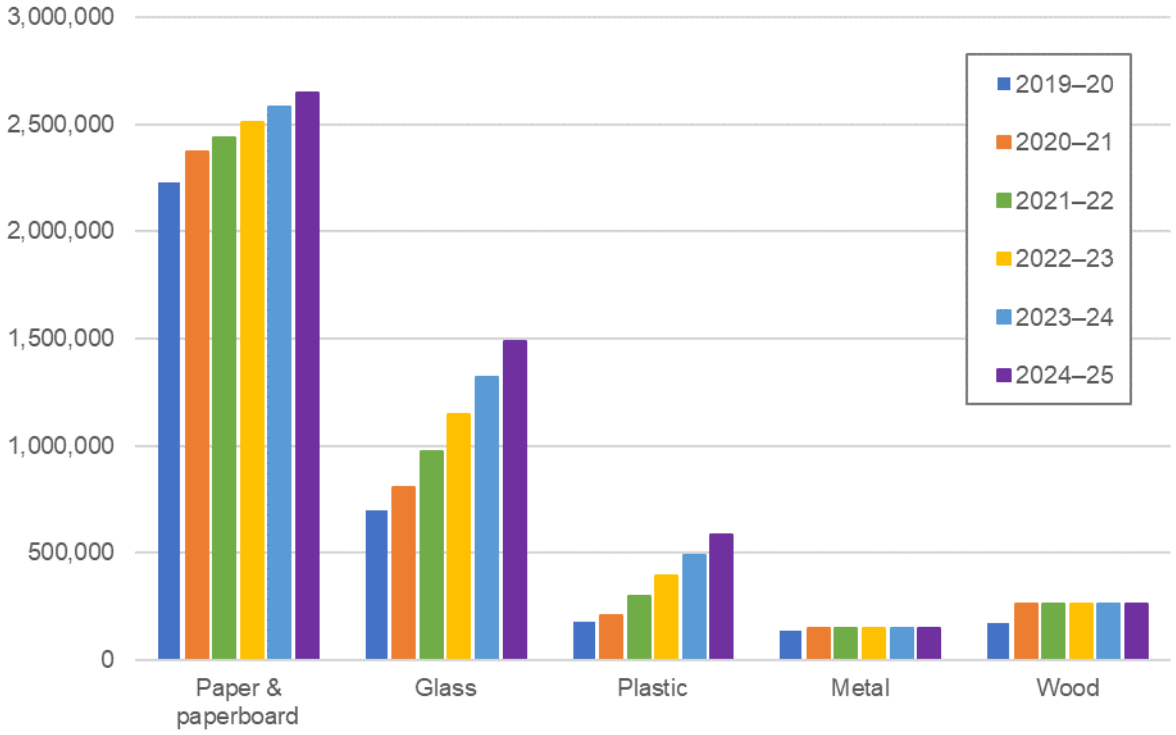

Figure 48 – Annual packaging reprocessing capacity projections from 2019–20 to 2024–25, by material group (tonnes)

Presented in **Table 59** are annual packaging reprocessing capacity projections from 2019–20 to 2024–25 by material type. The most significant growth in percentage terms is expected to be for plastics across all polymer types. Projected growth in capacity for PET is particularly notable. This is projected to increase from 58,000 tonnes in 2020–21 to 165,000 tonnes in 2024–25, which is approximately 100% of the amount of PET packaging projected to be POM in 2024–25.

Table 59 – Annual packaging reprocessing capacity projections from 2019–20 to 2024–25, by material type

Material type	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	5-year CAGR[a]
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%/yr)
Boxboard/Cartonboard	107,000	108,000	112,000	115,000	118,000	121,000	2.6%
Corrugated cardboard	1,988,000	2,114,000	2,176,000	2,237,000	2,299,000	2,360,000	3.5%
PCPB	5,000	2,000	3,000	4,000	5,000	6,000	4.8%
Polymer coated paper	0	0	0	0	0	0	0.0%
Other fibre pkg.	128,000	145,000	149,000	153,000	157,000	161,000	4.6%
Amber glass	202,000	202,000	244,000	287,000	330,000	372,000	13.0%
Flint glass	366,000	374,000	454,000	534,000	614,000	694,000	13.6%
Green glass	131,000	228,000	277,000	326,000	375,000	424,000	26.5%
PET (1)	55,000	58,000	85,000	112,000	138,000	165,000	24.4%
HDPE (2)	60,000	66,000	88,000	111,000	134,000	157,000	21.3%
PVC (3)	2,000	0	0	1,000	1,000	2,000	-2.8%
LDPE (4)	15,000	32,000	51,000	70,000	88,000	107,000	48.3%
PP (5)	20,000	30,000	52,000	74,000	96,000	118,000	42.6%
PS (6)	4,000	2,000	3,000	5,000	7,000	8,000	13.4%
EPS (6)	4,000	9,000	9,000	10,000	11,000	11,000	21.1%
Compostable plastic (7)	0	0	0	0	0	0	2.2%
Other (7)	1,000	0	0	0	0	0	-58.8%
Unidentified plastic	17,000	10,000	14,000	17,000	21,000	24,000	7.5%
Beverage aluminium	66,000	73,000	73,000	73,000	74,000	74,000	2.3%
Non-bev. aluminium	3,000	3,000	3,000	3,000	3,000	3,000	2.5%
Tin-plate steel	53,000	53,000	53,000	53,000	53,000	53,000	0.2%
Mild steel	17,000	18,000	18,000	18,000	18,000	18,000	0.5%
Fibreboard	1,000	0	0	0	0	0	-100.0%
Hardwood	9,000	5,000	5,000	5,000	5,000	5,000	-11.6%
Softwood	36,000	36,000	36,000	36,000	36,000	36,000	0.0%
Plywood	125,000	219,000	219,000	219,000	219,000	219,000	11.8%
Total	**3,416,000**	**3,788,000**	**4,126,000**	**4,463,000**	**4,801,000**	**5,139,000**	**8.5%**

a) CAGR – Compound annual growth rate.

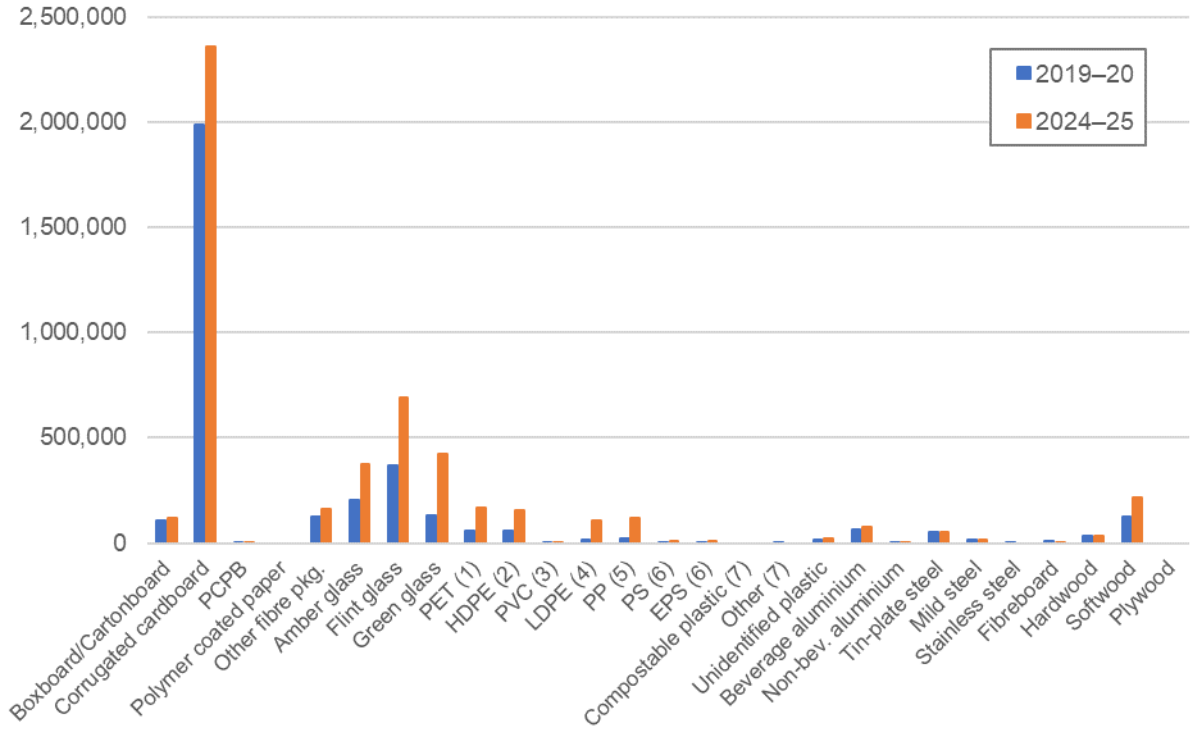

Figure 49 – Annual packaging reprocessing capacity projections from 2019–20 to 2024–25, by material type (tonnes).

6 PACKAGING REUSE IN 2020–21

6.1 Introduction

This year flows of eight reusable packaging systems have been quantified, which are the same as those quantified in 2019–20. This is a continuation of the 2018–19 pilot exercise, working towards fully incorporating reusable packaging flows into the core consumption and recovery dataset, along with the appropriate metrics to measure comparative flows of reusable and single-use packaging systems. This is a complex measurement that requires more research on the most appropriate methodology (explained further below).

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) and,*

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 quantified this year are:

- **Kegs** – Beer kegs only.
- **Drums (200–205 litre)** – All reusable steel and plastic drums in the 200–205 litre volumetric capacity range (44-gallon UK or 55 gallon US).
- **Intermediate bulk containers (IBCs)** – All rigid IBCs are assumed to be reusable (rather than single-use) packaging.
- **Milk crates** – Non-collapsible plastic crates. Limited to dairy applications only.
- **Pallets** – Reusable timber and plastic pallets only, including display pallets. Single-use pallets are excluded.
- **Returnable plastic crates (RPCs)** – Collapsible plastic crates. Limited to major supermarket systems only (e.g., ALDI, Coles and Woolworths).
- **Reusable shopping bags** – Reusable non-woven PP (NWPP) bags, and reusable HDPE and LDPE bags (supermarket type).
- **Reusable coffee cups** – Reusable coffee cups used in an away-from-home (AfH) setting where they could be reasonably expected to have avoided the use of a single-use coffee cup.

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 system 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 quantification of eight reusable packaging systems is to advance the consideration of this system performance measure.

The data collection plan adopted for the reusable packaging quantifications is outlined in the following table.

Table 60 – Data plan for packaging reuse quantification (2020–21 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 (2). Major pool operators (5). Major reusable plastic bag suppliers (2). Reusable packaging manufacturers (4).
Quantity of new reusable packaging POM in 2020–21.	Reusable packaging pool inputs in 2020–21.	
Quantity of reusable packaging leaving the reusable packaging pool (stocks) to end-of-life (EoL) fate in 2020–21.	Reusable packaging pool outputs in 2020–21 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 2020–21.	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 2020–21 (tonnes and number).
- New reusable packaging entering service (inputs) in 2020–21 (tonnes and number).

- Old reusable packaging exiting service (outputs) in 2020–21 (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.

6.2 Reusable packaging system flows

Estimates of reusable packaging system flows in 2020–21 are provided in **Table 61** and **Figure 50**. Reusable timber 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 timber pallets, plastic pallets and drums had the largest pool sizes, followed by IBCs and beer kegs.

Table 61 – Reusable packaging system flows in 2020–21.

Packaging system	Input flow		Pool size[a]		Output flow	
	(tonnes)	('000 units)	(tonnes)	('000 units)	(tonnes)	('000 units)
Beer kegs	200	20	7,800	560	200	20
Drums (200–205 L)	15,600	930	46,500	2,320	15,600	930
Rigid IBCs	8,200	200	12,400	300	8,200	200
Reusable plastic pallets	10,400	300	80,300	2,360	10,400	300
Reusable timber pallets	93,700	2,760	937,400	27,570	93,700	2,760
Dairy crates	1,100	1,000	10,500	10,040	1,100	1,000
RPCs	1,000	640	9,600	6,430	500	320
Reusable HDPE bags	6,000	419,790	300	24,220	6,000	419,790
Reusable LDPE bags	17,000	581,470	500	33,550	17,000	581,470
Reusable PP bags	5,900	63,380	1,800	126,750	5,900	63,380
Cups/mugs	400	2,640	1,000	11,250	400	2,640
Total	**159,500**	**1,073,130**	**1,108,100**	**245,350**	**159,000**	**1,072,810**

a) Estimated pool size at 30 June 2021.

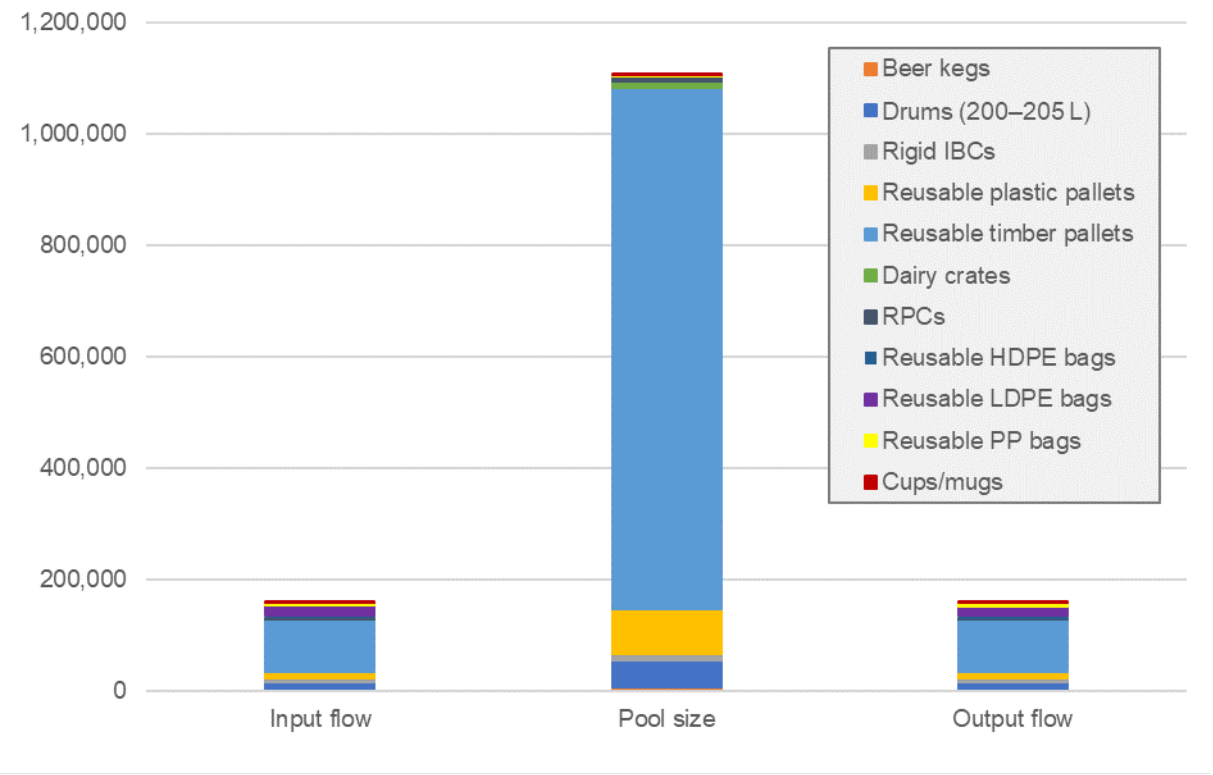

Figure 50 – Reusable packaging system flows in 2020–21 (tonnes).

