



2011-12 National Plastics Recycling Survey

Final Report

Plastics and Chemicals Industries Association



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- Plastics reprocessors — for the provision of confidential reprocessing data and on-going co-operation with the study. PACIA acknowledges the considerable time and effort the plastic reprocessors put into completing this survey year-on-year. Their invaluable input allows the study to be completed and to be considered one of the most comprehensive studies of its type in Australia.
- Waste plastics exporters — for the provision of confidential export market intelligence and on-going co-operation with the study.
- Australian polymer producers — for the provision of confidential consumption data.

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EXECUTIVE SUMMARY

In June 2012 the Plastics and Chemicals Industries Association (PACIA) commissioned the annual National Plastics Recycling Survey (NPRS) to capture the consumption and recycling of plastics in Australia during the 2011–12 financial year. The 2012 survey has been conducted by Sustainable Resource Use Pty Ltd (SRU) on behalf of PACIA, and the survey results are aggregated and analysed within this report. This research started in 1997 and has been undertaken annually since 2000.

The survey provides the most comprehensive picture of the consumption, flow, recovery and recycling of plastics in Australia, the state of reprocessing markets and the status of product stewardship commitments. The survey is seen as a valuable tool for promotion, knowledge of the industry and forward planning, including informing and tracking policies and programs to further improve plastics resource efficiency over whole of life.

The 2012 NPRS has been supported by the following project partners:

- NSW Government Office of Environment and Heritage
- Sustainability Victoria
- Queensland Government
- Zero Waste South Australia
- Western Australia Department of Environment and Conservation
- Australian Packaging Covenant.

Key survey findings

The key findings of the 2012 PACIA National Plastics Recycling Survey assessing the 2011–12 financial year are:

- A total of 1 476 690 tonnes of plastics from domestic production or imported resin were consumed in Australia in 2011–12. This number has increased by 3% from 2010–11
- A total of 302 635 tonnes of plastics were recycled in 2011–12. This was an increase of 5% from 2010–11.
- In 2011–12 overall plastics recycling rate was 20.5%, increasing from 20.1% in 2010–11.
- The quantity of plastic packaging recycled in 2011–12 was 215 538 tonnes, giving a packaging recycling rate of 41.9%, compared with 37.5% in 2010–11. This increase was mostly underpinned by a strong increase in exported recycle
- The quantity of durable plastics recycling in 2011–12 was 87 097 tonnes, giving a durable plastics recycling rate of 9.5%, compared with 9.7% in 2010–11.
- Durable plastics often have a much longer service life (of between two and 100 years) than packaging plastics (typically less than one year). This means there can often be a significant delay between the manufacture of durable plastic products and end-of-life, when they become available for recycling.
- Of the 302 635 tonnes of plastics collected for recycling, 136 032 tonnes (44.9%) was reprocessed in Australia and 166 604 tonnes (55.1%) was exported for reprocessing. The proportion of plastics reprocessed in Australia has decreased from 74.0% in 2000 (calendar year), to 44.9% in 2011–12.

- The majority of plastics that were reprocessed in Australia continue to be used locally to manufacture new products, mainly durable (non-packaging) products.

Total plastics consumption and recycling

The figures for total annual plastics consumption and total annual plastics recycling from 1997 to 2011–12 are presented in Table 1.

Table 1: Annual Australian plastics consumption and recycling (1997 to 2011–12)

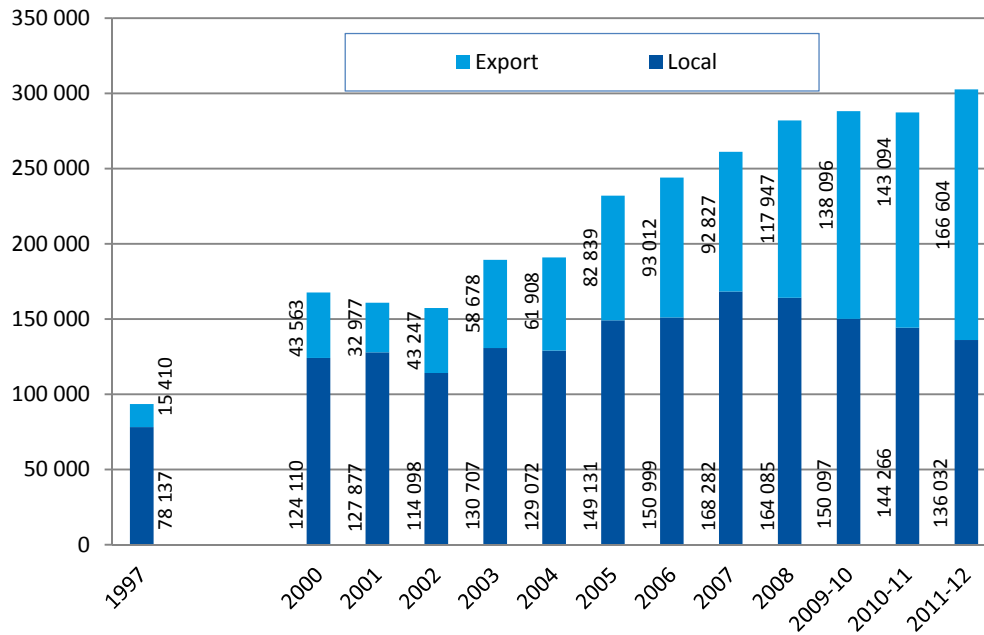
Year	Total consumption		Total recycling	
	(tonnes)	% change from previous year	(tonnes)	% change from previous year
1997	1 336 386	-	93 547	
2000	1 530 783	-	167 673	
2001	1 430 874	-6.5%	160 854	-4.1%
2002	1 496 387	4.6%	157 345	-2.2%
2003	1 521 394	1.7%	189 385	20.4%
2004	1 510 839	-0.7%	190 979	0.8%
2005	1 480 154	-2.0%	231 969	21.5%
2006	1 533 475	3.6%	244 011	5.2%
2007	1 710 085	11.5%	261 109	7.0%
2008	1 525 185	-10.8%	282 032	8.0%
2009–10	1 501 258	-1.6%	288 194	2.2%
2010–11	1 433 046	-4.5%	287 360	-0.3%
2011–12	1 476 690	3.0%	302 635	5.3%

The apparent reduction in local consumption since 2007 is probably in large part due to a continuing shift from local manufacturing to the import of finished and semi-finished plastic products, which now represents a significant proportion of plastic polymer consumed in Australia, possibly in the order of 25–30% (SRU estimate). For the last 10 years the NPRS has captured the import of virgin resin into Australia, however the import of plastics in other forms is difficult to quantify and has been consistently excluded from the study.

The data for local and exported Australian plastics recycling is presented in Figure 1. Overall reprocessing has increased slightly since last year and the share of local reprocessing has declined further from 2010–11.



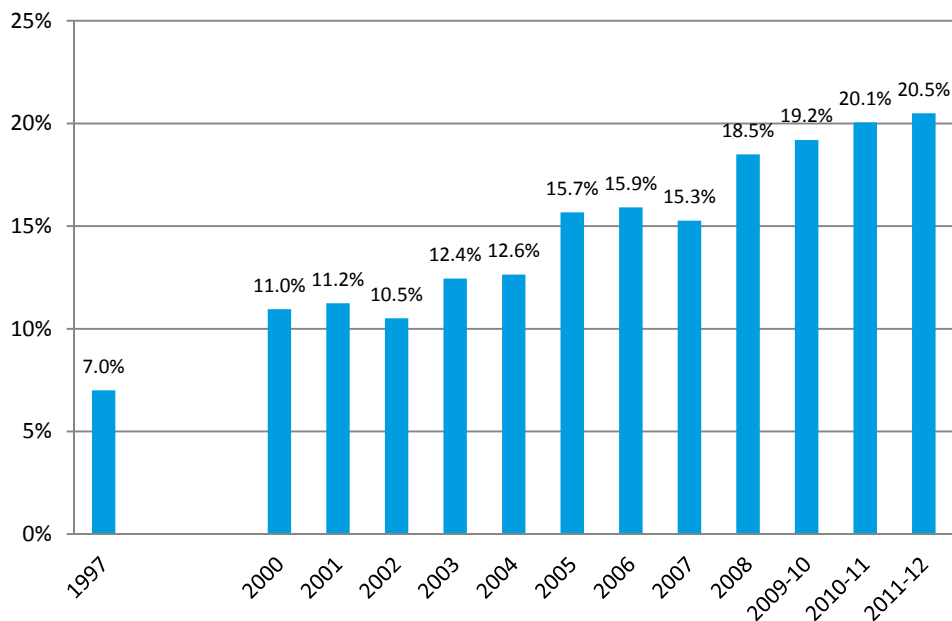
Figure 1: Annual Australian plastics recycling from 1997 to 2011–12 (in tonnes)



Total plastics recycling rate

From 1997 to 2011–12 the recycling rate of plastics has increased from 7.0% to 21.1%, as shown in Figure 2. The recycling rate has increased by 1.0% from 2010–11 to 2011–12.

Figure 2: Annual Australian plastics recycling rates from 1997 to 2011–12



Over the period of 2000 to 2011–12 the quantities of both durable and packaging plastics recycling have increased. The lower recycling rate of durable plastics is influenced by the longer life of these products and that consumer recycling collection systems in Australia are predominantly set up for packaging materials. Since 2009–10, it can be seen that the amount of durable plastics recycled reduced slightly.

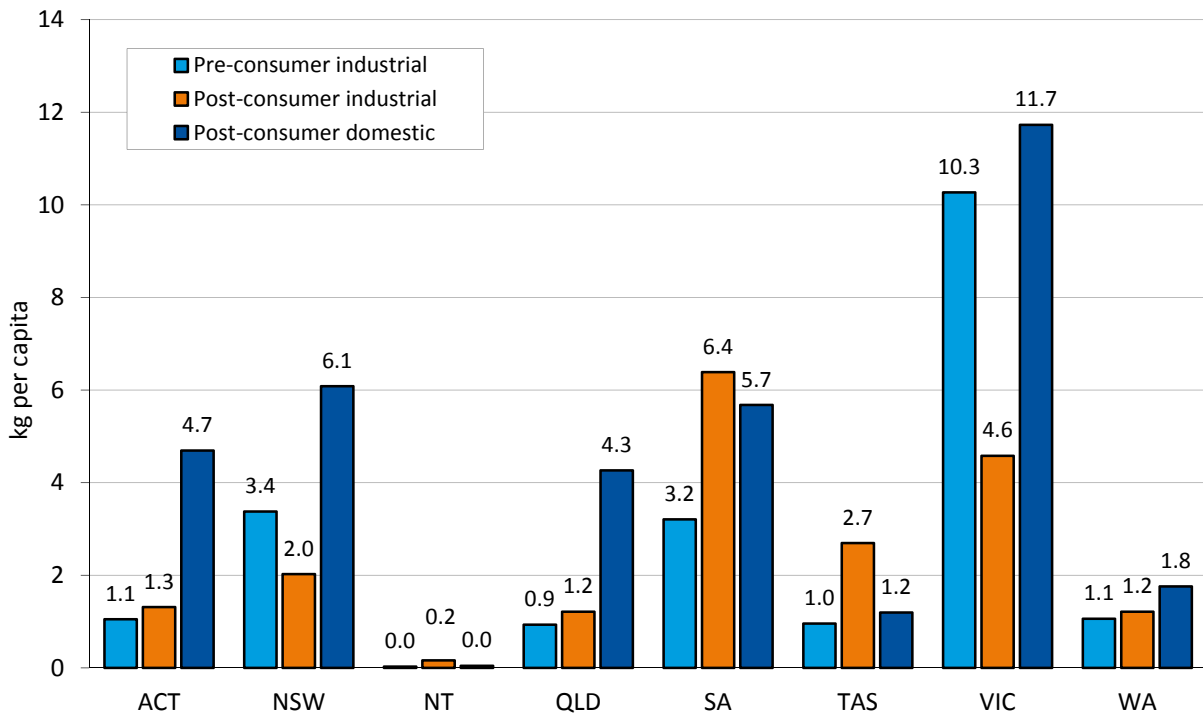
Table 2: Packaging and durables recycling quantities and rates (2000 to 2011–12)