Reusable packaging system inputs in 2020–21, by material group, are provided in **Table 62** and **Figure 51**. Wood was the most significant material input into the quantified systems, making up 91 kt or 57% of total inputs. Plastic made up 44 kt (27%) and metal contributed 24 kt (15%).

Table 62 – Reusable packaging input flows in 2020–21, by packaging system and material group.

Packaging system	Paper & paperboard	Glass	Plastic	Metal	Wood	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beer kegs	0	0	0	200	0	**200**
Drums (200–205 L)	0	0	2,200	13,400	0	**15,600**
Rigid IBCs	0	0	0	8,200	0	**8,200**
Reusable plastic pallets	0	0	10,400	0	0	**10,400**
Reusable timber pallets	0	0	0	2,300	91,400	**93,700**
Dairy crates	0	0	1,100	0	0	**1,100**
RPCs	0	0	1,000	0	0	**1,000**
Reusable HDPE bags	0	0	6,000	0	0	**6,000**
Reusable LDPE bags	0	0	17,000	0	0	**17,000**
Reusable PP bags	0	0	5,900	0	0	**5,900**
Cups/mugs	0	200	200	0	0	**400**
Total (tonnes)	**0**	**200**	**43,600**	**24,200**	**91,400**	**159,400**
Total (%)	**0.0%**	**0.1%**	**27.4%**	**15.2%**	**57.3%**	**100%**

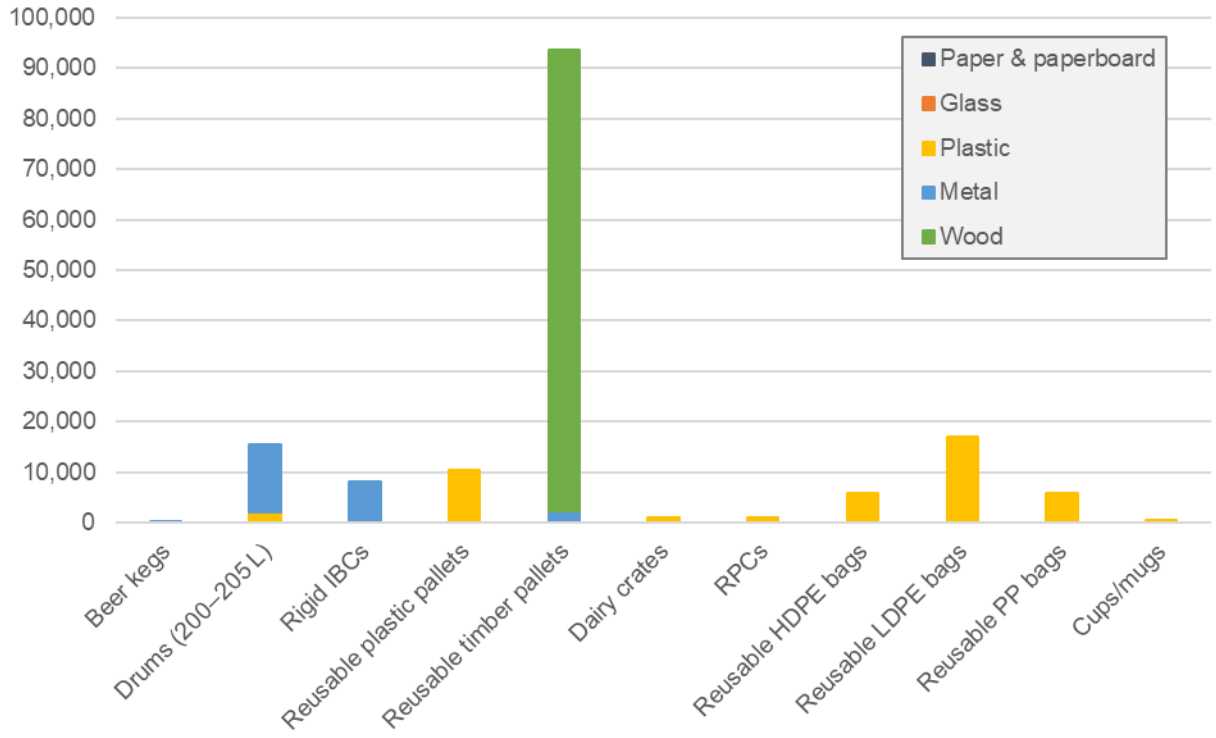

Figure 51 – Reusable packaging input flows in 2020–21, by packaging system and material group (tonnes).

Reusable packaging system outputs in 2020–21, by end-of-life destination, are provided in **Table 63** and **Figure 52**. The most significant destination was 70,000 tonnes of timber pallets to mulching or composting, which was 44% of total output flows. Overall diversion of outputs to recovery fates was 65%, reflecting the high rates of recovery that are achievable with (mostly) closed system reusable packaging flows.

Table 63 – Reusable packaging system end-of-life destinations in 2020–21.

Packaging system	Recycling	Composting	Landfill	System leakage	Other	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beer kegs	200	0	0	0	0	**250**
Drums (200–205 L)	11,700	0	0	780	3,100	**15,610**
Rigid IBCs	8,100	0	200	0	0	**8,240**
Reusable plastic pallets	9,800	0	0	260	300	**10,350**
Reusable timber pallets	0	70,310	18,700	2,340	2,300	**93,740**
Dairy crates	900	0	0	110	0	**1,050**
RPCs	500	0	0	20	0	**480**
Reusable HDPE bags	400	0	5,500	0	0	**5,960**
Reusable LDPE bags	1,200	0	15,800	0	0	**16,980**
Reusable PP bags	400	0	5,500	0	0	**5,930**
Cups/mugs	0	0	400	0	0	**380**
Total (tonnes)	**33,200**	**70,310**	**46,100**	**3,510**	**5,700**	**159,000**
Total (%)	**21%**	**44%**	**29%**	**2.2%**	**4%**	**100%**

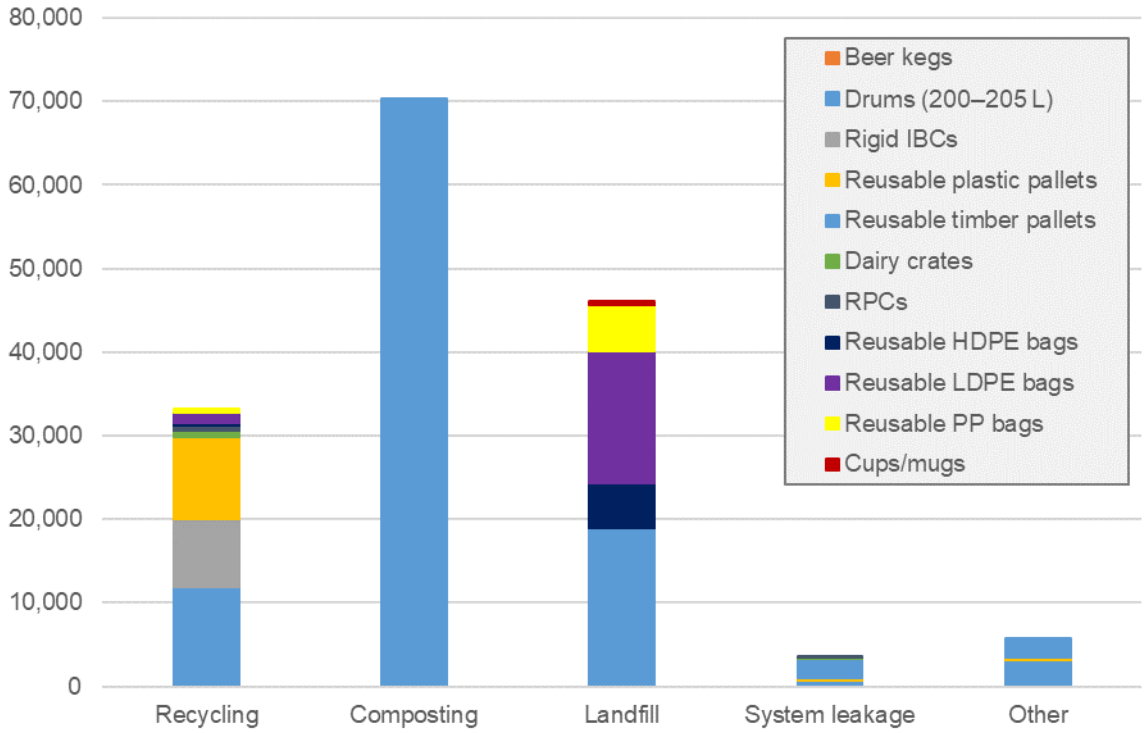

Figure 52 – Reusable packaging system end-of-life destinations in 2020–21 (tonnes).

6.3 Reusable packaging system use phase parameters

Provided in **Table 64** 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 64 – 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	12.705	25	100	4.0	50
Drums (200–205 L)	16.167	3	3	1.0	200
Rigid IBCs	41.000	2	3	2.0	1,000
Reusable plastic pallets	34.000	10	50	5.0	1,000
Reusable timber pallets	34.000	10	37	3.7	1,000
Dairy crates	1.050	10	120	12.0	18
RPCs	1.500	10	120	12.0	15
Reusable HDPE bags	0.014	0	3	52.0	14
Reusable LDPE bags	0.029	0	3	52.0	14
Reusable PP bags	0.094	2	104	52.0	17
Cups/mugs	0.191	4	1,000	250.0	0
Simple average (unweighted)	**12.951**	**7**	**140**	**40.5**	**303**

6.4 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 65** and **Figure 53** are estimates of the single-use packaging avoided by each reusable packaging rotation, by material group. IBCs avoided the most single-use packaging (the competing product was a single-use IBC), reflecting the importance of reusing IBCs wherever possible.

Table 65 – Single-use packaging avoided per reusable packaging rotation, by material group and packaging system.

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
Drums (200–205 L)	0.0	0.0	2.4	5.8	0.0	8.1
Rigid IBCs	0.0	0.0	0.0	41.0	0.0	41.0
Reusable plastic pallets	0.0	0.0	0.0	0.0	20.0	20.0
Reusable timber pallets	0.0	0.0	0.0	0.0	20.0	20.0
Dairy crates	0.5	0.0	0.0	0.0	0.0	0.5
RPCs	0.7	0.0	0.0	0.0	0.0	0.7
Reusable HDPE bags	0.000	0.000	0.007	0.000	0.000	0.007
Reusable LDPE bags	0.000	0.000	0.007	0.000	0.000	0.007
Reusable PP bags	0.000	0.000	0.009	0.000	0.000	0.009
Cups/mugs	0.010	0.000	0.003	0.000	0.000	0.013

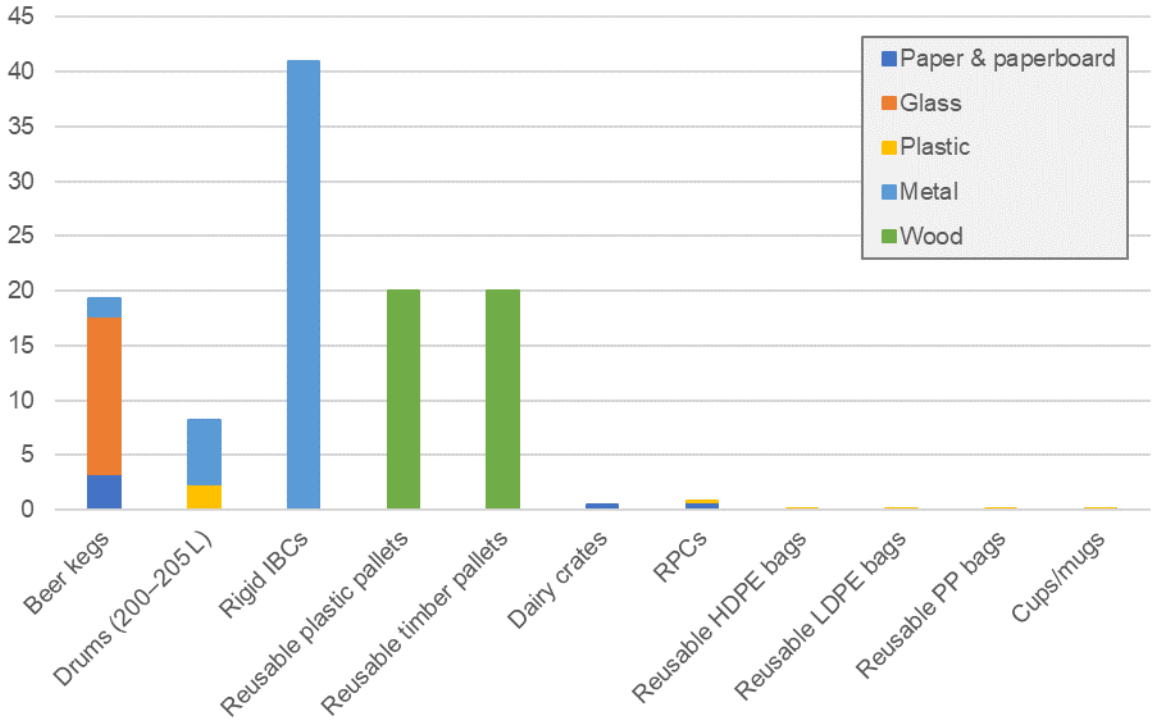

Figure 53 – Single-use packaging avoided per reusable packaging rotation, by material group and packaging system (kg).

Provided in **Table 66** and **Figure 54** are estimates of the total quantities of single-use packaging avoided in 2020–21, through the use of the eight quantified reusable packaging systems.

The quantified reusable packaging systems avoided the use of an estimated 2.6 million tonnes of single-use packaging. Approximately 92% of the avoided single-use packaging consumption benefit is provided by reusable pallets and plastic crates. The net theoretical reduction in packaging use was 2.4 million tonnes, as there were 0.2 million tonnes of reusable packaging inputs in 2020–21 (**Table 61**).

Table 66 – Total single-use packaging avoided in 2020–21 through use of the quantified reusable packaging systems.

Packaging system	Paper & paperboard	Glass	Plastic	Metal	Wood	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beer kegs	7,300	32,300	0	3,700	0	43,300
Drums (200–205 L)	0	0	5,500	13,400	0	18,900
Rigid IBCs	0	0	0	24,700	0	24,700
Reusable plastic pallets	0	0	0	0	236,300	236,300
Reusable timber pallets	0	0	0	0	2,012,700	2,012,700
Dairy crates	60,200	0	0	0	0	60,200
RPCs	50,300	0	1,000	0	0	51,300
Reusable HDPE bags	0	0	9,200	0	0	9,200
Reusable LDPE bags	0	0	12,700	0	0	12,700
Reusable PP bags	0	0	58,300	0	0	58,300
Cups/mugs	27,400	0	8,200	0	0	35,600
Total (tonnes)	**145,200.0**	**32,300.0**	**94,800.0**	**41,800.0**	**2,249,000.0**	**2,563,100.0**
Total (%)	**5.7%**	**1.3%**	**3.7%**	**1.6%**	**87.7%**	**100.0%**

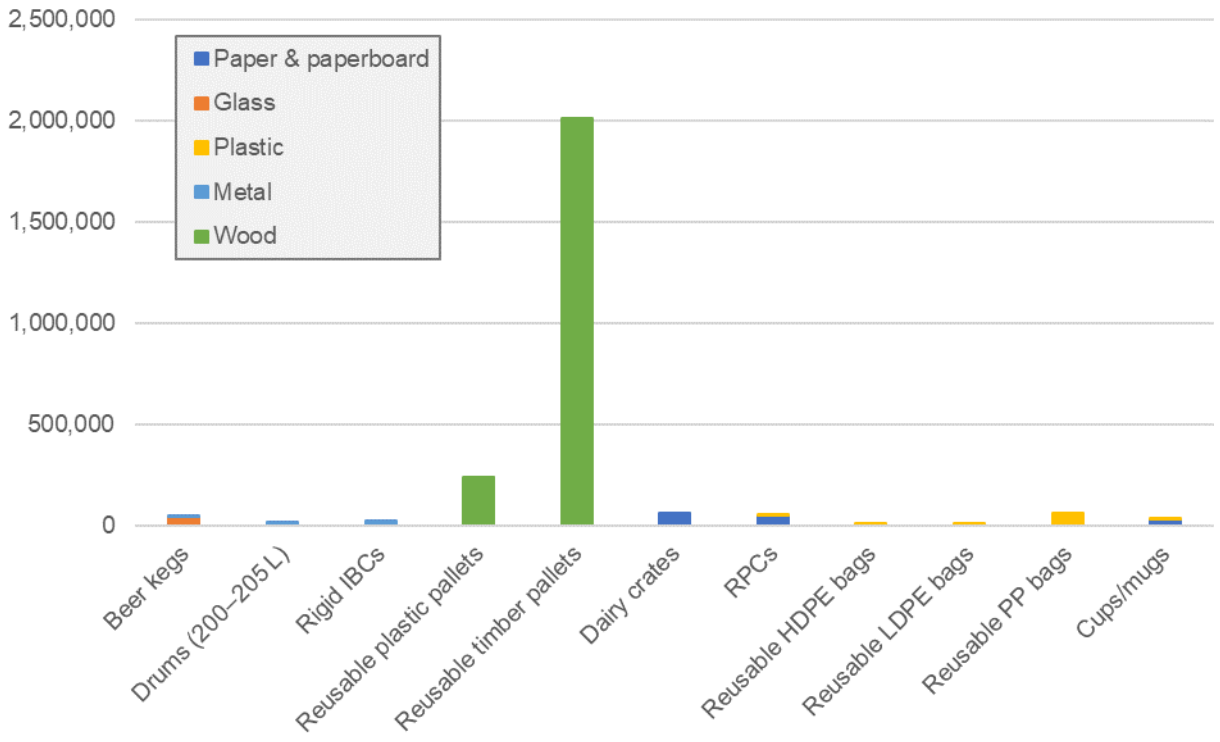

Figure 54 – Total single-use packaging avoided in 2020–21 through use of the quantified reusable packaging systems (tonnes).

In 2020–21 packaging POM was 6.7 million tonnes (**Table 5**), so reusable packaging POM of 160,000 tonnes (inflows into reusable packaging systems –**Table 62**) made up around 2% of total packaging POM. However, it avoided the theoretical use of 2.6 million tonnes of single-use packaging, or the equivalent of 39% of total packaging POM in 2020–21.

Table 67 provides estimates of the material inputs reduction ratios in 2020–21 through the use of the quantified reusable packaging systems. For example, beer kegs have a very high reduction ratio of 213. That is, every kilogram of beer keg avoids the use of 213 kg of single-use packaging over the lifespan of the beer keg. Note that this ratio is lower than that calculated in the 2019–20 report, due to the dramatic impact of COVID-19 on average beer keg rotations in 2020–21, which is the baseline calculation year adopted here.

On average, every kilogram of the quantified reusable packaging systems avoided the use of 16 kg of single-use packaging.

Table 67 – Material inputs reduction ratio in 2020–21 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[a]	RNC[a]	N/A	18.0	N/A	212.6
Drums (200–205 L)	N/A	N/A	2.5	1.0	N/A	1.2
Rigid IBCs	N/A	N/A	N/A	3.0	N/A	3.0
Reusable plastic pallets	N/A	N/A	RNC[a]	N/A	RNC[a]	22.8
Reusable timber pallets	N/A	N/A	N/A	RNC[a]	22.0	21.5
Dairy crates	RNC[a]	N/A	RNC[a]	N/A	N/A	57.1
RPCs	RNC[a]	N/A	1.0	N/A	N/A	53.2
Reusable HDPE bags	N/A	N/A	1.5	N/A	N/A	1.5
Reusable LDPE bags	N/A	N/A	0.7	N/A	N/A	0.7
Reusable PP bags	N/A	N/A	9.8	N/A	N/A	9.8
Cups/mugs	RNC[a]	RNC[a]	42.0	RNC[a]	N/A	93.5
Overall	**RNC[a]**	**209.0**	**2.2**	**1.7**	**24.6**	**16**

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

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APPENDIX A – GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Definition
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'. B2C packaging can be split into two categories related to the location of used packaging generation, which are 'At home' and 'Away-from-home (AfH)'. At home packaging includes any packaging that is likely or known to be generated as used packaging at homes, and so will enter residential waste management systems. AfH packaging includes any packaging that is likely or known to be generated as used packaging in non-residential settings, and so will enter commercial waste management systems.
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'.

Term	Definition
Collection	Packaging materials collected for recycling.
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.
Compound annual growth rate (CAGR)	The CAGR is a term for the ratio that provides a constant rate of growth, each year, over a defined time period of two or more years. CAGR is equivalent to the more generic exponential growth rate when the exponential growth interval is one year. The CAGR is useful as it provides a smoothed rate of growth over a number of years, reducing the impact of year-on-year growth data volatility.
Construction and demolition (C&D) waste	Solid inert waste generated from residential and commercial construction and demolition activities e.g., bricks and concrete.

Term	Definition
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. • 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'.

Term	Definition
Domestic	Material from domestic (household) sources.
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 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).
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

Term	Definition
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 density, size, magnetism and optical characteristics, 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’.
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.

Term	Definition
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 assembly	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 assembly consisting of; a glass bottle, a metal or plastic closure and a paper or plastic label. Also see 'Packaging component'.
Packaging component	A part of a packaging assembly that can be separated by hand or by using simple physical means. Also see 'Packaging assembly'.
Packaging constituent	A part from which a packaging assembly or its components are made and which cannot be separated by hand or by using simple physical means.
Packaging level	Identifies the hierarchical level of the packaging assembly, 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.
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.

Term	Definition
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 is not 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.
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.

Term	Definition
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.
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.

Term	Definition
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). 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.

Term	Definition
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.
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.

Term	Definition
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 offshore 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 table (**Table B-1**).

Two separate lists are provided for the consumption and recovery/disposal lifecycle 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 material type and group 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
Polymer coated paper	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

Material types – Consumption related	Material type list – Collection or sorting output related	Material group
N/A	Plastic – Mixed (3–7)	Plastic
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 this 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

Component	Component group	In scope?	Comments
			faces, and joined at three edges to form an enclosure. The non-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.
Pail	Barrel or drum	Yes	Plastic or tin-plate steel containers of ≤20 L. Cylindrical packaging whose bottom end is permanently fixed to the body and top end (lid), if present, is removable.
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-

Component	Component group	In scope?	Comments
			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 basket	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 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 shopping 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.

Component	Component group	In scope?	Comments
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 thermoplastic can be thermoformed into a blister. Where a blister pack 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 an 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'.
Fodder film or net wrap	Wrap	Yes	A plastic film or netting around a round or rectangular bale of agricultural fodder (e.g. hay) to protect the fodder from weather, maintain the bale integrity, and/or generally protect the fodder. Often referred to as silage wrap.
Pallet wrap	Wrap	Yes	A high-tensile plastic film, stretched and wrapped repeatedly around a pallet item or group of items to secure and maintain unit integrity. The use of stretch film to tightly wrap the pallet load is to bind, protect and immobilise it for further handling or shipping. This is specifically B2B use.

Component	Component group	In scope?	Comments
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. Includes packaging tape. Includes baling twine, and other forms of packaging twines.
Stretch wrap	Wrap	Yes	A high-tensile plastic film, stretched and wrapped 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 storage, handling or shipping. This mainly includes 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 component group	Yes	Pouches, sachets or similar filled with an absorbent material or 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 component group	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 component group	No	A semi rigid container usually open at the top traditionally used for gathering, shipping and marketing agricultural products.
Coat hanger	Other component group	Yes	Coat hangers for clothes.
Dunnage	Other component group	No	Loose wood, matting, or similar material used to keep a cargo in position during sea, road or air transport.
Rack	Other component group	No	A nonspecific 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 component group	Yes	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 component group	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 component group	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 component	Other component group	Yes	Packaging components not currently specified on the list.

Table B-4 – Reusable packaging systems.

Reusable packaging system	Packaging level	Sector of use	Profiled in 2020–21 (Section 6)	Comments
Kegs – Beer & cider	Primary	B2B	Yes	-
Plastic crates – Collapsible – RPCs	Secondary	B2B	Yes	-

Reusable packaging system	Packaging level	Sector of use	Profiled in 2020–21 (Section 6)	Comments
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	Yes	Excludes beer kegs (and kegs for other beverages) and IBCs.
Beverage bottles	Primary	B2C	No	-
Coat hangers	Primary	B2C	No	-
Cups/mugs	Primary	B2C	Yes	-
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	Yes	-
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

This section provides consumption (POM) and recovery data for Australia (Table C-1) and for each of the states and territories (**Tables C-2 to C-9**).

The state/territory level data reported here was primarily captured through the two main surveys, on packaging manufacturers (POM data), and packaging reprocessing facility operators (recovery data). As part of both surveys, respondents were surveyed on the destination (for POM) and source (for recovery), by jurisdiction. Refer to Section 1.2 (**Table 1** and **Table 2**) for more detail on the surveys and the survey coverage respectively.

Many of the packaging manufacturers, particularly the larger manufacturers, could not provide accurate data on the destination jurisdictions for their packaging. For these respondents, packaging POM was allocated to states/territories on a per capita basis.

Imports of packaging POM (both empty and filled) were allocated to states/territories on a per capita basis.

Australian Customs data on scrap packaging exports was also obtained and analysed at the state/territory source level to provide information on the source jurisdiction for exported scrap packaging.

Table C-1 – Australian packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	3,387,000	2,370,000	70%
Glass	1,283,000	805,000	63%
Plastic	1,179,000	207,000	18%
Metal	254,000	147,000	58%
Wood	638,000	260,000	41%
Total	**6,740,000**	**3,788,000**	**56%**

Table C-2 – ACT packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	65,000	51,000	78%
Glass	23,000	12,000	54%
Plastic	20,000	5,000	27%
Metal	4,000	3,000	62%
Wood	11,000	2,000	14%
Paper & paperboard	**123,000**	**73,000**	**59%**

Table C-3 – NSW packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	1,145,000	878,000	77%
Glass	404,000	254,000	63%
Plastic	366,000	63,000	17%
Metal	77,000	44,000	57%
Wood	201,000	91,000	45%
Total	**2,194,000**	**1,330,000**	**61%**

Table C-4 – NT packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	33,000	5,000	14%
Glass	12,000	5,000	39%
Plastic	11,000	1,000	6%
Metal	2,000	1,000	62%
Wood	6,000	0	0%
Total	**65,000**	**12,000**	**18%**

Table C-5 – QLD packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	682,000	403,000	59%
Glass	261,000	159,000	61%
Plastic	232,000	17,000	7%
Metal	50,000	33,000	66%
Wood	130,000	58,000	45%
Total	**1,354,000**	**669,000**	**49%**

Table C-6 – SA packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	226,000	147,000	65%
Glass	90,000	65,000	73%
Plastic	83,000	27,000	33%
Metal	19,000	12,000	62%
Wood	45,000	55,000	124%
Total	**462,000**	**306,000**	**66%**

Table C-7 – TAS packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	70,000	37,000	53%
Glass	28,000	6,000	23%
Plastic	26,000	2,000	9%
Metal	5,000	3,000	60%
Wood	14,000	3,000	18%
Total	**144,000**	**52,000**	**36%**

Table C-8 – VIC packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	822,000	717,000	87%
Glass	327,000	231,000	71%
Plastic	319,000	77,000	24%
Metal	70,000	35,000	49%
Wood	163,000	44,000	27%
Total	**1,701,000**	**1,104,000**	**65%**

Table C-9 – WA packaging consumption and recovery data in 2020–21, by material group.