Year	Packaging recycling		Durables recycling	
	(tonnes)	%	(tonnes)	%
2000	113 189	20.0%	54 484	5.6%
2001	125 375	23.7%	35 479	3.9%
2002	127 397	19.9%	29 948	3.5%
2003	134 905	20.5%	54 480	6.3%
2004	140 584	22.2%	50 395	5.7%
2005	179 125	30.5%	52 844	5.9%
2006	178 351	30.5%	65 660	6.9%
2007	205 019	32.7%	56 089	5.2%
2008	204 036	36.2%	77 996	8.1%
2009–10	196 925	34.8%	91 268	9.8%
2010–11	199 812	37.5%	87 548	9.7%
2011–12	215 538	41.5%	87 097	9.1%

Source of recycled plastics

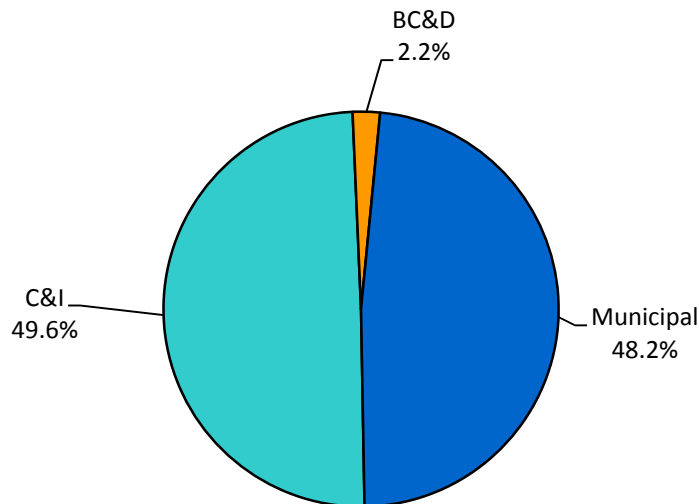
The 302 635 tonnes of plastics recycled in 2011–12 was sourced from each Australian state and territory and from both pre-consumer and post-consumer sectors (see glossary on page 60 for explanation). The breakdown of plastics sourced from each jurisdiction, these sectors and domestic and industrial users on a per capita basis can be seen below in Figure 3.

Figure 3: Recycling by material source, state and sector level (kg per capita)



Plastics reprocessed nationally were recovered from the Commercial and Industrial (C&I), Building, Construction and Demolition (BC&D) and Municipal sectors as shown in Figure 4.

Figure 4: Source sector of recycled plastics



Total plastics recycling by polymer

The total quantities of recycled plastics by polymer type, from all sectors, and including packaging and non-packaging (durable) materials, are presented in Table 3. Detail on the uses of recycled polymers in Australia is provided in Section 8.4. The full names of each polymer type are provided in the Glossary on page 60.

Table 3: Total consumption and recycling by polymer

Polymer	Plastics Identification Code (PIC)	Consumption	Domestic reprocessing	Export for reprocessing	Total recycling	Recycling rate
		(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
PET	1	116 838	15 101	47 043	62 144	53.2%
HDPE	2	405 977	33 668	59 535	93 203	23.0%
PVC	3	209 465	6 222	2 212	8 434	4.0%
L/LLDPE	4	212 525	33 658	34 036	67 694	31.9%
PP	5	216 347	20 323	18 817	39 140	18.1%
PS	6	23 630	2 994	4 896	7 889	33.4%
EPS	6	40 335	2 712	64	2 775	6.9%
ABS/SAN	7	20 619	5 312	0	5 312	25.8%
PU	7	56 523	6 993	0	6 993	12.4%
Nylon	7	15 871	860	0	860	5.4%
Other	7	158 560	8 189	0	8 189	5.2%
Totals	-	1 476 690	136 032	166 604	302 635	20.5%

1 INTRODUCTION

To provide information to members, government and the wider community, the Plastics and Chemicals Industries Association (PACIA) collects data annually on plastics manufacturing, imports, local reprocessing and exports destined for reprocessing, through the National Plastics Recycling Survey (NPRS). In 2012 SRU was commissioned by PACIA to conduct the survey for the 2011–12 financial year.

The survey continues to give an excellent picture of the consumption, flow and recycling of plastics in Australia, the state of reprocessing markets and the status of product stewardship commitments. The survey is seen as a valuable tool for promotion, knowledge of the industry and forward planning. The survey informs policy development and supports the tracking of policy outcomes. It also supports programs to further improve plastics resource efficiency over whole of life. Key aspects of the survey are that it:

- has the largest number of respondents of any similar study and is conducted Australia-wide
- covers durable as well as packaging plastics
- breaks down recycling by polymer types
- is the longest running such survey, commencing in 1997 and undertaken annually since 2000.

Valuable collaborative, financial and advisory support was provided to the 2012 NPRS by the following project partners:

- NSW Government Office of Environment and Heritage
- Sustainability Victoria
- Queensland Department of Environment and Resource Management
- Zero Waste South Australia
- Western Australia Department of Environment and Conservation
- Australian Packaging Covenant.

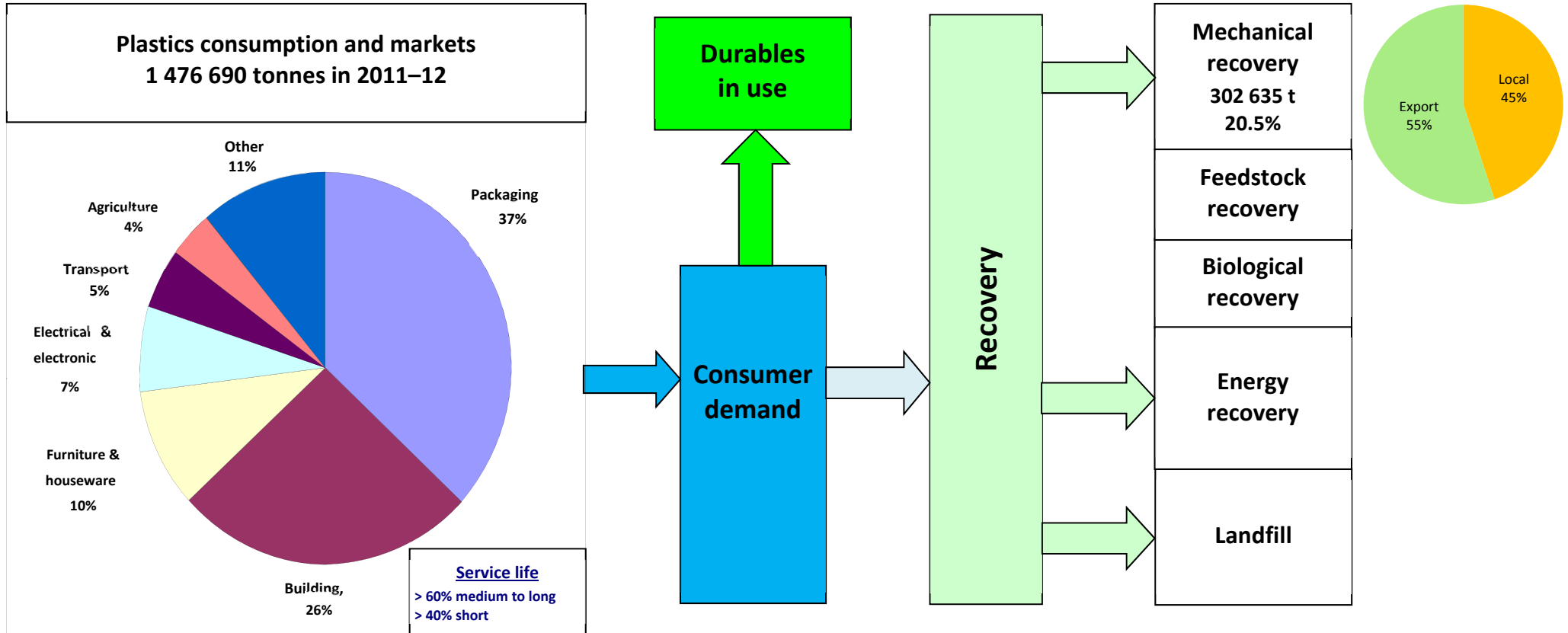
The plastics industry is well established in Australia, with several major polymer resin types produced domestically and product manufacturing across a large variety of industries. Resins imports for use by the domestic manufacturing market are also very significant, totalling nearly 50% of total local virgin resin consumption. The plastics reprocessing and recycling sectors continue to evolve as a part of the overall industry, with locally manufactured and imported plastic products being collected at end-of-life and processed for reuse in new products.

These resins are used to manufacture a large range of plastic products for many market sectors, from packaging, materials handling, furniture and clothing, to electrical and electronic equipment, building products and transport components. The life-span of plastic products varies from short-term single-use items, to long-term durable products which may remain in use for many years.

For all plastic products, recovery is often an important stage of the product life cycle. While there are a range of current technologies available for recovery, in Australia mechanical recycling is the primary process used to recover plastic materials, particularly shorter-life plastics. Figure 5 shows the typical life cycle of plastics in Australia.



Figure 5: Plastics consumption and typical recovery life cycle (per cent splits for the sector of consumption are sourced from the PACIA Quickstarts 2008)



The markets which consume the majority of plastics in Australia include:

- packaging
- building
- furniture and housewares
- electrical and electronic
- transport
- agriculture.

The demand for recycled plastics, used in the production of new products, has continued to grow in strength both domestically and internationally. Well-developed plastics recycling through the kerbside recycling system enables the collection of many post-consumer household recyclables. There are also established systems for the collection and reprocessing of pre-consumer industrial scrap and many types of post-consumer industrial plastics.

However away-from-home plastic packaging recycling systems, and systems for the recovery of many types of durable plastic items, both residential and non-residential, are not nearly so well developed, and many of these products are disposed to landfill at end of life. It is also worth noting that there is currently no good data on the national profile of plastic products going to landfill.

1.1 Purpose of survey

This 2012 survey of Australian resin producers, plastics reprocessors and waste plastic exports aims to give an accurate picture of the plastics industry as a whole during the 2011–12 financial year, and the trends in consumption and recycling.

PACIA seeks to obtain this up-to-date and reliable consumption and recycling data to:

- provide an understanding of the current state of demand, use, recovery and recycling across a broad range of sectors and polymer types
- provide reliable data to governments, industry and the broader community
- provide information for responses to international surveys
- provide information on packaging recycling rates to the Australian Packaging Covenant Council
- determine recycling rates relative to consumption
- provide an indication of the import and export flows
- gather information on the use and destination of recycled plastics materials
- inform development and tracking of policies and programs to assist further improvement of plastics resource efficiency over whole of life.

1.2 Survey method

Plastics consumption data was obtained from a combination of sources, primarily:

- Australian resin producers
- Resin importers

- Australian Customs Service (ACS) data
- Australian plastics reprocessors—as plastics recovery by plastics reprocessors contributes to consumption if the recycle is reused locally.

Ninety-four domestic reprocessing sites were identified and contacted nationally. Of these, 65 sites responded with data for the survey and data for an additional 15 South Australian sites was provided directly by Zero Waste SA. In 2012 this gives a reprocessor response rate of 85%. Three of the declining operators were sufficiently large that their reprocessing was subsequently estimated based upon information available on their website and other industry sources. As data for several reprocessing sites was not available, the stated recovery of plastics for recycling will be somewhat less than the actual annual activity. It is estimated that the sites for which data is available account for approximately 95% of the market in terms of mass of plastics recycled.