Material group	POM	Recovery	Recovery rate
	(tonnes)	(tonnes)	(%)
Paper & paperboard	344,000	133,000	39%
Glass	137,000	72,000	52%
Plastic	124,000	14,000	11%
Metal	26,000	17,000	65%
Wood	68,000	8,000	11%
Total	**699,000**	**242,000**	**35%**

APPENDIX D – EMPLOYMENT AND FACILITY CAPACITY DATA

This year the project included an expanded scope to quantify 2020–21 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 2020–21 packaging related employment in terms of equivalent full-time employees (EFTE) are provided in **Table D-1** and **Table 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	3,200	16.0
Manufacturer – glass	1,800	20.0
Manufacturer – metals	500	24.4
Manufacturer – plastics	6,800	93.6
Manufacturer – wood	400	10.0
Total	**12,700**	**30.2**

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

Organisation type	Employment	Normalised employment
	(EFTE)	(EFTE/10 kt)
Reprocessor – fibre	1,200	9.4
Reprocessor – glass	800	9.4
Reprocessor – metals	30	14.6
Reprocessor – plastics	400	50.5
Reprocessor – wood	200	0.0
Total	**2,640**	**11.0**

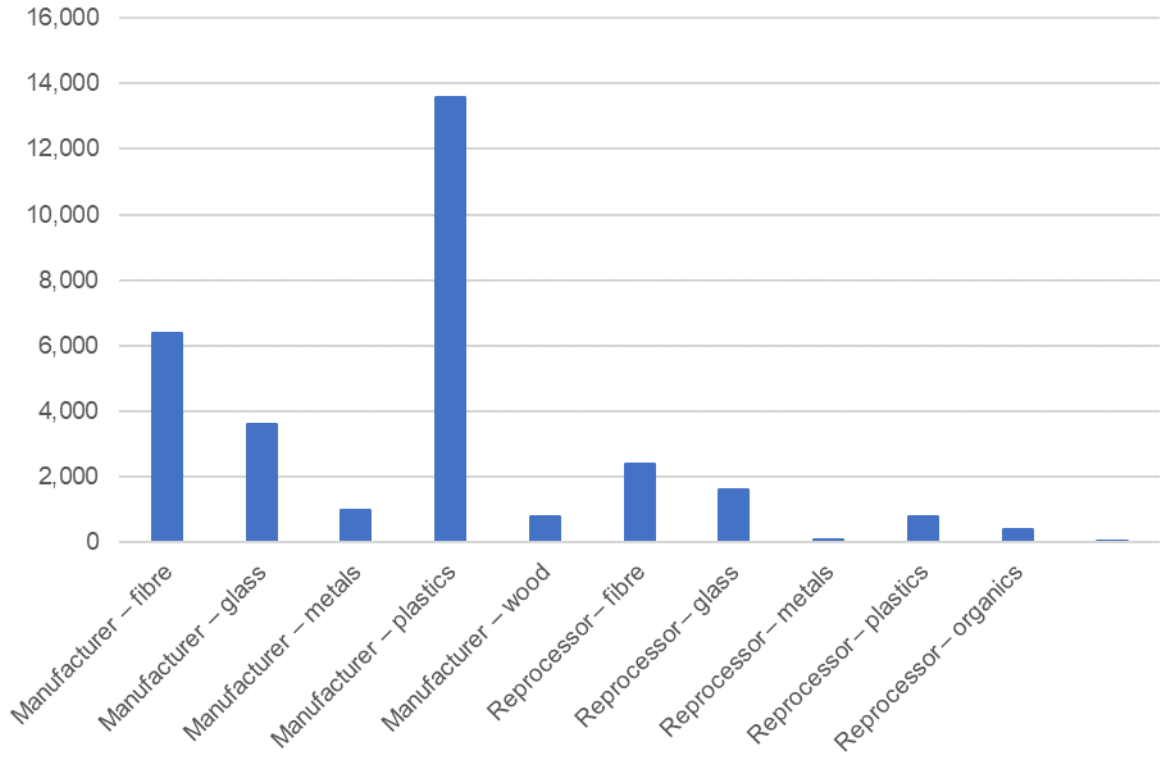

Figure D-1 – Number of employees involved in packaging related activities (EFTE).

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**.

There are two major shifts between the 2019–20 and 2020–21 surveys:

- Glass packaging – In the 2020–21 survey glass packaging manufacturers reported plans to increase PCR content by 236,000 tonnes over the next few years, compared to the equivalent reporting of 170,000 tonnes in 2019–20.
- Plastic packaging – In the 2020-21 survey plastic packaging manufacturers reported plans to increase PCR content by 56,000 tonnes over the next few years, compared to the equivalent reporting of 14,000 tonnes in 2019–20.

Table D-3 – Number of manufacturing facilities with funded and approved plans to increase use of PCR 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	36	**40**
Glass	5	0	0	1	**6**
Plastic	17	25	5	25	**72**
Metal	1	4	1	10	**16**
Wood	0	0	0	2	**2**
Total	**23**	**33**	**6**	**74**	**136**

Table D-4 – Total tonnes of PCR content expected based on manufacturing facilities with funded and approved plans to increase use of PCR 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	236,000	N/A	0	N/A	**236,000**
Plastic	56,000	N/A	0	N/A	**56,000**
Metal	0	N/A	0	N/A	**0**
Wood	0	N/A	0	N/A	**0**
Total	**292,000**	**N/A**	**0**	**N/A**	**293,000**

D.2.2 Packaging reprocessors – Existing capacity

Packaging reprocessors were surveyed to collect data on their average reprocessing capacity utilisation in 2020–21, 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 estimated 'spare' capacities in **Table D-5** and **Figure D-5**.

Table D-5 – Average reprocessing capacity utilisation in 2020–21, by material group and capacity utilisation category.

Material group	At <25% capacity	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)	(tonnes)
Paper & paperboard	0	0	0	0	468,000	1,070,300	700	830,500	**2,369,500**
Glass	0	0	163,500	64,000	37,500	5,000	534,300	300	**804,500**
Plastic	4,400	16,100	4,400	24,600	13,500	16,800	22,800	104,200	**206,700**
Metal	100	200	0	0	0	0	20,900	125,800	**146,900**
Wood	0	0	0	0	0	0	0	260,100	**260,100**
Total	**4,500**	**16,300**	**167,900**	**88,600**	**519,000**	**1,092,100**	**578,600**	**1,320,800**	**3,787,700**

a) The 'Not applicable' quantity is mostly exported material. For wood packaging it refers to mulching and composting facilities.

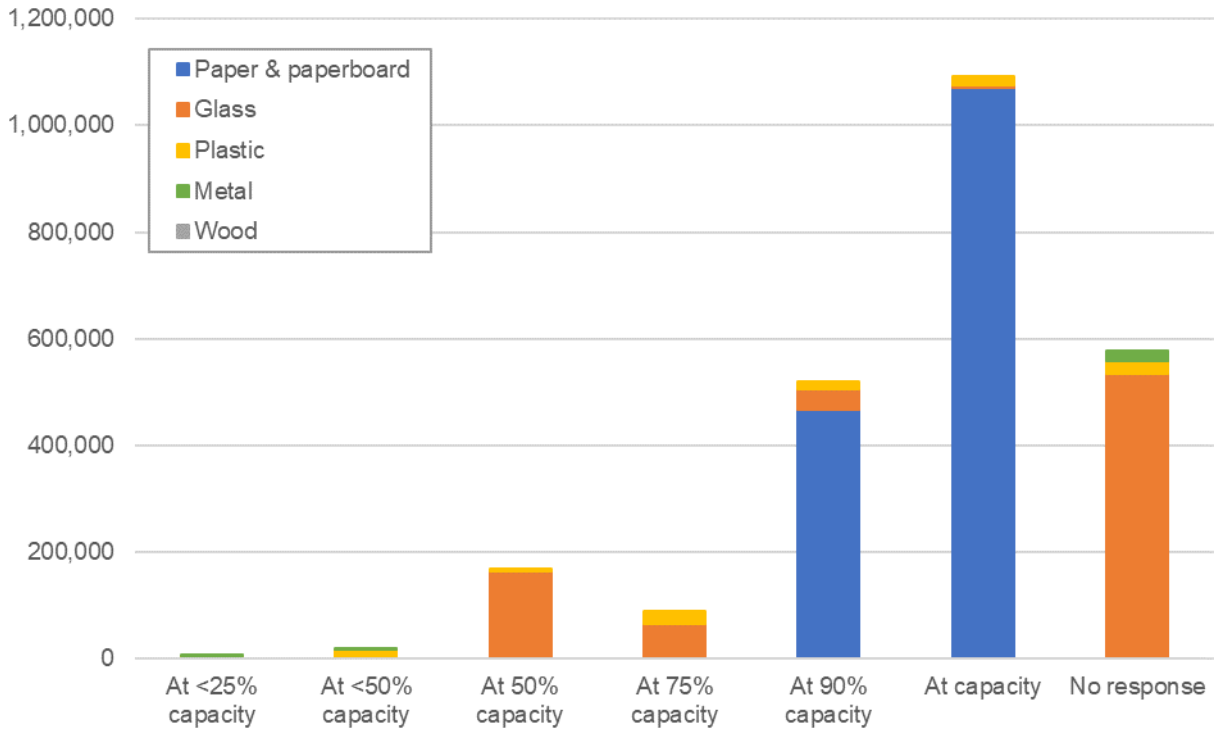

Figure D-2 – Average reprocessing capacity utilisation in 2020–21, by material group and capacity utilisation category (tonnes).

Table D-6 and **Figure D-3** present the estimated quantities of spare reprocessing capacity nationally in 2020–21. Total reported spare capacity was 335 kt, which is around 9% of local 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 local reprocessing.

Table D-6 – Spare reprocessing capacity utilisation in 2020–21, by material group and capacity utilisation category.

Material group	At <25% capacity[a]	At <50% capacity[a]	At 50% capacity	At 75% capacity	At 90% capacity	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Paper & paperboard	0	0	0	0	52,000	**52,000**
Glass	0	0	163,500	21,300	4,200	**189,000**
Plastic	30,700	48,200	4,400	8,200	1,500	**93,000**
Metal	500	700	0	0	0	**1,200**
Wood	0	0	0	0	0	**0**
Total	**31,200**	**48,900**	**167,900**	**29,500**	**57,700**	**335,200**

a) Reprocessors that reported being at less than 25% capacity were assumed to be at 12.5% capacity utilisation, and at less than 50% capacity were assumed to be at 25% capacity utilisation, in calculating spare capacity.

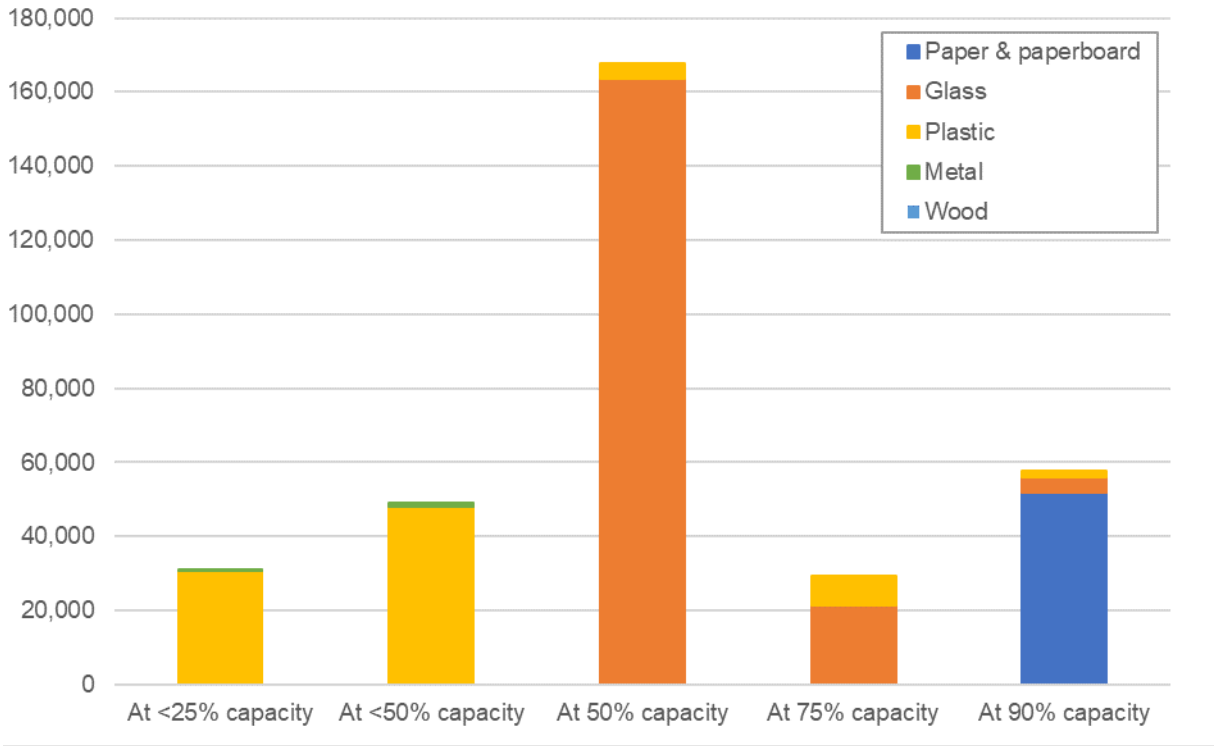

Figure D-3 – Spare reprocessing capacity utilisation in 2020–21, by material group and capacity utilisation category (tonnes).

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 few years, by material type. The summary results by material group are provided in **Table D-7** and **Figure D-4**.

There was 1,042 kt of new reprocessing capacity reported to be in the pipeline, 48% of which was related to glass packaging and 28% to plastic packaging reprocessing. This is a 292% increase on the planned new capacity (266 kt) reported for the 2019–20 packaging quantification study.

The expected increase in reprocessing capacity for plastics (+293,000 tonnes) is around double the projected increase in the 2019–20 survey.

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

Material group	Quantity (tonnes)
Paper & paperboard	254,000
Glass	496,000
Plastic	293,000
Metal	0
Wood	0
Total	**1,042,000**

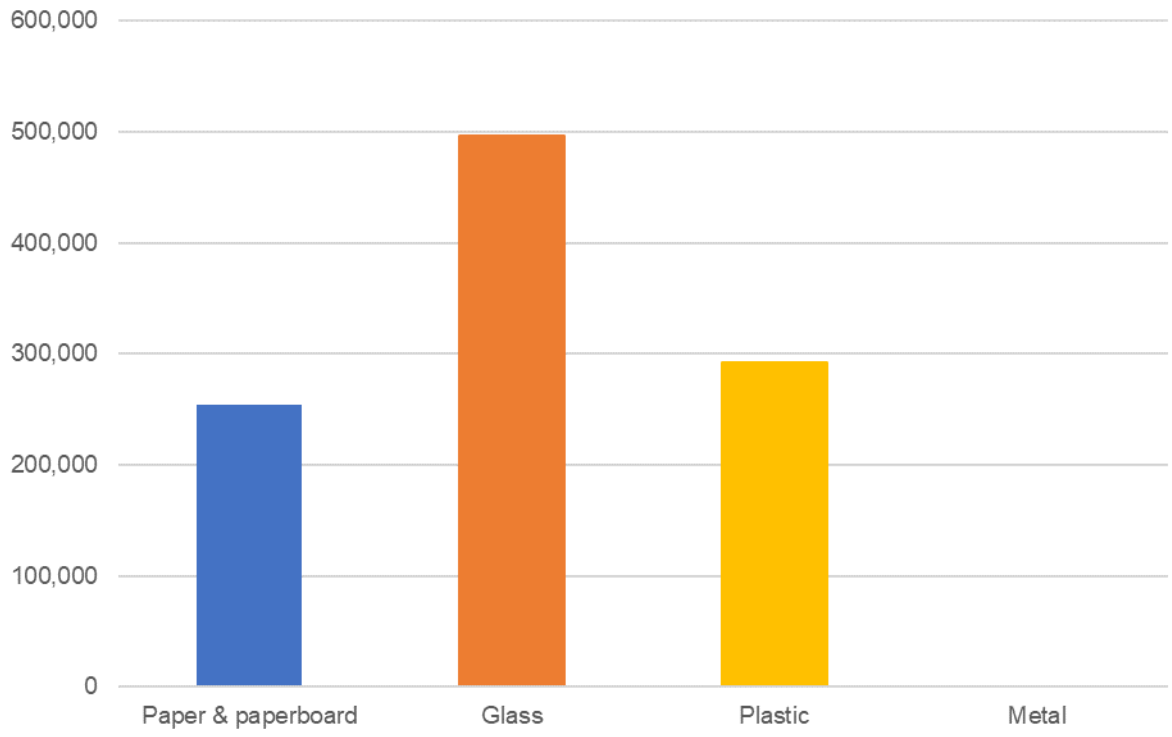

Figure D-4 – Expected increase in reprocessing capacity over the next few years, by material group (tonnes).

APPENDIX E – CONTAINER DEPOSIT ELIGIBLE PACKAGING DATA

This year the project has included the quantification of 2020–21 flows of container deposit (CD) eligible packaging, both POM and recovered by collection pathway.

The CD scheme operational dates covered by the data in this appendix are:

- ACT is full year 2020–21 (launched 30 June 2018).
- NSW is full year 2020–21 (launched 1 December 2017).
- NT is full year 2020–21 (launched 3 January 2012).
- QLD is full year 2020–21 (launched 1 November 2018).
- SA is full year 2020–21 (launched in 1977).
- TAS scheme to commence in 2022 (no data in this appendix).
- VIC scheme to commence in 2023 (no data in this appendix).
- WA scheme commenced 1 October 2020 (no data in this appendix, as data not provided at time of reporting).

The data provided in this section includes (in terms of both tonnes and package counts):

- CD eligible packaging POM by jurisdiction (Section E.1).
- CD eligible packaging redeemed via depots and reverse vending machines (Section E.2.1).
- CD eligible packaging redeemed via MRFs (Section E.2.2).
- CD eligible packaging unredeemed packaging recovered via MRFs and other pathways (Section E.2.3).
- Total recovery of CD eligible packaging via all collection routes (Section E.2.4).
- Reprocessing destinations for CD eligible packaging (Section E.2.5).
- CD eligible packaging to landfill (Section E.3).

E.1 CD eligible packaging POM

Table E-1 – CD eligible packaging POM in 2020–21 by jurisdiction (tonnes).

Material type	ACT	NSW	NT	QLD	SA	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	800	18,870	920	26,790	5,300	52,680
Tin-plate steel	10	200	10	80	0	290
Amber glass	2,930	66,970	1,380	68,330	14,230	153,830
Flint glass	3,300	75,370	3,650	76,890	15,640	174,840
Green glass	2,120	48,460	960	49,450	10,230	111,220
PET (1)	950	23,220	820	26,030	5,220	56,230
HDPE (2)	170	1,940	110	3,120	460	5,800
Other plastic (7)	0	10	0	0	0	10
PCPB – Aseptic	90	1,710	10	1,780	820	4,410
PCPB – Gable top	50	1,010	90	1,050	240	2,440
Other material	10	50	0	0	0	60
Total	**10,420**	**237,790**	**7,940**	**253,530**	**52,140**	**561,820**

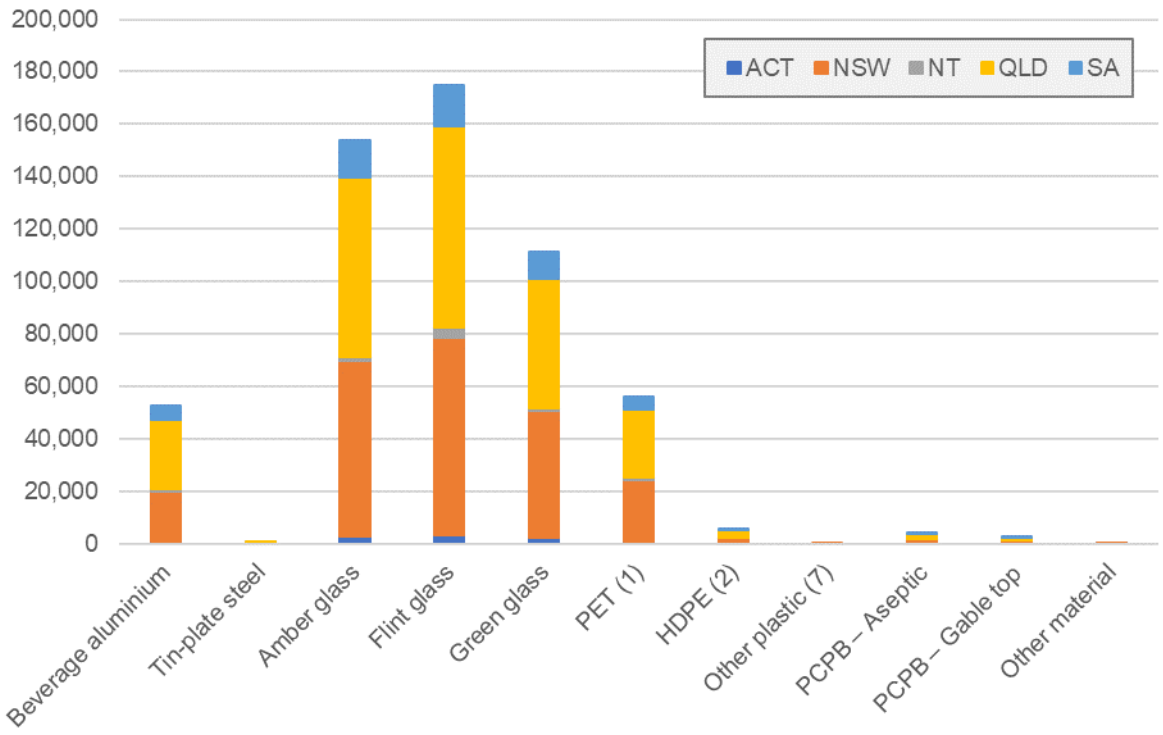

Figure E-1 – CD eligible packaging POM in 2020–21 by jurisdiction (tonnes).

Table E-2 – CD eligible packaging POM in 2020–21 by jurisdiction (million packs).

Material type	ACT	NSW	NT	QLD	SA	Total
	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)
Beverage aluminium	58.909	1,387.325	67.345	1,300.698	390.399	3,204.676
Tin-plate steel	0.186	4.420	0.093	1.900	0.000	6.599
Amber glass	14.207	324.941	6.928	239.246	69.710	655.031
Flint glass	15.988	365.674	18.374	269.237	78.455	747.728
Green glass	10.281	235.142	4.819	173.130	50.541	473.914
PET (1)	42.337	1,036.431	33.123	748.130	208.627	2,068.647
HDPE (2)	5.900	68.239	3.467	88.451	23.152	189.210
Other plastic (7)	0.034	0.563	0.000	0.000	0.000	0.598
PCPB – Aseptic	5.915	117.249	0.479	85.251	34.338	243.232
PCPB – Gable top	3.474	68.861	5.513	50.068	20.167	148.082
Other material	0.395	1.751	0.000	0.000	0.000	2.146
Total	**157.625**	**3,610.596**	**140.141**	**2,956.111**	**875.388**	**7,739.861**

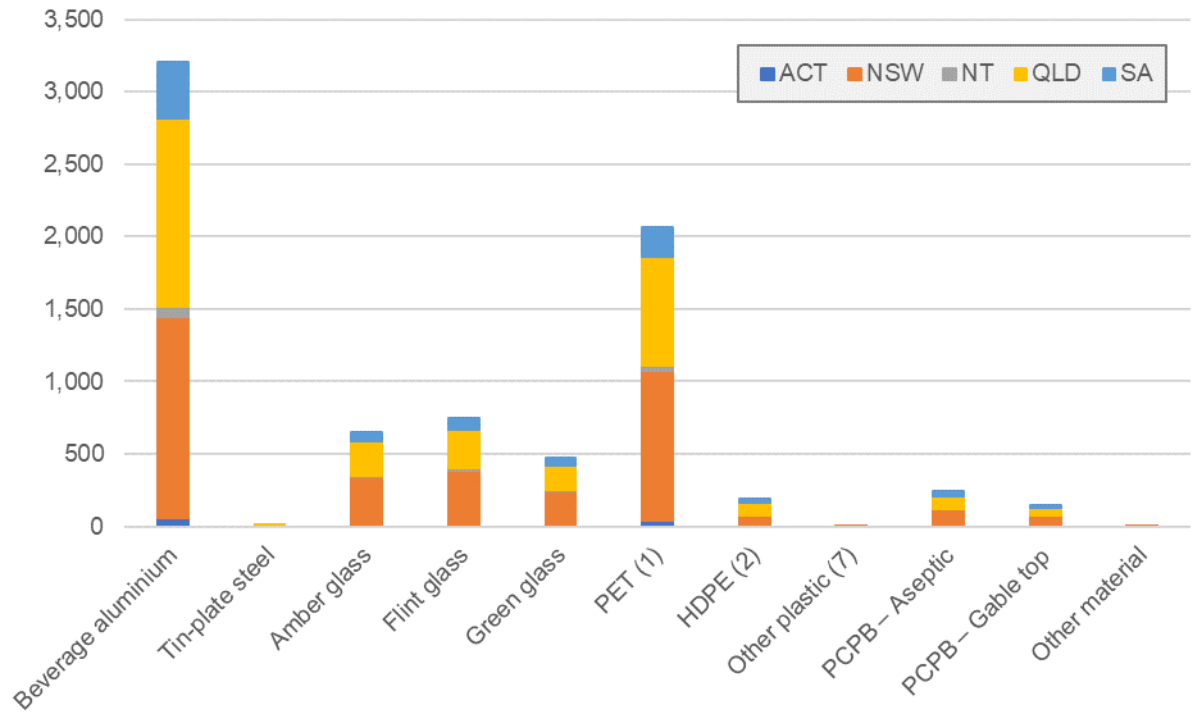

Figure E-2 – CD eligible packaging POM in 2020–21 by jurisdiction (million packs).

E.2 CD eligible packaging recovery

E.2.1 Redeemed recovery via depots and reverse vending machines

Table E-3 – CD eligible packaging recovery in 2020–21 by jurisdiction – Redeemed recovery via depots and reverse vending machines (tonnes).

Material type	ACT	NSW	NT	QLD	SA	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	370	11,510	700	15,330	4,190	32,090
Tin-plate steel	0	70	10	20	0	100
Amber glass	1,050	39,510	1,170	37,310	11,510	90,550
Flint glass	920	44,470	3,100	41,980	12,650	103,120
Green glass	300	28,590	810	27,000	8,280	64,980
PET (1)	140	11,610	520	11,690	3,220	27,180
HDPE (2)	10	620	30	970	290	1,920
Other plastic (7)	0	0	0	0	0	0
PCPB – Aseptic	10	330	0	430	430	1,210
PCPB – Gable top	10	190	40	250	130	620
Other material	0	10	0	0	0	10
Total	**2,810**	**136,900**	**6,390**	**134,990**	**40,700**	**321,790**
Recovery (%) relative to POM	**27.0%**	**57.6%**	**80.4%**	**53.2%**	**78.0%**	**57.3%**

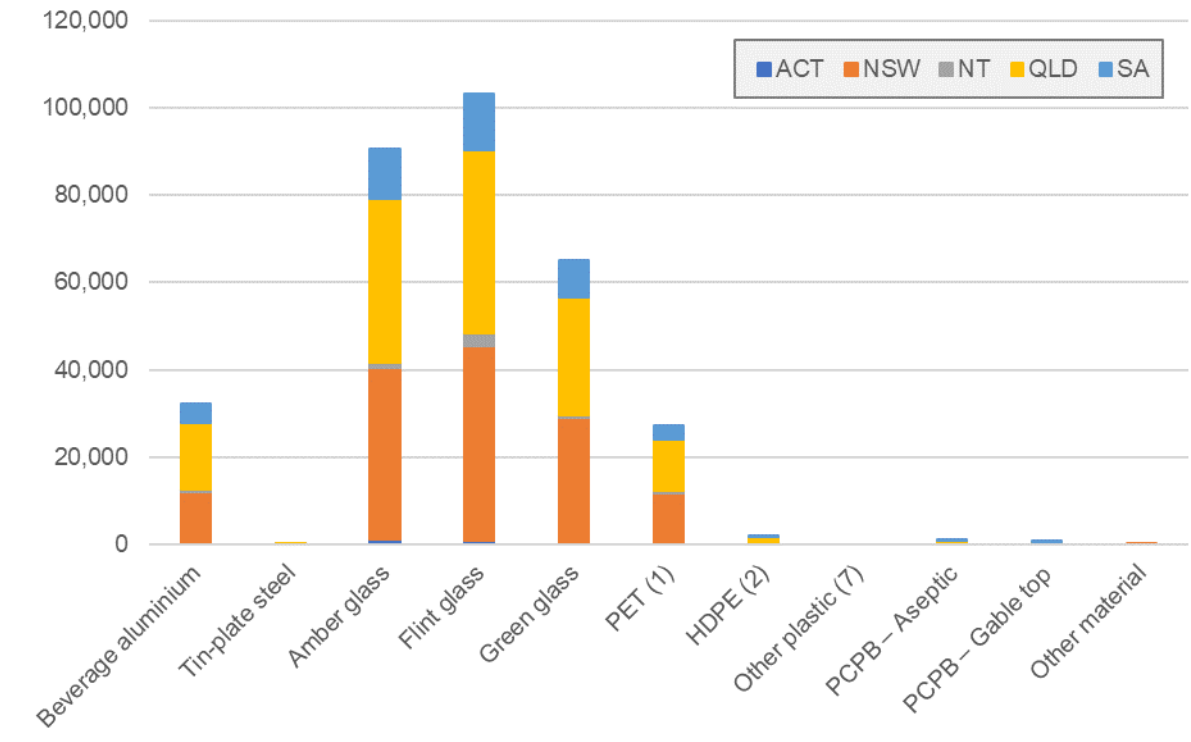

Figure E-3 – CD eligible packaging recovery in 2020–21 by jurisdiction – Redeemed recovery via depots and reverse vending machines (tonnes).