In addition to the reprocessor sites, five resin producers were contacted. One manufacturer did not respond, and production for this manufacturer was estimated. This gave an overall survey response rate (across reprocessors and resin producers) of 86%.

As in previous years, the data for 2011–12 has been split into two distinct categories, packaging and durables (non-packaging). This is to give an indication of the life-span of the plastic product. Each category is defined as below:

Packaging: Plastic material used for the containment, protection, marketing and/or handling of a product. Includes primary, secondary and tertiary (freight) packaging in both consumer and industrial packaging applications.

Durables/non-packaging: Plastic material used for a broad range of consumer and industrial products, with varying life-spans. Includes items such as medical consumables (short-term useful life) as well as pipes, cable casing, computer bodies, furniture and building products (long-term useful life).

The polymer types covered by this survey, and the identifying Plastics Identification Code (PIC) are:

Table 4: Polymer types and PIC

PIC	Polymer type
1	Polyethylene terephthalate (PET)
2	High density polyethylene (HDPE)
3	Poly-vinyl chloride (PVC)
4	Low / linear low density polyethylenes (L/LLDPE)
5	Polypropylene (PP)
6	Polystyrene (PS) and expanded polystyrene (EPS)
7	Acrylonitrile butadiene styrene / styrene acrylonitrile (ABS/SAN)
	Polyurethane (PU)
	Nylon
	Other aggregated polymer types

The plastic resin types which make up the majority of the ‘other aggregated’ category are various acrylics, acetals, cellulosics, polyethylene oxide, polyisobutylene and other polymers of propylene (other than PP), and polymers of styrene (other than PS, EPS and ABS/SAN).

In the plastics industry, the term ‘recycling’ is used to cover a range of activities including collection, sorting, reprocessing, export for reprocessing and manufacture of new products. To avoid double-counting of material flowing through the system, the main focus of data gathering in this survey was placed on the reprocessing stage of the plastics life cycle.

The applied definition of reprocessing for the survey was the off-site sourcing of waste plastics (including returned product) which are then converted into either a finished or semi-finished product, or into a chipped format or similar. In-house recovery/regrind, or the baling and compaction of plastics where further reprocessing steps are required (e.g. size reduction) before the recyclate could be used to manufacture a new product was not reported as reprocessing.

Reprocessors, manufacturers (who re-use end-of-life plastic from an external source) and exporters of used plastics were identified through: previous survey contacts, the PACIA industry knowledge, state agencies and industry sources. These reprocessors were then surveyed on the weight, polymer types, form, source and destination of the plastics they reprocessed, or exported for reprocessing, during the 2011–12 financial year.

With the exception of Section 4.5, none of the recycled plastics data published throughout this report includes material being processed in energy recovery (waste-to-energy) facilities or composting facilities.

Population data from the Australian Bureau of Statistics was used to calculate per capita figures for states and territories, which has been used in determining plastics consumption for each jurisdiction.

Table 5: State and territory populations

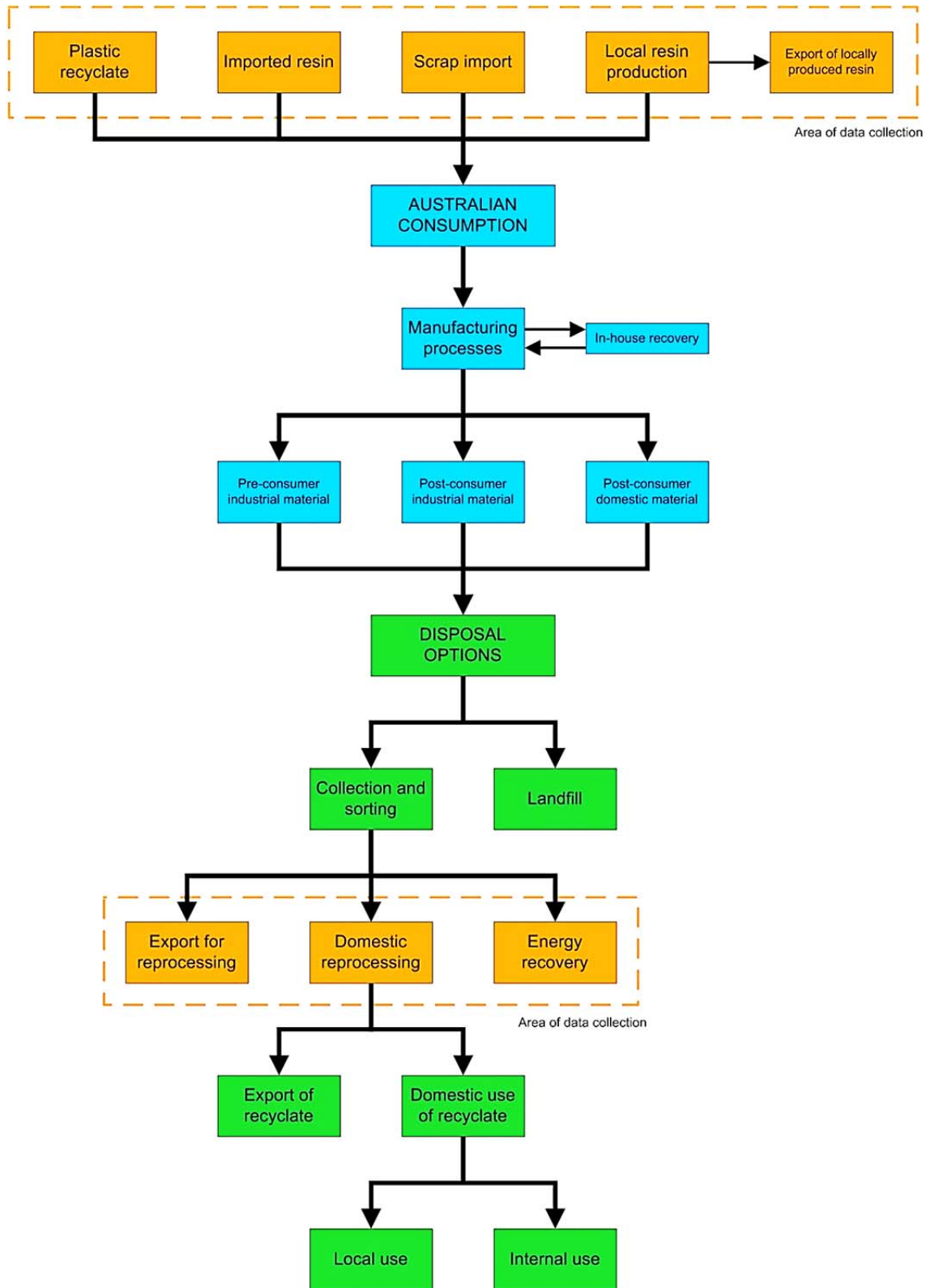
State	Population	% of national population
ACT	374 658	1.7%
NSW	7 290 345	32.1%
NT	234 836	1.0%
QLD	4 560 059	20.1%
SA	1 654 778	7.3%
TAS	512 019	2.3%
VIC	5 623 492	24.8%
WA	2 430 252	10.7%
Total	22 680 439	100.0%

Note: Populations are for end June 2012 (ABS estimates)

Note that in summary tables and figures presented in this report, minor discrepancies may occur between stated totals and the sums of the component items. Totals were calculated using component item values prior to rounding, and therefore a minor discrepancy may occur from the total that can be calculated from the rounded values.



Figure 6: Polymer material flows in Australia



2 CONSUMPTION OF PLASTICS IN AUSTRALIA

As depicted graphically in Figure 6, plastics consumption was determined using the following formula:

$$\begin{aligned}
 & \text{Local resin production (sales)} \\
 + & \text{ Imported resin} \\
 + & \text{ Plastic recyclate (local use)} \\
 + & \text{ Scrap import} \\
 - & \text{ Export of locally produced resin} \\
 \hline
 = & \text{ Domestic consumption}
 \end{aligned}$$

Data on national domestic production of plastic resin and the export of resin during 2011–12 was obtained from resin producers in Australia, except for PET resin. Local PET resin production was based upon the estimated manufacturing capacity available in Australia, and industry advice on the export of locally produced resin.

Data on the importation of plastic resin and a relatively small amount of scrap plastic was obtained from the ACS through the Department of Foreign Affairs and Trade (DFAT). Local recyclate consumption data was obtained from plastic reproducers. Together these sources give the national domestic consumption of plastics.

Total Australian plastics consumption data for the year 2011–12 is summarised in Table 6.

The total consumption of plastics in Australia in 2011–12 was 1 433 190 tonnes, which is steady from the 2010–11 consumption.

Table 6: Australian resin consumption

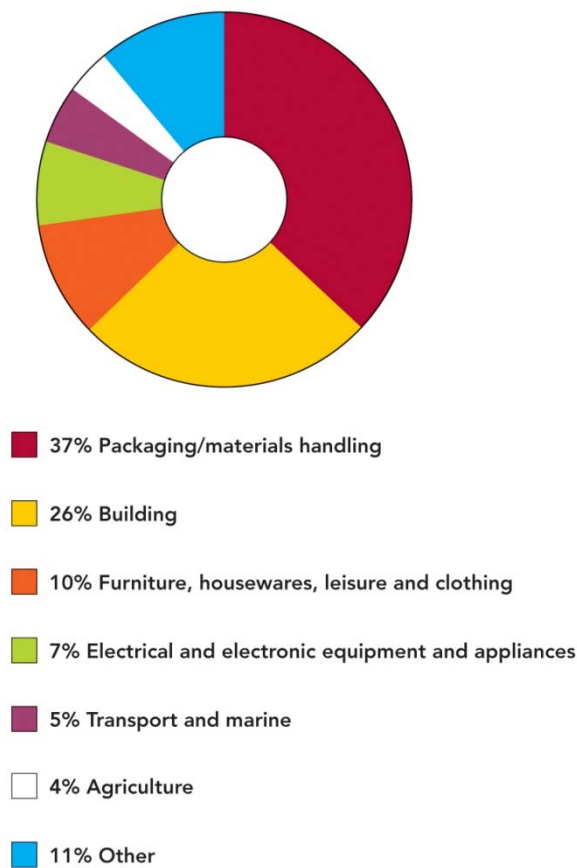
Polymers	PIC	Consumption (tonnes)
PET	1	116 838
HDPE	2	405 977
PVC	3	209 465
L/LLDPE	4	212 525
PP	5	216 347
PS	6	23 630
EPS	6	40 335
ABS/SAN	7	20 613
Polyurethane	7	56 523
Nylon	7	15 871
Other	-	158 560
Total	-	1 476 690