Table E-4 – CD eligible packaging POM in 2020–21 by jurisdiction – Redeemed recovery via depots and reverse vending machines (million packs).

Material type	ACT	NSW	NT	QLD	SA	Total
	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)
Beverage aluminium	27.098	846.268	51.260	743.999	308.456	1,977.082
Tin-plate steel	0.007	1.547	0.093	0.450	0.000	2.098
Amber glass	5.114	191.715	5.886	130.628	56.395	389.739
Flint glass	4.477	215.748	15.610	147.003	63.470	446.308
Green glass	1.439	138.734	4.095	94.529	40.888	279.685
PET (1)	6.350	518.215	21.136	335.910	128.759	1,010.371
HDPE (2)	0.236	21.836	0.857	27.597	14.614	65.141
Other plastic (7)	0.000	0.034	0.000	0.000	0.000	0.034
PCPB – Aseptic	0.887	22.277	0.210	20.716	18.016	62.106
PCPB – Gable top	0.521	13.084	2.412	12.167	10.581	38.764
Other material	0.000	0.280	0.000	0.000	0.000	0.280
Total	**46.131**	**1,969.739**	**101.560**	**1,513.000**	**641.179**	**4,271.608**
Recovery (%) relative to POM	**29.3%**	**54.6%**	**72.5%**	**51.2%**	**73.2%**	**55.2%**

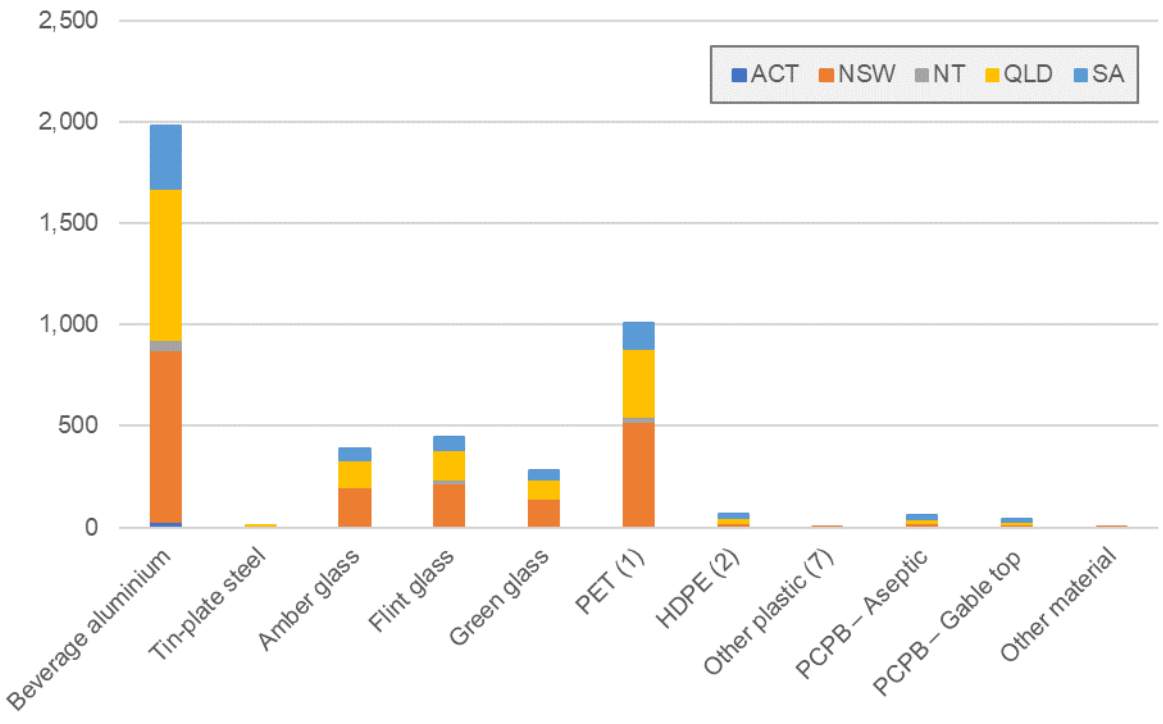

Figure E-4 – CD eligible packaging POM in 2020–21 by jurisdiction – Redeemed recovery via depots and reverse vending machines (million packs).

E.2.2 Redeemed recovery via MRFs

Table E-5 – CD eligible packaging recovery in 2020–21 by jurisdiction – Redeemed recovery via MRFs (tonnes).

Material type	ACT	NSW	NT	QLD	SA	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	250	1,890	0	1,740	130	4,000
Tin-plate steel	0	0	0	0	0	0
Amber glass	910	12,050	0	14,620	70	27,660
Flint glass	1,520	13,570	0	16,460	80	31,620
Green glass	530	8,720	0	10,580	50	19,890
PET (1)	0	3,250	0	2,600	200	6,060
HDPE (2)	0	250	0	30	0	280
Other plastic (7)	0	0	0	0	0	0
PCPB – Aseptic	0	0	0	0	0	0
PCPB – Gable top	0	0	0	0	0	0
Other material	0	0	0	0	0	0
Total	**3,200**	**39,730**	**0**	**46,030**	**530**	**89,500**
Recovery (%) relative to POM	**30.7%**	**16.7%**	**0.0%**	**18.2%**	**1.0%**	**15.9%**

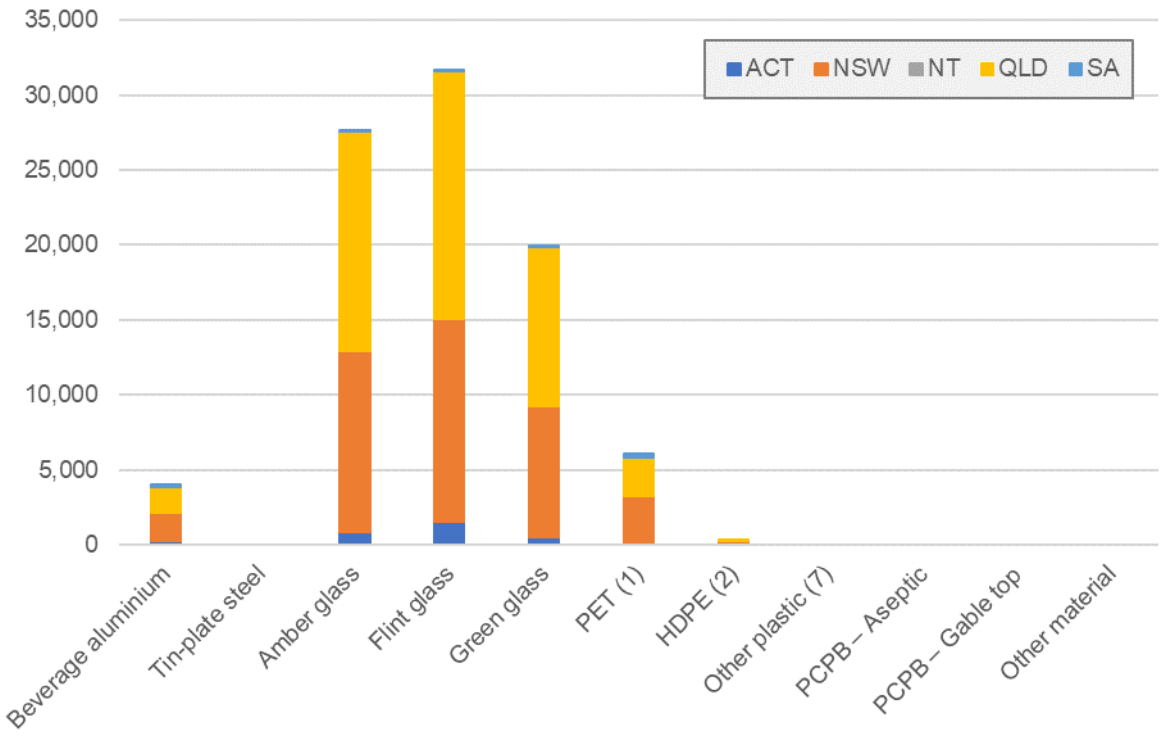

Figure E-5 – CD eligible packaging recovery in 2020–21 by jurisdiction – Redeemed recovery via MRFs (tonnes).

Table E-6 – CD eligible packaging POM in 2020–21 by jurisdiction – Redeemed recovery via MRFs (million packs).

Material type	ACT	NSW	NT	QLD	SA	Total
	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)
Beverage aluminium	18.262	138.733	0.000	84.545	9.446	250.986
Tin-plate steel	0.000	0.000	0.000	0.000	0.000	0.000
Amber glass	4.404	58.489	0.000	51.199	0.349	114.441
Flint glass	7.354	65.821	0.000	57.617	0.392	131.185
Green glass	2.570	42.326	0.000	37.050	0.253	82.198
PET (1)	0.000	145.100	0.000	74.813	8.063	227.976
HDPE (2)	0.000	8.871	0.000	0.796	0.000	9.667
Other plastic (7)	0.000	0.000	0.000	0.000	0.000	0.000
PCPB – Aseptic	0.000	0.000	0.000	0.000	0.000	0.000
PCPB – Gable top	0.000	0.000	0.000	0.000	0.000	0.000
Other material	0.000	0.000	0.000	0.000	0.000	0.000
Total	**32.591**	**459.340**	**0.000**	**306.020**	**18.502**	**816.452**
Recovery (%) relative to POM	**20.7%**	**12.7%**	**0.0%**	**10.4%**	**2.1%**	**10.5%**

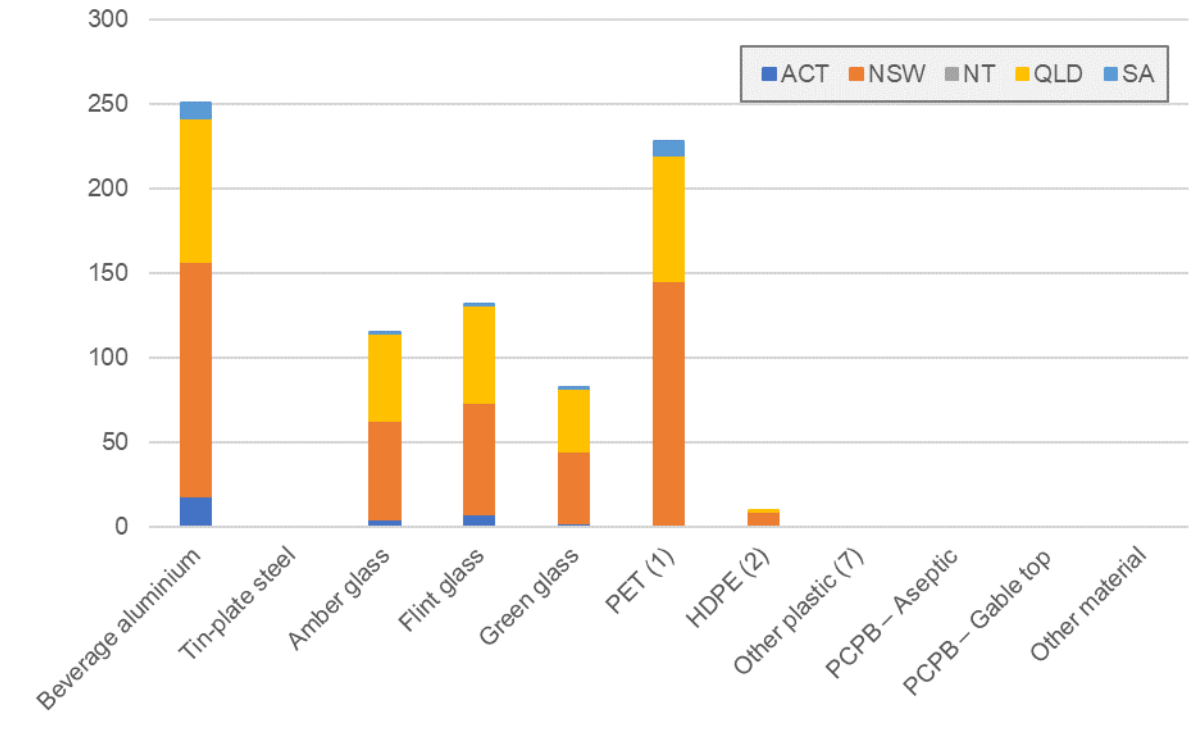

Figure E-6 – CD eligible packaging POM in 2020–21 by jurisdiction – Redeemed recovery via MRFs (million packs).