Note: PIC is an abbreviation for Plastics Identification Code

3 MARKETS, USES AND LIFE SPANS OF PLASTICS

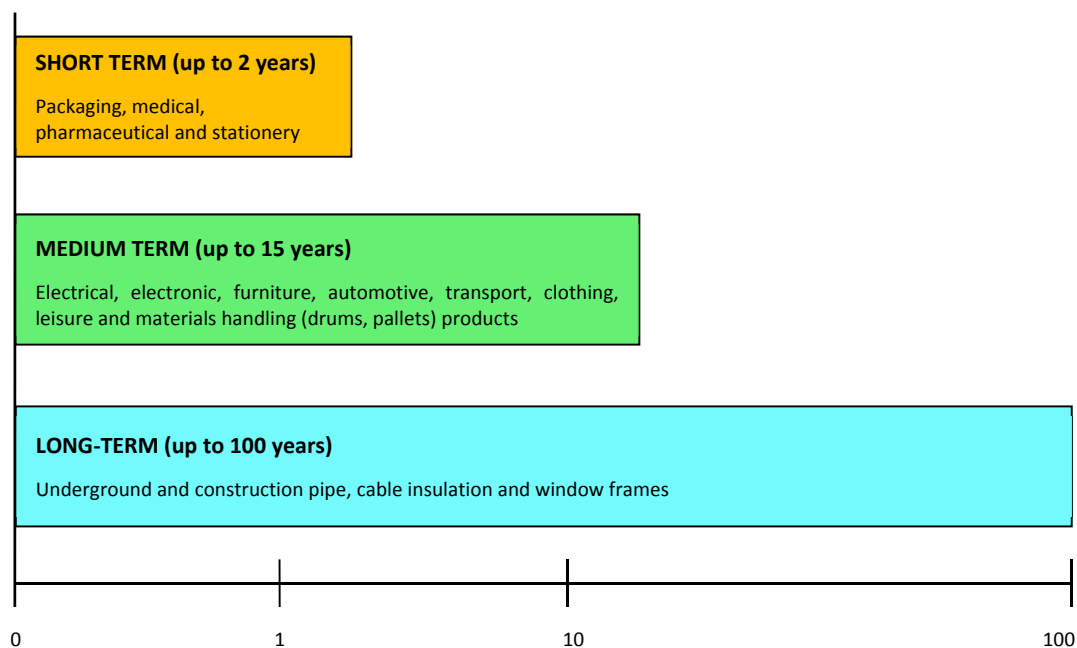
Plastics are used to manufacture an enormous range of products in every sector of the economy. The design and innovation advantages of plastics include their ability to be moulded into almost any shape, size and colour, the wide range of properties which can be achieved, such as water and chemical resistance, high strength to weight ratio, sound and heat insulation, hygiene and food safety, water or gas barrier, and their relatively low cost.

Figure 7: Market sectors for plastics use in Australia (PACIA Quickstarts 2008)



The life-span of products manufactured from plastics varies enormously. The life-span of a product can be defined as the time from leaving the manufacturer’s site to the time of disposal (or recycling). Figure 8 gives some indicative life-spans for a range of high volume applications.

Figure 8: Expected useful life of plastic products by use



The life-span of plastic products ranges from short-term for packaging and single-use products, through to long-term building and construction products. The utilisation of polymer resin in single-use or short-term packaging applications and longer term durable applications varies widely with each polymer. The breakdown of total plastic consumption into packaging and non-packaging product applications is critical, as many durable items may not enter the waste stream for many years, if at all (e.g. HDPE and PVC pipes buried in the ground). The recycling of plastic materials also differs widely due to product sources, collection methods and other recovery constraints.

Plastics used in packaging applications will generally be used and disposed of in less than one year. However, a range of consumer goods, including clothing, appliances, toys and computers, the lifespan is more likely to be a number of years. Recycling programs will be quite different for these products. Collection infrastructure for these products is slowly being developed, with some collection already occurring for phones, printer cartridges and computer equipment. No large scale collection infrastructure or systems exist as yet for items such as toys, stationery, footwear, small appliances and furniture.

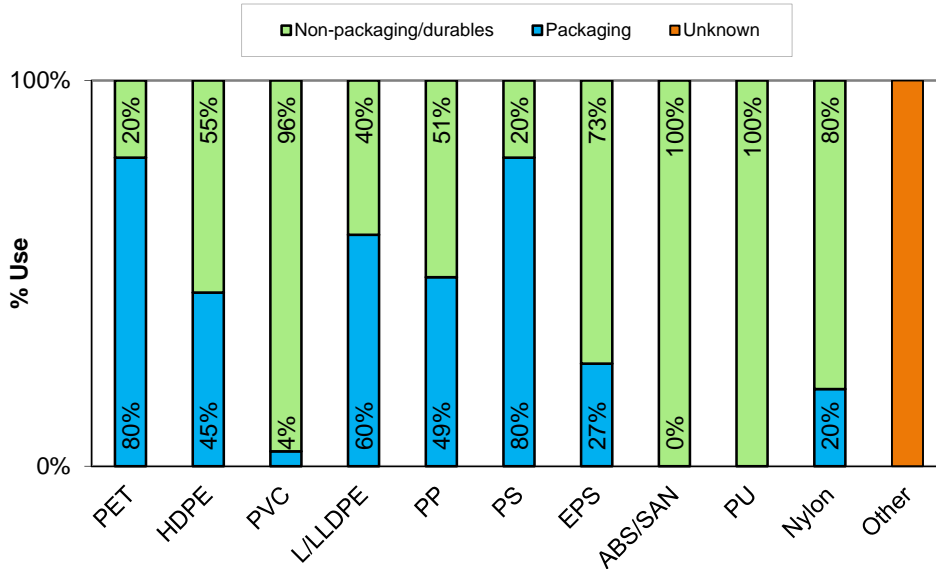
A range of plastics are used in long-term applications in areas such as automotive, construction, agricultural and electrical. In this category most material will not reach end-of-life and be available for recycling for more than 10 years, and in some cases over 50 years. Potentially most underground piping will never be recovered. Recycling programs for products with long-term applications continue to emerge overseas and in Australia.

The long delay between sale and disposal of these products needs to be taken into account when assessing recycling rates. As plastics have gained market share for long-term applications the amount of plastics consumed is always greater than the amount requiring disposal and available for recycling. For long-term applications a diversion rate is required that is based upon the quantity of plastics recycled in a particular year compared to the quantity of end-of-life plastics becoming available for recycling. The establishment of the amount of plastics being disposed of from long-term applications in any 12 month period would require extensive additional data collection, for example the regular quantification of plastics entering landfill nationally, and is not currently feasible for inclusion in this study.



Figure 9 below shows the packaging and non-packaging uses of each major polymer type during 2011–12 by percentage. No data is currently available for the packaging/durables split of ‘other’ plastics.

Figure 9: Packaging and non-packaging/durable use by polymer type

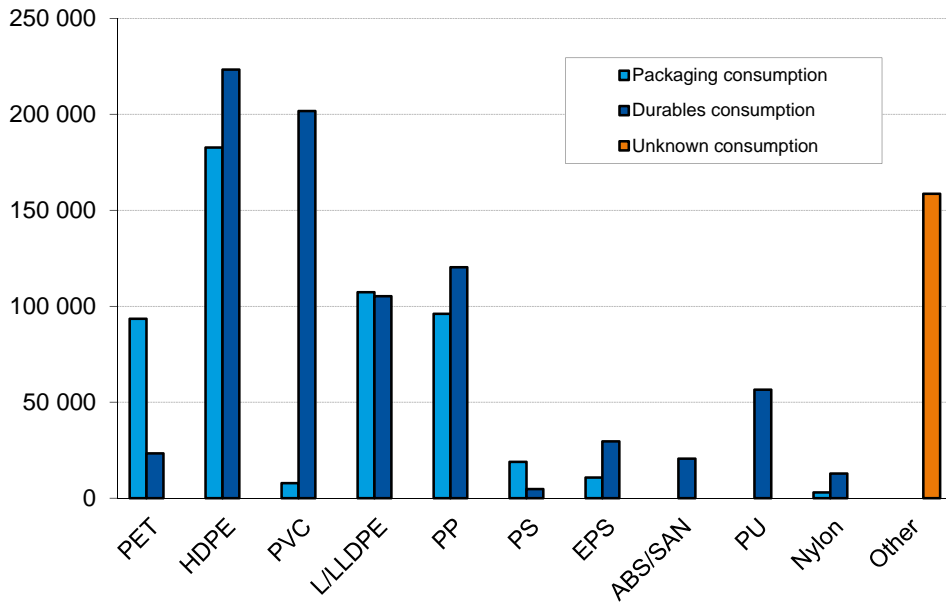


As the figure above shows, some polymers such as PET were used mostly for packaging which generally enters the waste stream very quickly, while others such as PVC and PU are used widely in long-term durable applications which may take many years to enter the waste stream.

In 2011–12 the proportion of HDPE for durable use has increase to 55% from 40% in 2010–11. Total HDPE consumption has also increased by approximately 26% in the same time period. It is likely that the additional HDPE consumption has gone into durable applications.

The quantities of plastics consumed by polymer type in packaging and non-packaging/durables applications are presented in Figure 10. No data is currently available for the packaging/durables split for 'other' plastics.

Figure 10: Consumption of packaging and non-packaging/durables during 2011–12 (tonnes)



4 RECOVERY OPTIONS FOR PLASTIC PRODUCTS

The waste hierarchy provides a guide to the selection of waste minimisation and recovery strategies which maximise the conservation of resources. Avoidance is always preferable to recovery, however there are a number of options available for the recovery of plastic products. It is also important to note that recoverability should also be considered at the design stage to minimise the product's environmental impacts at end of life.

Figure 11: The waste hierarchy (PACIA Quickstarts 2008)

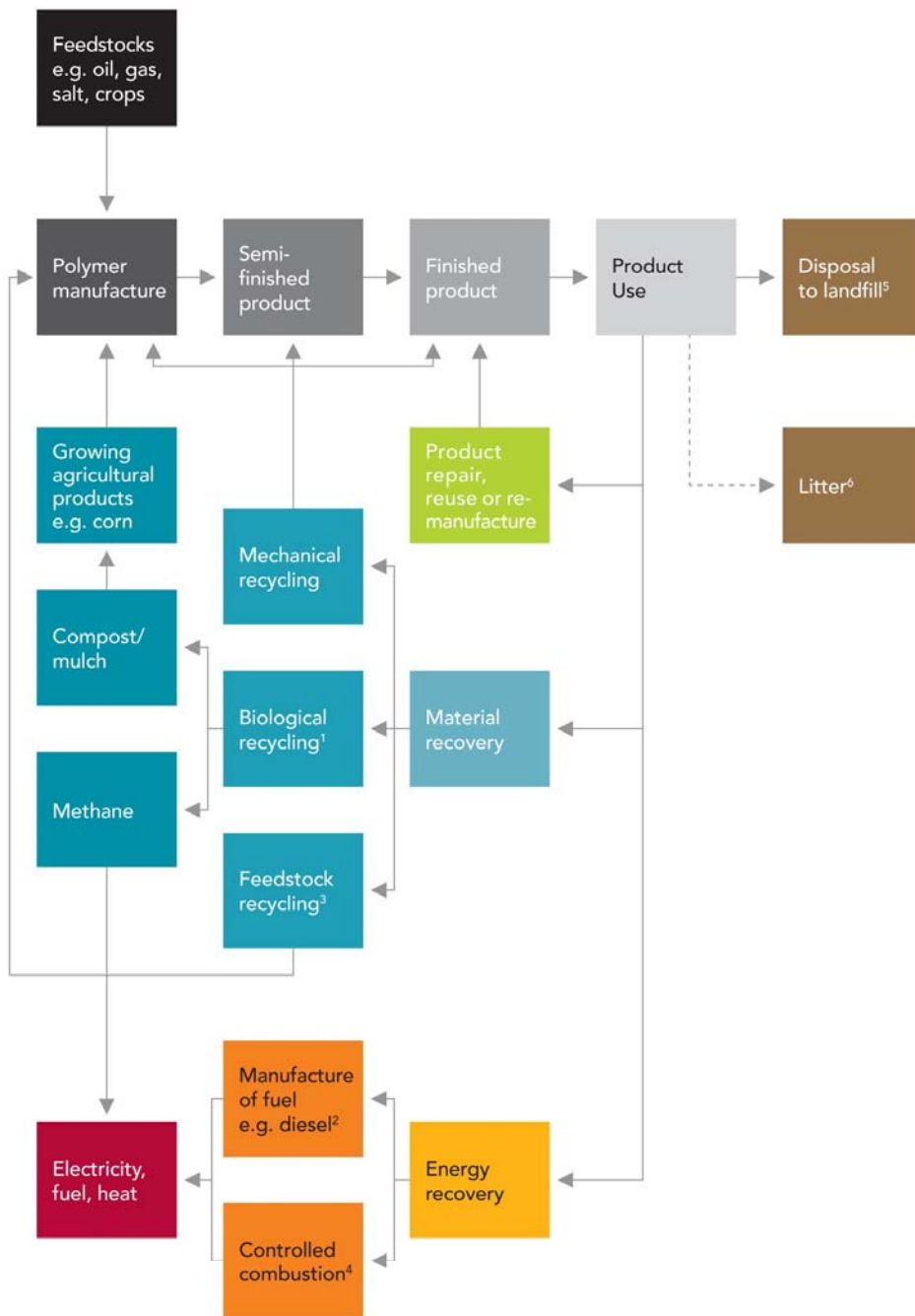


The following sections provide a brief summary of the current status of each recovery option for plastics products in Australia. Refer to Figure 12 for an overview of the life cycle, recovery options and material flows of plastics.