E.2.3 Unredeemed recovery via MRFs and other pathways

While most CD eligible packaging recovery in 2020–21 was via pathways that triggered the payment of a redeemed deposit, this was not always the case. There are a number of unredeemed recovery pathways that exist, with differing levels of applicability to different jurisdictions. These unredeemed recovery pathways included:

- MRF recovery where the MRF operators may not have claimed the deposits for internal operational or administrative reasons.
- MRF recovery where the published methods for claiming deposits in mixed CD eligible / CD ineligible streams did not cover all material types (e.g., LPB packaging), or otherwise had particular exceptions.
- MRF recovery of CD eligible packaging recovered from some C&I sources.
- CD eligible packaging recovered through away-from-home recycling bins or events related recycling, in some circumstances.
- Alternative Waste Treatment (AWT) or Mechanical Biological Treatment (MBT) facility recovery of CD eligible packaging.

Provided here are estimates of the recovery of unredeemed but CD eligible packaging during 2020–21. It is important to note that the earlier estimates of CD eligible packaging POM and redeemed CD eligible packaging are highly accurate as they are based on detailed regulated monthly or quarterly reporting. However, the recovery estimates of unredeemed CD eligible packaging are estimates derived from industry surveys and are less precise.

Table E-7 – CD eligible packaging recovery in 2020–21 by jurisdiction – Unredeemed recovery via MRFs and other pathways (tonnes).

Material type	ACT	NSW	NT	QLD	SA	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	20	1,700	40	4,370	320	6,440
Tin-plate steel	0	10	0	10	0	30
Amber glass	180	4,020	80	4,100	1,850	10,230
Flint glass	200	4,520	220	4,610	2,030	11,590
Green glass	130	2,910	60	2,970	1,330	7,390
PET (1)	60	1,390	50	1,560	0	3,060
HDPE (2)	10	120	10	190	0	320
Other plastic (7)	0	0	0	0	0	0
PCPB – Aseptic	0	0	0	0	0	0
PCPB – Gable top	0	0	0	0	0	0
Other material	0	0	0	0	0	0
Total	**600**	**14,670**	**450**	**17,810**	**5,530**	**39,060**
Recovery (%) relative to POM	**5.7%**	**6.2%**	**5.7%**	**7.0%**	**10.6%**	**7.0%**

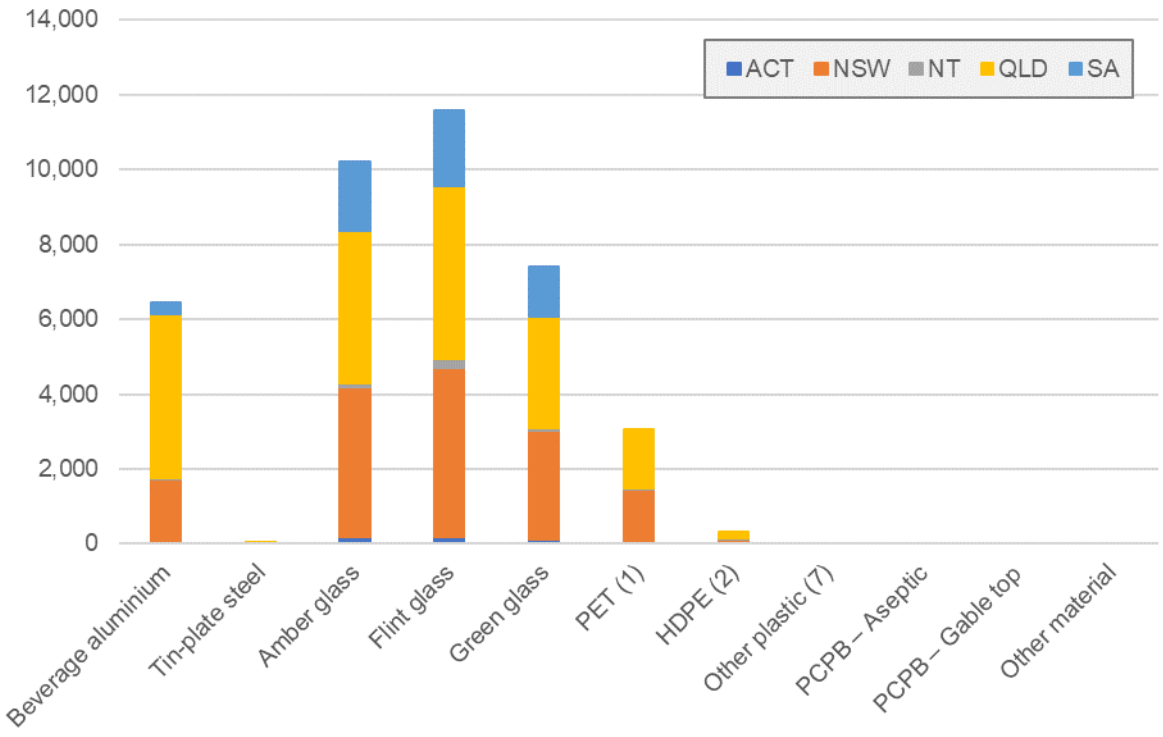

Figure E-7 – CD eligible packaging recovery in 2020–21 by jurisdiction – Unredeemed recovery via MRFs and other pathways (tonnes).

Table E-8 – CD eligible packaging POM in 2020–21 by jurisdiction – Unredeemed recovery via MRFs and other pathways (million packs).

Material type	ACT	NSW	NT	QLD	SA	Total
	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)
Beverage aluminium	1.767	124.859	2.615	212.014	23.424	364.680
Tin-plate steel	0.072	0.336	0.000	0.266	0.000	0.674
Amber glass	0.852	19.496	0.416	14.355	9.062	44.182
Flint glass	0.959	21.940	1.102	16.154	10.199	50.356
Green glass	0.617	14.109	0.289	10.388	6.570	31.973
PET (1)	2.540	62.186	1.987	44.888	0.000	111.601
HDPE (2)	0.354	4.094	0.208	5.307	0.000	9.963
Other plastic (7)	0.000	0.000	0.000	0.000	0.000	0.000
PCPB – Aseptic	0.000	0.000	0.000	0.000	0.000	0.000
PCPB – Gable top	0.000	0.000	0.000	0.000	0.000	0.000
Other material	0.134	0.000	0.000	0.000	0.000	0.134
Total	**7.295**	**247.021**	**6.618**	**303.371**	**49.256**	**613.561**
Recovery (%) relative to POM	**4.6%**	**6.8%**	**4.7%**	**10.3%**	**5.6%**	**7.9%**

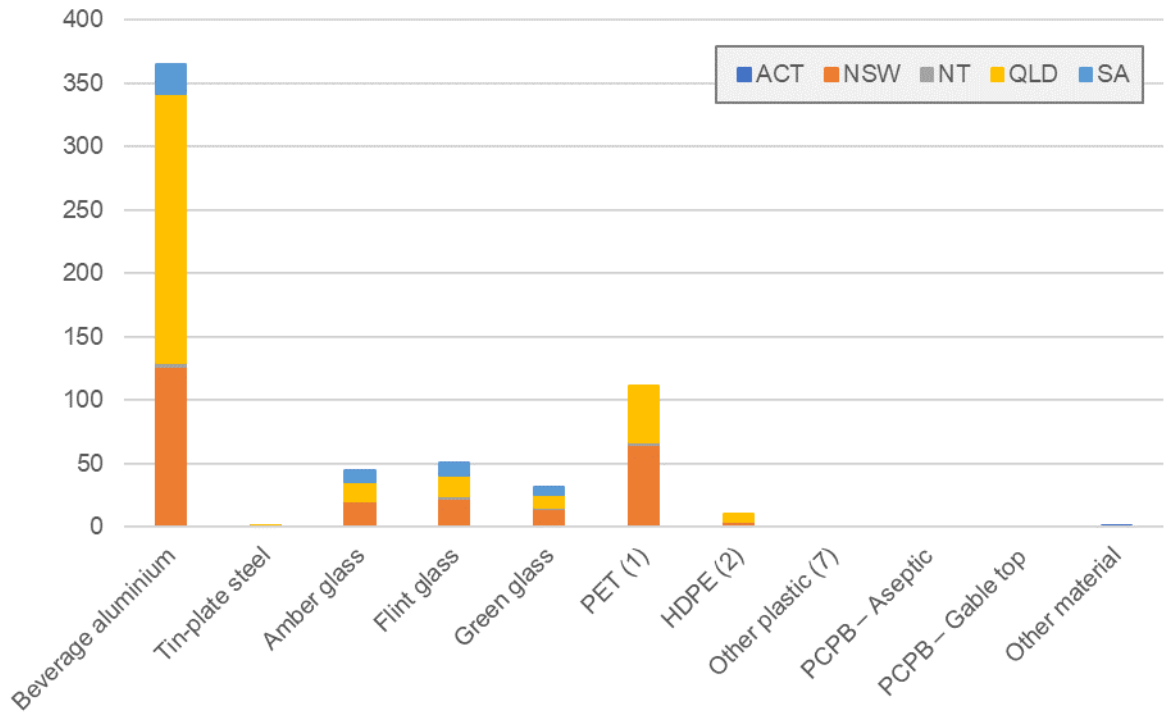

Figure E-8 – CD eligible packaging POM in 2018–19 by jurisdiction – Unredeemed recovery via MRFs and other pathways (million packs).

E.2.4 Total recovery via all collection routes

Table E-9 – CD eligible packaging recovery in 2020–21 by jurisdiction (tonnes).

Material type	ACT	NSW	NT	QLD	SA	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	640	15,090	740	21,440	4,630	42,540
Tin-plate steel	0	80	10	30	0	130
Amber glass	2,140	55,590	1,250	56,030	13,430	128,440
Flint glass	2,640	62,550	3,320	63,050	14,760	146,320
Green glass	950	40,220	870	40,550	9,660	92,260
PET (1)	200	16,250	570	15,860	3,420	36,300
HDPE (2)	20	990	30	1,190	290	2,520
Other plastic (7)	0	0	0	0	0	0
PCPB – Aseptic	10	330	0	430	430	1,210
PCPB – Gable top	10	190	40	250	130	620
Other material	0	10	0	0	0	10
Total	**6,610**	**191,310**	**6,840**	**198,830**	**46,760**	**450,340**
Recovery (%) relative to POM	**63.5%**	**80.5%**	**86.1%**	**78.4%**	**89.7%**	**80.2%**

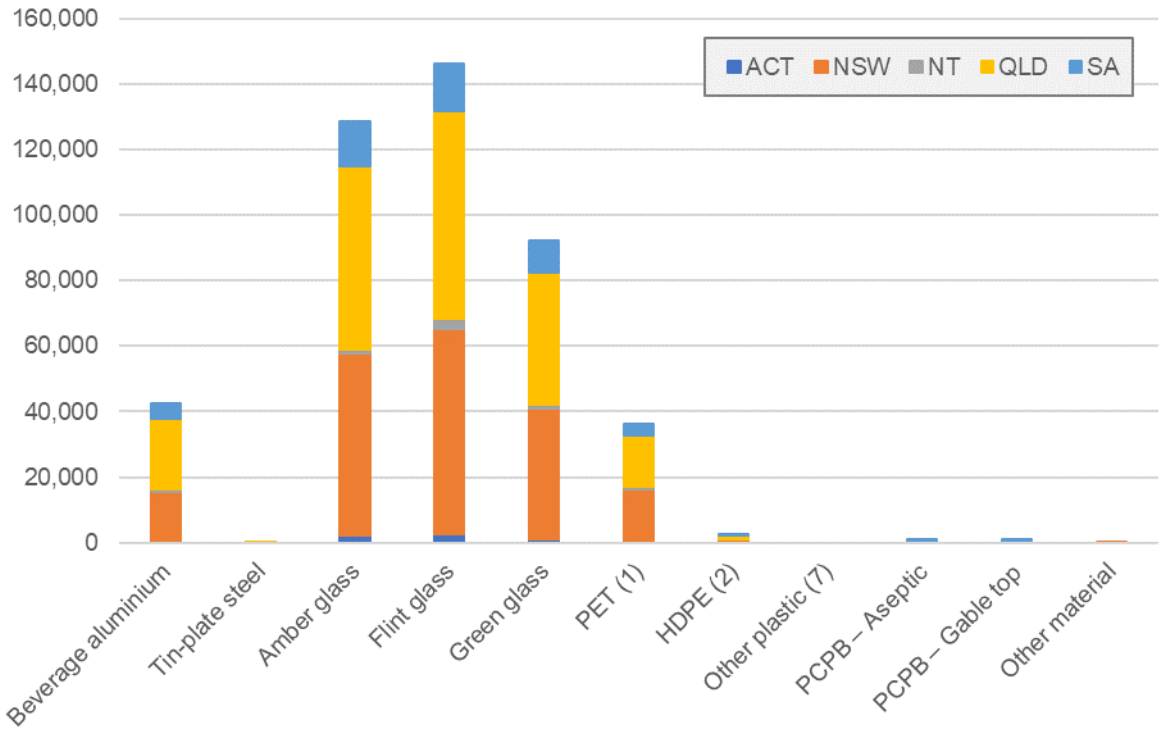

Figure E-9 – CD eligible packaging recovery in 2020–21 by jurisdiction (tonnes).

Table E-10 – CD eligible packaging recovery in 2020–21 by jurisdiction (million packs).

Material type	ACT	NSW	NT	QLD	SA	Total
	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)
Beverage aluminium	47.128	1,109.860	53.876	1,040.559	341.325	2,592.747
Tin-plate steel	0.079	1.883	0.093	0.716	0.000	2.771
Amber glass	10.371	269.701	6.302	196.182	65.806	548.361
Flint glass	12.790	303.510	16.713	220.774	74.062	627.849
Green glass	4.626	195.168	4.384	141.966	47.711	393.856
PET (1)	8.891	725.502	23.124	455.611	136.821	1,349.948
HDPE (2)	0.590	34.802	1.065	33.700	14.614	84.772
Other plastic (7)	0.000	0.034	0.000	0.000	0.000	0.034
PCPB – Aseptic	0.887	22.277	0.210	20.716	18.016	62.106
PCPB – Gable top	0.521	13.084	2.412	12.167	10.581	38.764
Other material	0.134	0.280	0.000	0.000	0.000	0.414
Total	**86.017**	**2,676.100**	**108.177**	**2,122.391**	**708.937**	**5,701.621**
Recovery (%) relative to POM	**54.6%**	**74.1%**	**77.2%**	**71.8%**	**81.0%**	**73.7%**

Note: These recovery rates may differ from published figures available elsewhere as they included estimates for non-redeemed CD eligible packaging that is collected through MRFs.