The feasibility and environmental benefit of each recovery option will depend on the design of the product, its durability and the availability of a suitable recovery system. For this reason, an important distinction needs to be made between short-life products such as packaging, and more durable products such as appliances, furniture and building products.

The environmental impacts and benefits of durable products such as electrical and electronic appliances, furniture, cars and building products over their life cycle are more likely to be associated with the use stage.

Figure 12: Lifecycles and material flows for plastics (PACIA Quickstarts 2008)



Notes:

1. Commercial composting is still in its infancy in Australia
2. Pilot plants exist overseas but not currently in Australia
3. This technology is used on a small scale overseas but not currently in Australia
4. This technology is commonly used overseas but not currently in Australia
5. Whilst landfill is used, it is a least preferred destination
6. Litter is a problematic reality for some product types and needs to be eliminated

4.1 Product repair, reuse or remanufacture

Reuse is usually the preferable option, however its feasibility will depend on the economic viability and environmental impacts of reuse, for example from cleaning or transport. Reuse is increasingly being used as a design for sustainability strategy for distribution packaging, for example reusable produce crates are now commonly used for transporting fruit and vegetables from growers all the way to the supermarket shelf. Remanufacturing is undertaken on a smaller scale, usually for electrical or electronic products such as toner cartridges and photocopiers.

4.2 Mechanical recycling

Mechanical recycling means reprocessing of materials into secondary raw materials and products. Mechanical recycling is the focus of this report because the infrastructure for collection and reprocessing is relatively well established in Australia for some products such as packaging. It is also generally preferable to biological or feedstock recycling because it maintains the economic value of the polymer at a relatively high level and significantly reduces the amount of energy required to manufacture new plastic products.

This recovery option is most economically viable for plastics that are available in large quantities, in a clean and homogenous form, and in locations with reasonable access to recycling facilities. Mixed plastics can also be recycled, however they are more challenging as they either need to be separated, or recycled into a reduced range of mixed polymer product types. These mixed polymer products often have long lifespans, and may be recycled back into similar products at end of life.

4.3 Feedstock recycling

Feedstock recycling is the conversion of polymers back into a monomer or new raw materials by changing their chemical structure. Feedstock recycling back into monomers is undertaken on a small scale overseas but not in Australia.

4.4 Biological recycling

Biological recycling (i.e. through composting or anaerobic digestion) is undertaken on a very small scale for packaging made from biodegradable plastics, but facilities are limited, and contamination of compost products is a significant issue.

4.5 Energy recovery

Energy can be recovered from plastics through controlled combustion or conversion to a liquid fuel (which is subsequently burnt). Energy recovery may be a good option for plastics that are not suitable for mechanical recycling, such as contaminated products. There is now some controlled combustion occurring in Australia, however there is no known conversion to liquid fuels.

There is some energy recovery from plastics through the use of a waste derived process fuel at one cement kiln in South Australia, which was approximately 2 000 tonnes in 2010–11 (latest available data). There is also the thermal treatment of medical waste, which contains a reasonably high proportion of plastics, however this is typically undertaken without energy recovery.

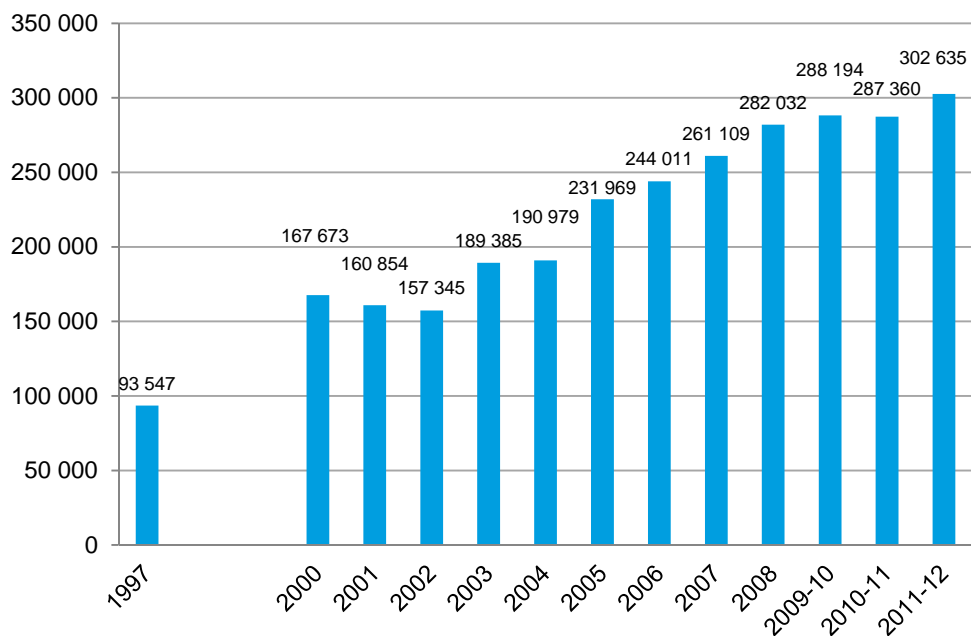
5 PLASTICS RECYCLING AND SOURCING DATA

5.1 Total plastics recycling

The 2012 survey collected data on total plastics recycling during the 2011–12 financial year, comprising of locally reprocessed plastics and plastics exported for reprocessing. This data was collected on a polymer-by-polymer, source state and source sector basis, including both packaging and non-packaging plastics. The overall total recycling outcomes are presented in this section.

A total of 302 635 tonnes of plastics were sent for recycling, either locally or via export in 2011–12. This compares with previous years as shown in Figure 13.

Figure 13: Total quantity of plastics recycled from 1997 to 2011–12 (in tonnes)



The overall result for Australian plastics recycling was an increase of 15 275 tonnes from 287 360 tonnes in 2010–11 to 302 635 tonnes in 2011–12. This represents a 5.0% increase.

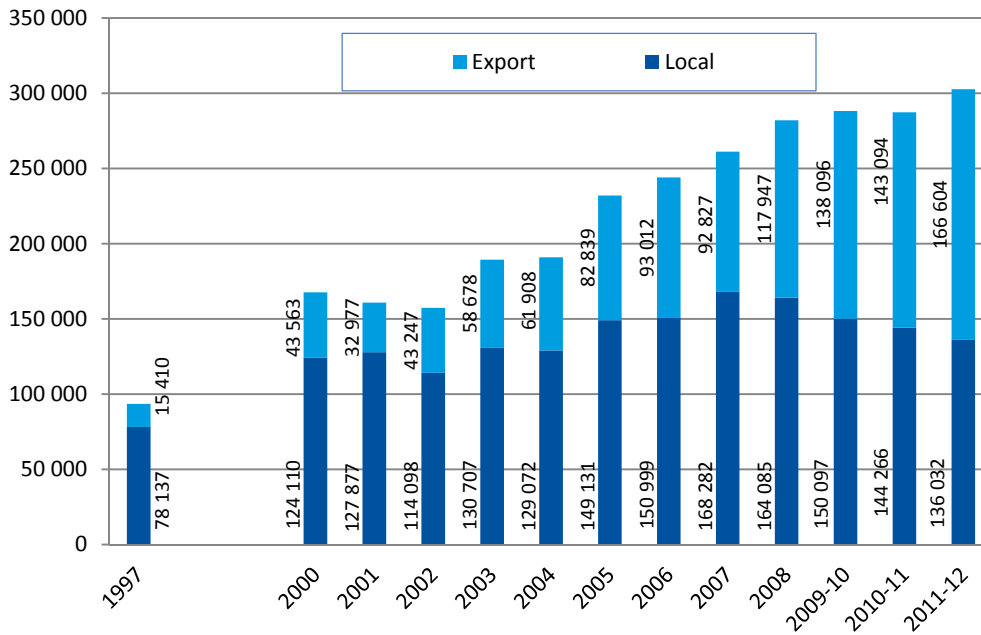
The overall plastics recycling rate increased from 20.1% in 2010–11 to 20.5% in 2011–12. This was largely achieved through an increase in exports of Australian plastics recyclate. Local plastics reprocessing, however, decreased again from 144 266 tonnes in 2010–11 to 136 032 tonnes in 2011–12, a decrease of nearly 6%, and the fourth year in a row in which the Australian reprocessing market has decreased in absolute size.

In 2011–12 166 604 tonnes of used plastics were exported, an increase of more than 16% on the 143 094 tonnes exported in 2010–11.



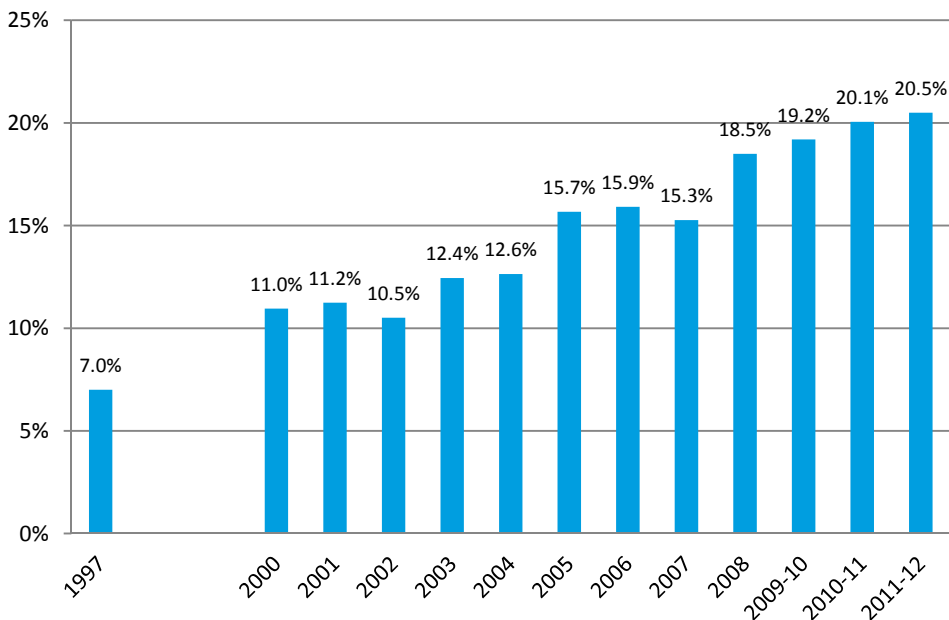
The growth and fluctuations of the local and export reprocessing industries can be seen in Figure 14.

Figure 14: Annual Australian plastics recycling from 1997 to 2011–12 (in tonnes)



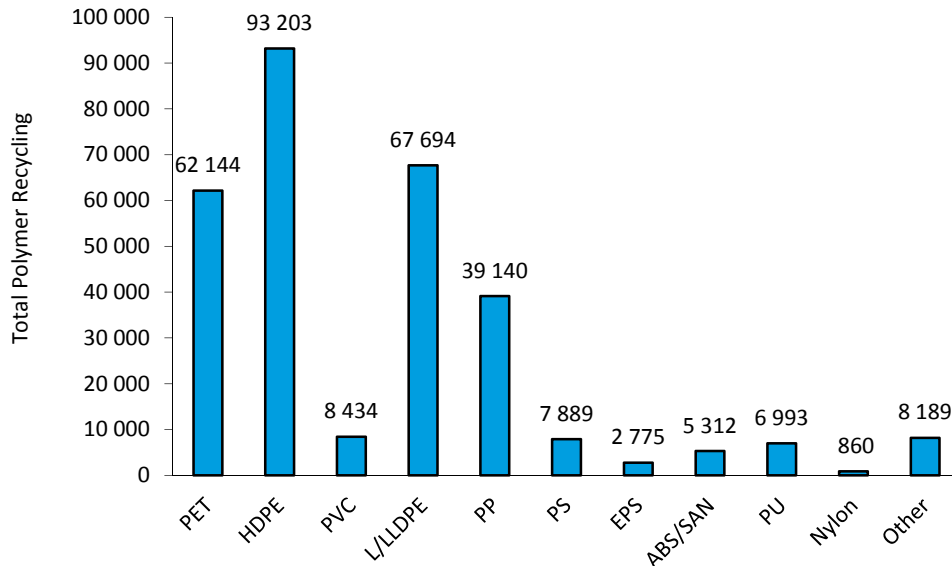
As a percentage of total consumption, across both packaging and non-packaging applications, the total recycling rate for plastics in 2011–12 was 21.1%. The overall annual plastics recycling rates are presented in Figure 15.

Figure 15: Annual Australian plastics recycling rates from 1997 to 2011–12



The quantities of each polymer type recovered for reprocessing (local and export), are shown in Figure 16. This data includes polymers from all sources.

Figure 16: Total polymer recycling (in tonnes)



It is important to note that the recycling rate of each polymer was determined as annual recovery divided by annual consumption. However, as some plastics are used more widely in longer term applications, which are not entering the waste stream in the same year as consumption takes place, this material is not reaching end-of-life and becoming (potentially) available for recycling. As such, it is not possible using the applied calculation method to achieve a perfect recycling rate, even with 100% recovery of all available used plastics.

Table 7 presents total Australian consumption, reprocessing and recycling rates, by polymer type, during 2011–12.

Table 7: Total consumption and recycling by polymer

Polymer	Plastics Identification Code	Consumption	Domestic reprocessing	Export for reprocessing	Total recycling	Recycling rate
		(tonnes)	(tonnes)	(tonnes)	(tonnes)	(%)
PET	1	116 838	15 101	47 043	62 144	53.2%
HDPE	2	405 977	33 668	59 535	93 203	23.0%
PVC	3	209 465	6 222	2 212	8 434	4.0%
L/LLDPE	4	212 525	33 658	34 036	67 694	31.9%
PP	5	216 347	20 323	18 817	39 140	18.1%
PS	6	23 630	2 994	4 896	7 889	33.4%
EPS	6	40 335	2 712	64	2 775	6.9%
ABS/SAN	7	20 619	5 312	0	5 312	25.8%
PU	7	56 523	6 993	0	6 993	12.4%
Nylon	7	15 871	860	0	860	5.4%
Other	7	158 560	8 189	0	8 189	5.2%
Totals	-	1 476 690	136 032	166 604	302 635	20.5%

5.2 Recycling rates for packaging and durables

The recycling rates for packaging and non-packaging/durables are presented in Table 8. The split between packaging and durables consumption and recycling is based on that reported by the surveyed manufacturers and reprocessors.

Table 8: Packaging and durables recycling quantities and rates (2000 to 2011–12)

Year	Packaging recycling		Durables recycling	
	(tonnes)	%	(tonnes)	%
2000	113 189	20.0%	54 484	5.6%
2001	125 375	23.7%	35 479	3.9%
2002	127 397	19.9%	29 948	3.5%
2003	134 905	20.5%	54 480	6.3%
2004	140 584	22.2%	50 395	5.7%
2005	179 125	30.5%	52 844	5.9%
2006	178 351	30.5%	65 660	6.9%
2007	205 019	32.7%	56 089	5.2%
2008	204 036	36.2%	77 996	8.1%
2009–10	196 925	34.8%	91 268	9.8%
2010–11	199 812	37.5%	87 548	9.7%
2011–12	215 538	41.5%	87 097	9.1%

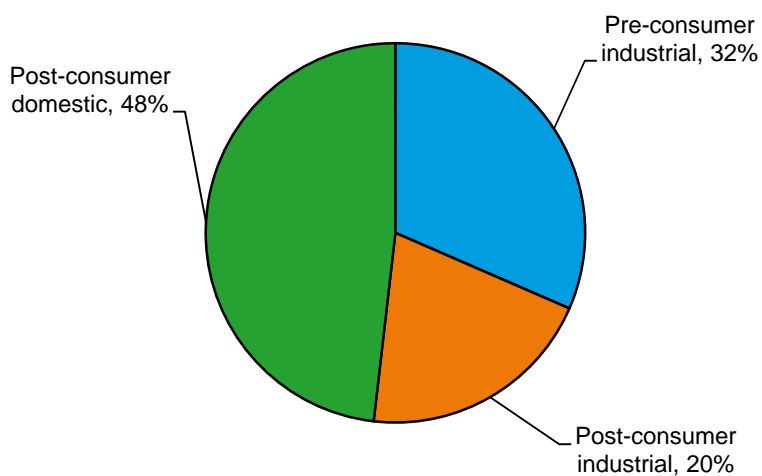
More detailed information on the consumption and recycling of plastic packaging is provided in Section 6.

5.3 Sources of recycled plastic

5.3.1 Sources by sector nationally

During 2011–12 the largest proportion (48%) of recycled plastics were sourced from post-consumer domestic uses, with a further 20% of plastics sourced from post-consumer industrial uses overall, a total of 68% from post-consumer uses. The remaining 32% was sourced from pre-consumer sources, which are almost entirely plastic goods manufacturers. These percentage values are similar to those in 2010–11.

Figure 17: Recycling by sector level of use





5.3.2 Sources by state and sector

In 2011–12, Victoria continued to dominate as the source state for pre-consumer industrial scrap material, due to the large manufacturing sector in the state. This accounts largely for the higher per capita recycling level in Victoria (Figure 19). For more detail on the categories used in Figure 18 and Figure 19 please refer to the Glossary on page 60.

Figure 18: Recycling by material source state and sector level (in tonnes)

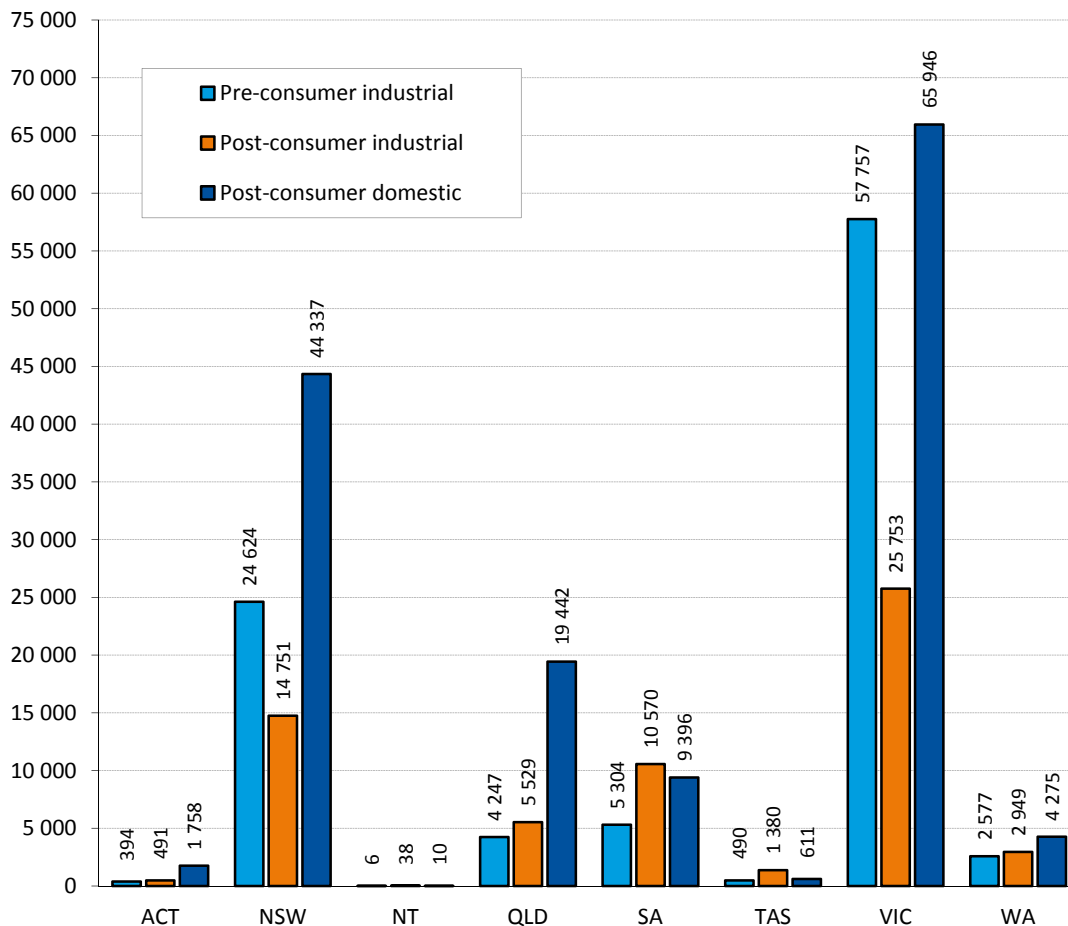
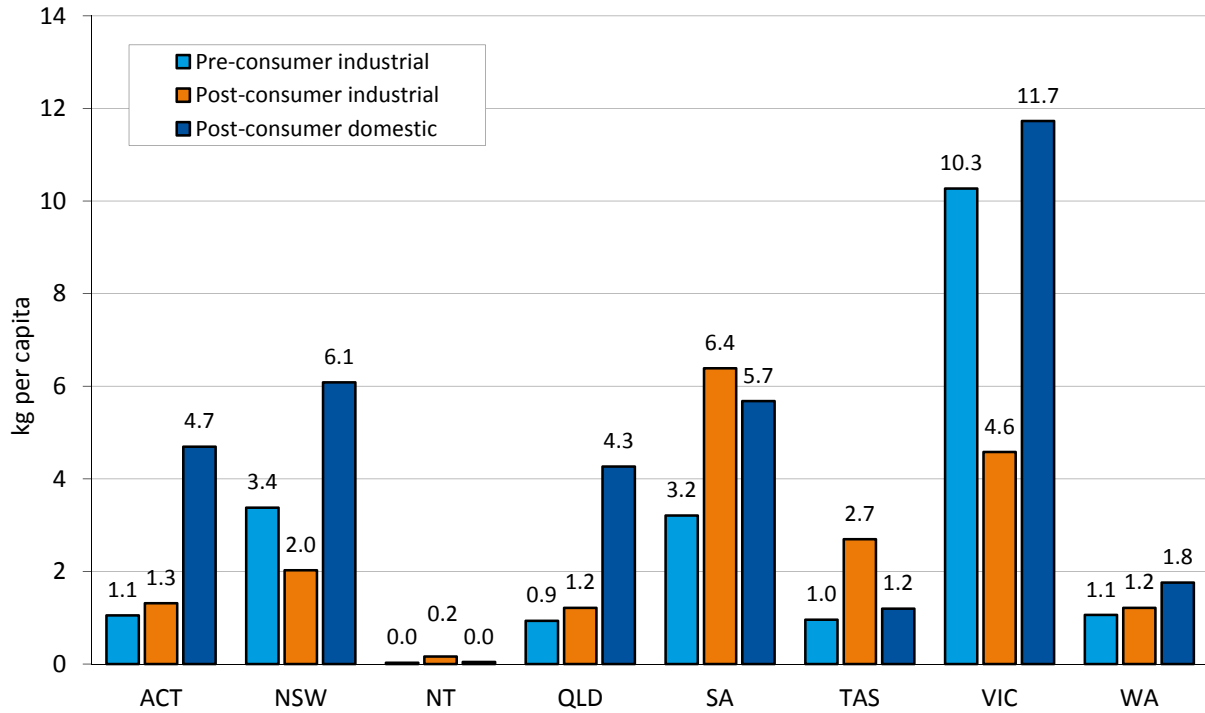