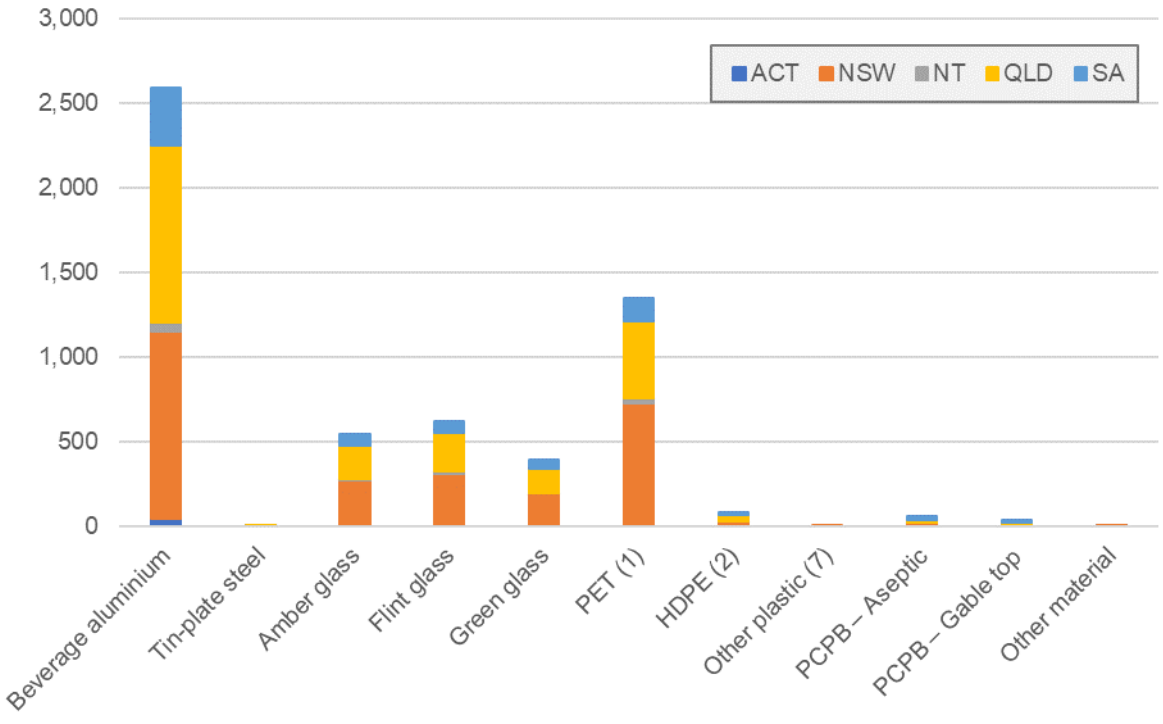

Figure E-10 – CD eligible packaging recovery in 2020–21 by jurisdiction (million packs).

E.2.5 Reprocessing destination

Table E-11 – CD eligible packaging reprocessing destination in 2020–21 by material type (tonnes).

Material type	Local	Overseas	Unknown	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	220	42,320	0	42,540
Tin-plate steel	0	130	0	130
Amber glass	128,440	0	0	128,440
Flint glass	146,320	0	0	146,320
Green glass	92,260	0	0	92,260
PET (1)	33,740	2,550	0	36,300
HDPE (2)	1,640	890	0	2,520
Other plastic (7)	0	0	0	0
PCPB – Aseptic	0	1,210	0	1,210
PCPB – Gable top	0	620	0	620
Other material	10	0	0	10
Total	**402,620**	**47,720**	**0**	**450,340**

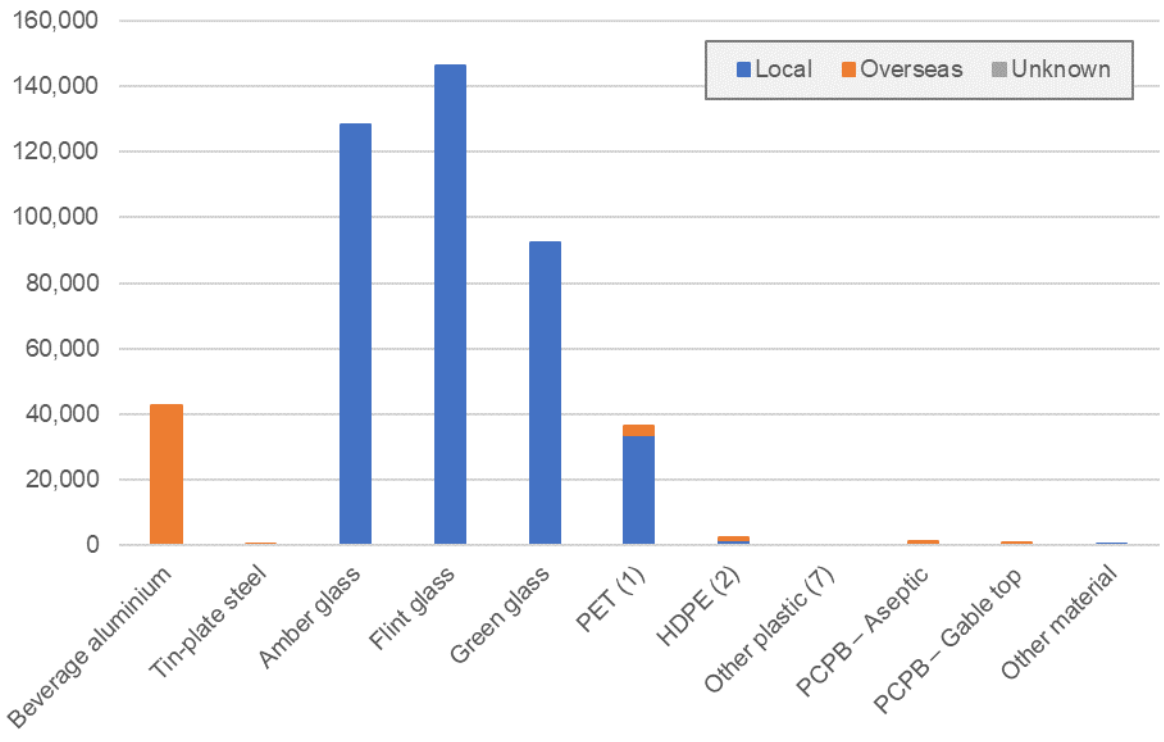

Figure E-11 – CD eligible packaging reprocessing destination in 2020–21 by material type (tonnes).

E.3 CD eligible packaging to landfill

The following tables provide estimates of CD eligible packaging disposed to landfill. These quantities are almost entirely based on estimates of CD eligible packaging disposal to landfill at the household level, and public place disposal where recycling systems are not available.

Table E-12 – CD eligible packaging to landfill in 2020–21 by jurisdiction (tonnes).

Material type	ACT	NSW	NT	QLD	SA	Total
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
Beverage aluminium	160	3,770	180	5,360	670	10,140
Tin-plate steel	0	110	0	50	0	170
Amber glass	790	11,380	120	12,300	800	25,400
Flint glass	660	12,810	330	13,840	880	28,520
Green glass	1,170	8,240	90	8,900	570	18,960
PET (1)	750	6,960	250	10,180	1,800	19,940
HDPE (2)	150	950	80	1,930	170	3,280
Other plastic (7)	0	10	0	0	0	10
PCPB – Aseptic	70	1,390	0	1,350	390	3,210
PCPB – Gable top	40	810	50	790	120	1,820
Other material	10	40	0	0	0	50
Total	**3,800**	**46,490**	**1,110**	**54,700**	**5,380**	**111,480**

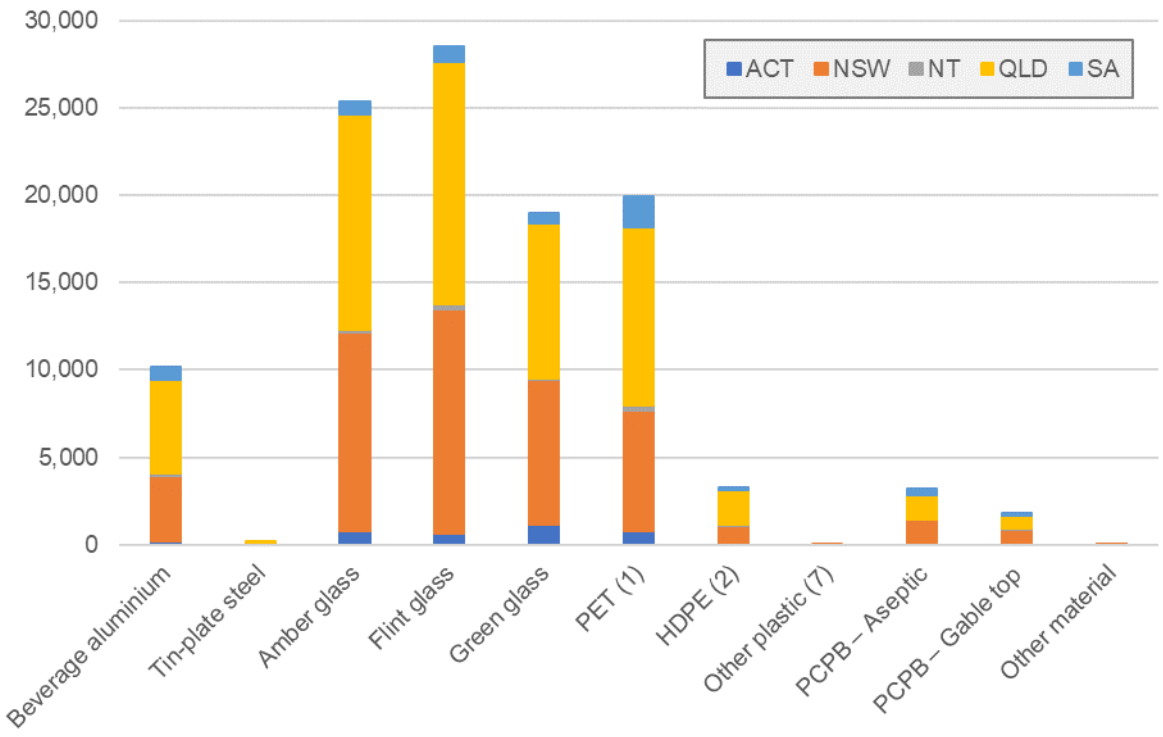

Figure E-12 – CD eligible packaging to landfill in 2020–21 by jurisdiction (tonnes).

Table E-13 – CD eligible packaging to landfill in 2020–21 by jurisdiction (million packs).

Material type	ACT	NSW	NT	QLD	SA	Total
	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)	(million packs)
Beverage aluminium	11.782	277.465	13.469	260.140	49.073	611.929
Tin-plate steel	0.107	2.537	0.000	1.183	0.000	3.827
Amber glass	3.836	55.240	0.626	43.064	3.904	106.670
Flint glass	3.198	62.165	1.661	48.463	4.393	119.879
Green glass	5.654	39.974	0.436	31.163	2.830	80.058
PET (1)	33.446	310.929	9.999	292.519	71.806	718.699
HDPE (2)	5.310	33.437	2.401	54.751	8.538	104.438
Other plastic (7)	0.034	0.529	0.000	0.000	0.000	0.564
PCPB – Aseptic	5.028	94.972	0.270	64.535	16.322	181.125
PCPB – Gable top	2.953	55.777	3.101	37.901	9.586	109.318
Other material	0.262	1.471	0.000	0.000	0.000	1.732
Total	**71.609**	**934.496**	**31.963**	**833.720**	**166.452**	**2,038.240**

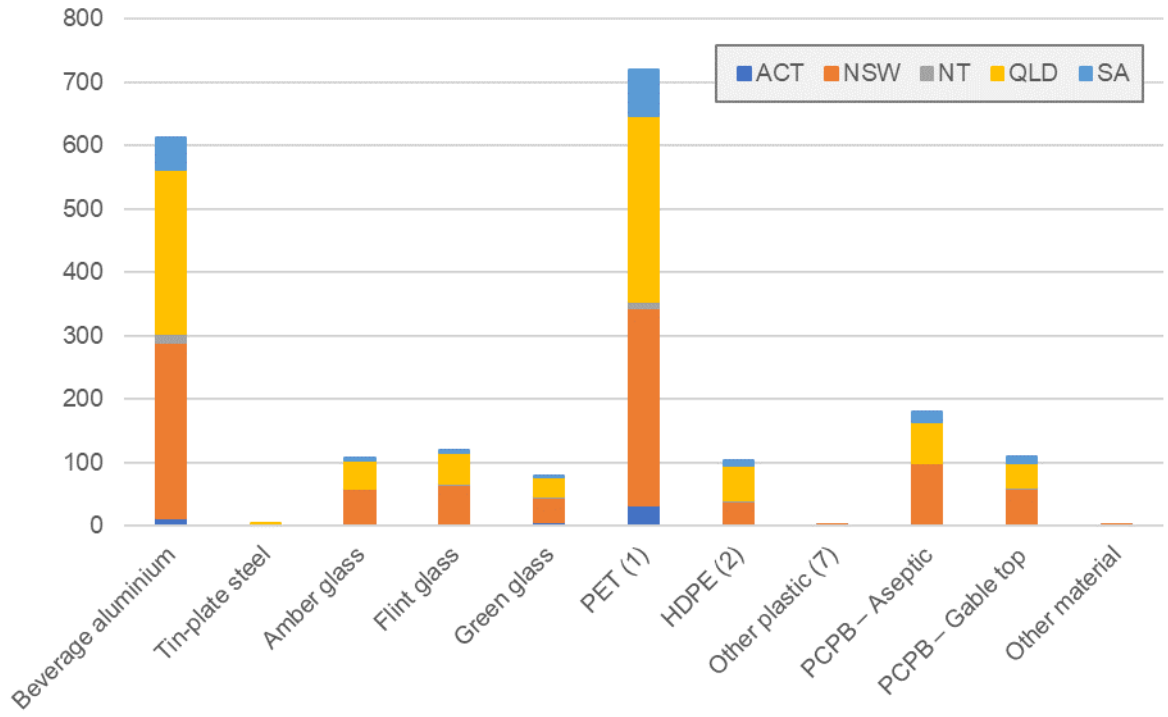

Figure E-13 – CD eligible packaging to landfill in 2020–21 by jurisdiction (million packs).

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