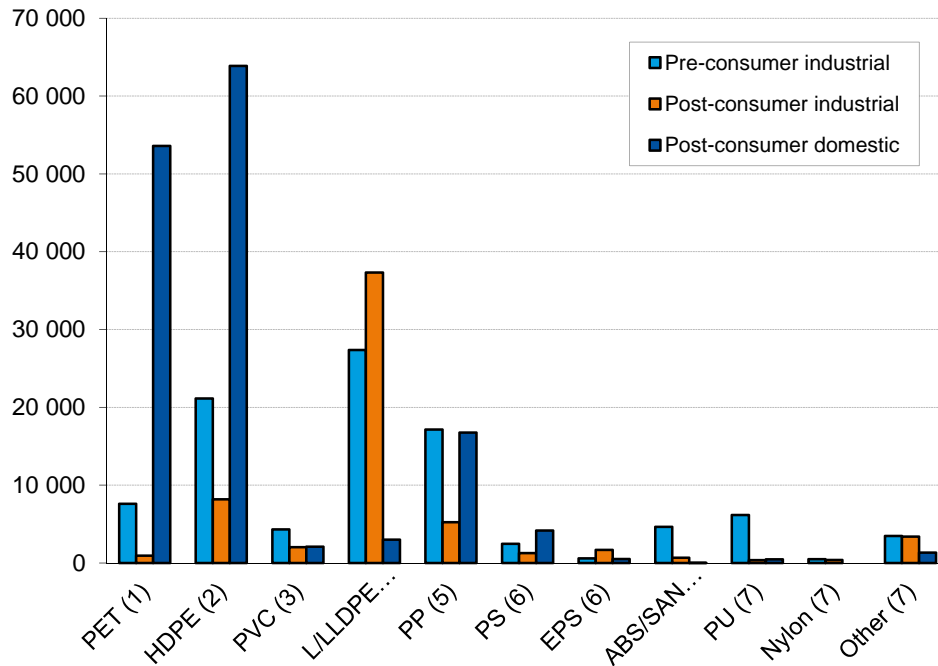
Figure 19: Recycling by material source state and sector level (kg per capita)



5.3.3 Sources by polymer and sector

A summary of the pre and post-consumer split for each polymer shows a wide variation in sources as shown in Figure 20. For example PET is recycled almost entirely from households while L/LLDPE recycle primarily comes from industrial sources.

Figure 20: Recycling by polymer type, by source sector (in tonnes)



5.3.4 Sources by market sector

Within the pre-consumer and post-consumer sectors, locally reprocessed plastics were sourced from a variety of market sectors. Table 9 presents these market sector sources of plastics in detail. In 2011–12 there has been an increase in reprocessed plastic sourced from the Agriculture sector. This is likely an increase in recycling of silage wrap. Recyclate sourced from the Automotive sector had a significant (apparent) reduction, potentially due to a reduction in activity in this sector. However, it should be noted that some reprocessors who reprocessed large quantities of Automotive recyclate closed in 2011–12, and more of this material may have been exported, which could then not be identified in the highly aggregated export data.

Table 9: Market sector sources of locally reprocessed plastics

Market sector	(tonnes)	%
Agriculture	7 958	5.9%
Automotive	1 576	1.2%
Building, construction and demolition	6 762	5.0%
Other commercial and industrial	79 301	58.3%
Domestic	39 773	29.2%
Electrical and electronic	661	0.5%
Total	136 032	100%

Note: As SA reprocessing data obtained from ZWSA did not include a detailed breakdown of industrial market sector, all SA industrial reprocessing is assumed to be from the “Other commercial and industrial” market sector.

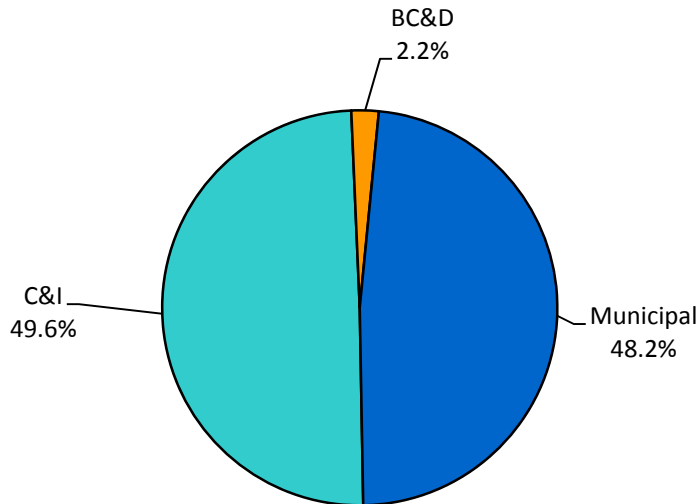
5.3.5 Sources by waste stream

When assessed from a waste/disposal stream perspective, discarded materials are often divided into three waste streams, which are:

- Commercial and industrial (C&I) sector (including both manufacturing scrap and post-consumer industrial).
- Building, construction and demolition (BC&D) sector.
- Municipal (including both kerbside and other municipal material) sector.

The proportion of recycled plastics from each of these three streams is summarised in Figure 21, this includes both locally reprocessed and exported material.

Figure 21: Waste stream source of all recycled plastics (export and local reprocessing)



Commercial and industrial

The C&I sector generated the majority of the plastics recovered for reprocessing during 2011–12. The quantity of plastics recovered for reprocessing from the C&I waste streams during 2011–12 was 150 096 tonnes, or 49.6% of the total quantity of recycled plastics. This includes scrap from plastic product manufacture.

Municipal

The municipal sector consists almost entirely of post-consumer domestic packaging. The total quantity recovered from this sector was 145 777 tonnes during 2011–12 or 48.2% of the total quantity of recycled plastics.

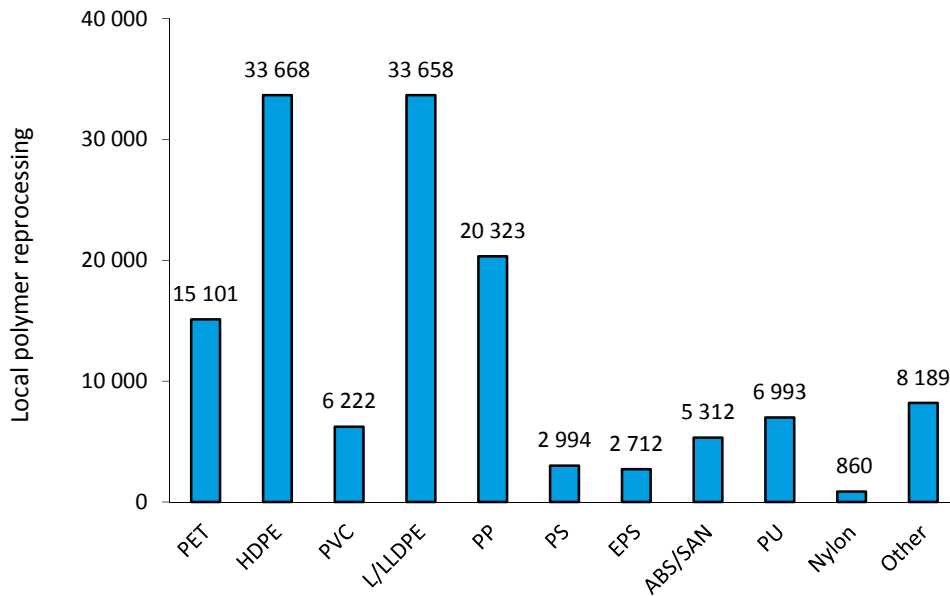
Building, construction and demolition

Although much of the plastic used in the BC&D sector is in long-term durable applications, little of the available plastic packaging and end-of-life durables generated by the industry are currently collected for recycling. The total quantity recovered from this sector in 2011–12 was 6 762 tonnes, or 2.2% of the total quantity of recycled plastics.

5.4 Polymer types reprocessed locally

The quantities for plastics reprocessed in Australia are presented in Figure 22.

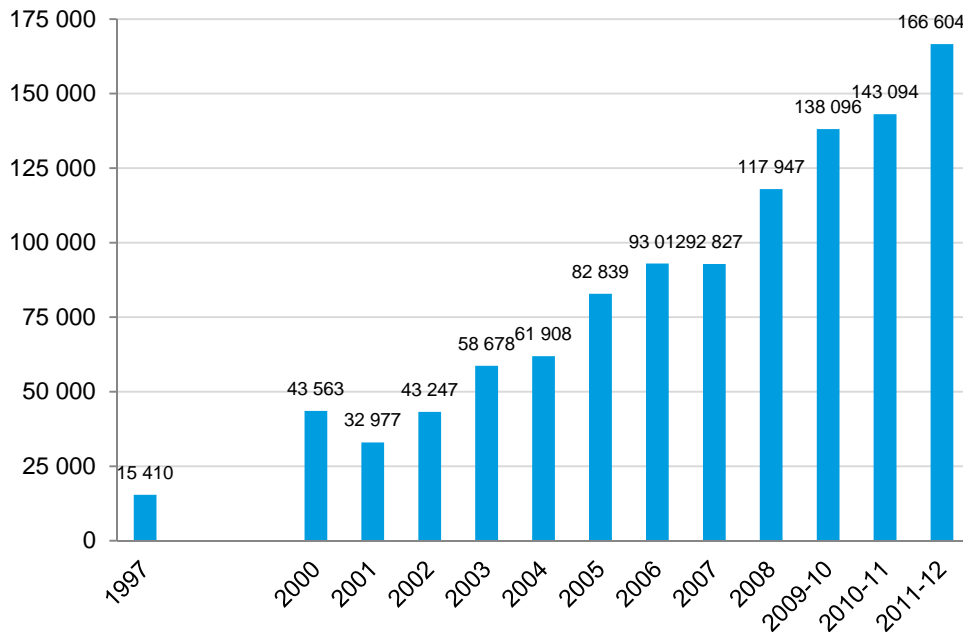
Figure 22: Local plastics reprocessing by polymer type (in tonnes)



5.5 Plastics exported for reprocessing

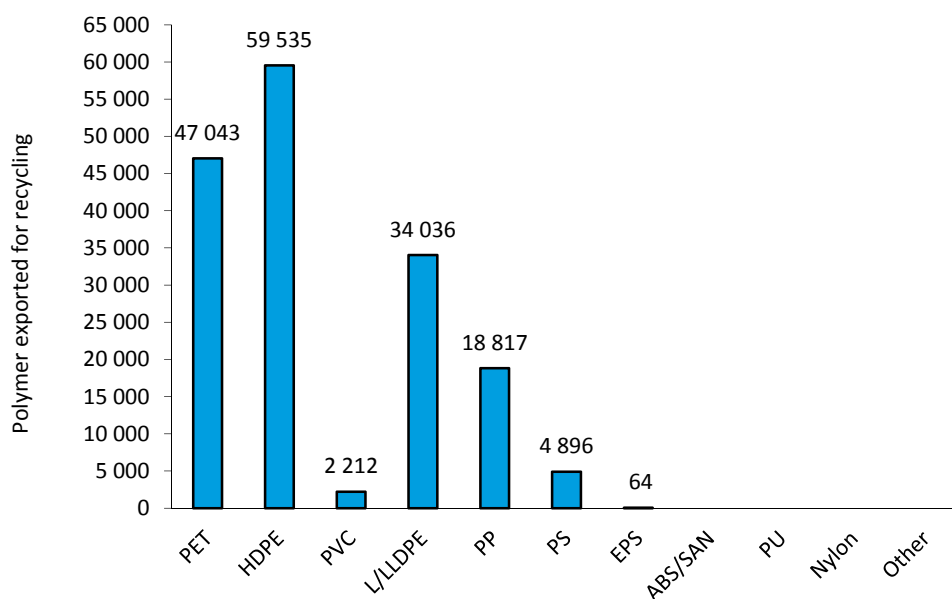
In 2011–12, a total of 166 604 tonnes of waste plastics were exported for reprocessing Figure 23. This is the highest export tonnage recorded to date. This reflects ongoing strong demand from overseas markets, and possibly increased vertical integration by exporters into waste plastics collection and recovery chains.

Figure 23: Plastics recycle export from 1997 to 2011–12 (in tonnes)



The polymer types exported from Australia for reprocessing are presented in Figure 24.

Figure 24: Plastics exported for reprocessing by polymer type (in tonnes)



A breakdown of the plastics exported overseas from each state for reprocessing during 2011–12 is presented in Table 10.

Table 10: Waste plastics exported overseas by polymer and state (in tonnes)

Polymer	PIC	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
PET	1	725	14 112	0	4 436	1 113	0	24 968	1 690	47 043
HDPE	2	941	18 302	12	4 721	1 063	692	32 058	1 764	59 535
PVC	3	34	665	0	198	50	0	1 112	155	2 212
L/LLDPE	4	578	11 244	28	1 126	0	1 616	19 138	306	34 036
PP	5	290	5 645	0	1 774	445	0	9 987	676	18 819
PS	6	75	1 453	0	546	111	17	2 525	169	4 896
EPS	6	1	14	0	34	0	6	9	0	64
Totals	-	2 643	51 435	40	12 834	2 782	2 331	89 797	4 741	166 604

Source: Exporters, DFAT and published kerbside recyclables audits. As some material is exported in a mixed form, overall totals are accurate, however the data for each polymer is an estimate based upon the composition of mixed bales.

6 CONSUMPTION AND RECYCLING OF PACKAGING

There are a number of ongoing developments and trends in plastic packaging technology, materials and design, and processing infrastructure that are likely to be impacting upon recycling trends. These developments/trends apply to some packaging types more than others, and are summarised below.

Technical development

- Light weighting – new production techniques are enabling plastics to be produced with the same performance properties but thinner material, meaning lighter packaging weight and less packaging material per unit weight of product. In some cases, this can be in the order of a 15% reduction and is likely to be impacting upon the reported weight (tonnes) in consumption and recovery.
- Multi-layer plastics (co-extruded) – laminated plastics, primarily films, are being increasingly produced where different types of plastics with different properties (UV protection, O₂/H₂O/CO₂ barrier) are extruded together to perform more complex functions. These are being used to meet the demand for improved food preservation and product protection. Co-extruded films are less able to be mechanically recycled, and are less likely to be labelled as recyclable, and are therefore likely to be changing some aspects of recovery data.

Packaging design developments

- Rigid to flexibles – products such as laundry detergents, and shelf stable foods such as soups and sauces, had seen a shift some years back from packaging in cardboard, glass or tin-plated steel, to rigid plastics. These product packages are now further evolving to use flexible pouches and sachets. Some manufacturers indicate this is yielding a weight reduction of over 50% for some packaging types, however, generally these types of flexible packaging are not currently recoverable through kerbside recycling systems.
- Single serve – products are increasingly sold in single serve containers. This is increasing the quantity and complexity of plastic items, reducing their average size, and potentially negatively impacting levels of recycling.

Collection and infrastructure

- Costs and purchase price – prices paid for plastic recyclate have been highly variable, especially with the impacts from the global financial crisis and shifts in the Australian dollar. This has had a direct impact upon export and local demand and costs of transport of plastics recyclate.
- Changes in processing – the shift from hand sorting to high speed mechanical sorting, has potentially reduced yields for some types of plastic packaging, but has also probably enabled the broadening of collection services. International innovations in processing equipment (e.g. polymer sorters) mean there is greater capacity to sort and separate different plastic packaging types by polymer type and colour. This type of equipment is achieving some scale of use in Australia, and should in the future be helpful in achieving higher levels of plastic packaging recovery across the more diverse range of packaging formats now on the market.

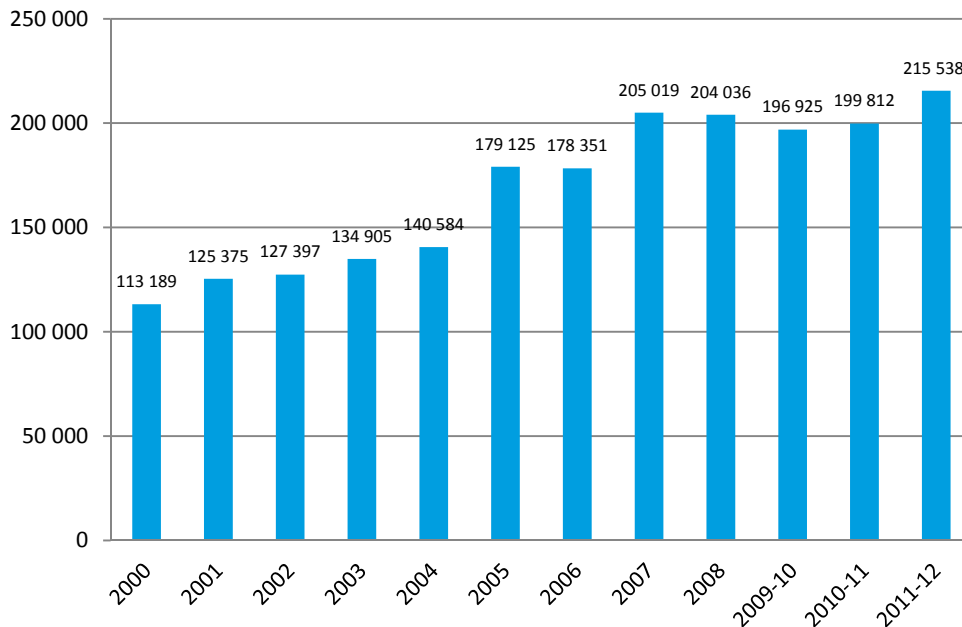
These trends represent ongoing challenges and opportunities to maintaining and increasing plastics packaging recycling rates. Any trend aspects negatively impacting on recovery rates are likely to be mitigated by improvements in the related processing and recovery technologies.

Presented in the rest of this section of the report are the key packaging related data.

6.1 Total plastics packaging recycling

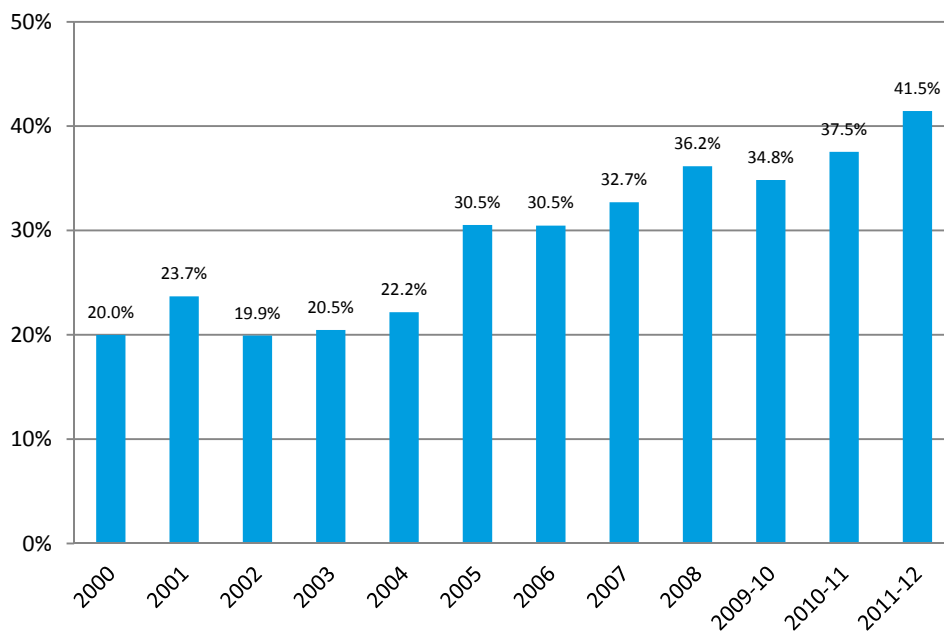
A total of 215 538 tonnes of plastics packaging was recycled in 2011–12, a 7.8% increase from 2010–11.

Figure 25: Total plastics packaging recycling from 2000 to 2011–12 (in tonnes)



Total packaging consumption during 2011–12 was 519 966 tonnes, giving a plastics packaging recycling rate of 41.5%, up from 37.5% in 2010–11. The packaging recycling rate has generally increased since 2002. Year-on-year recycling rates are shown in Figure 26.

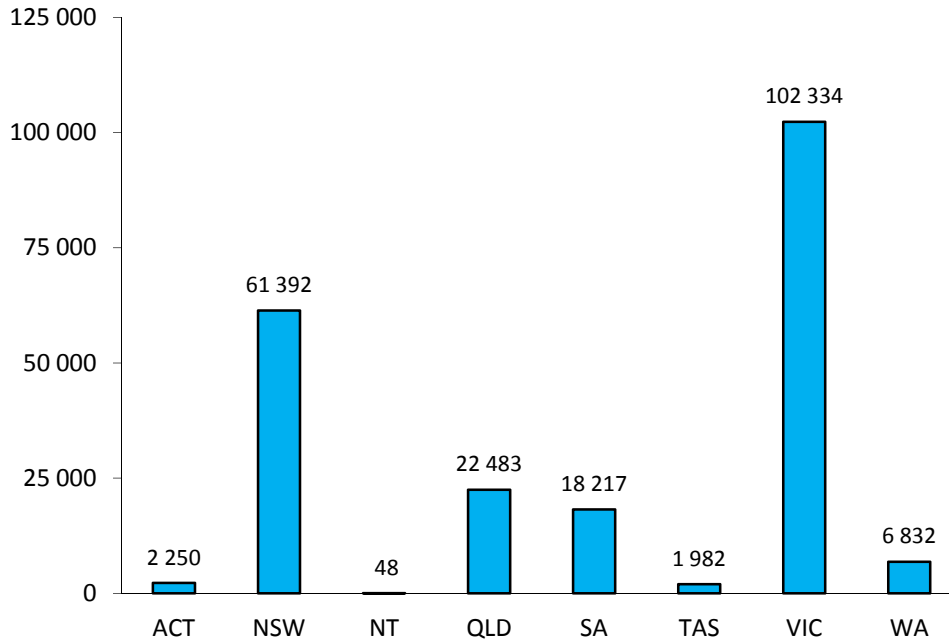
Figure 26: Total plastics packaging recycling rate from 2000 to 2011–12



6.2 Packaging recovery by state source

Figure 27 shows the total recovery of plastic packaging. This material is sourced from a mix of: building, construction and demolition; commercial and industrial; and municipal sources.

Figure 27: Plastics packaging recycling by source state



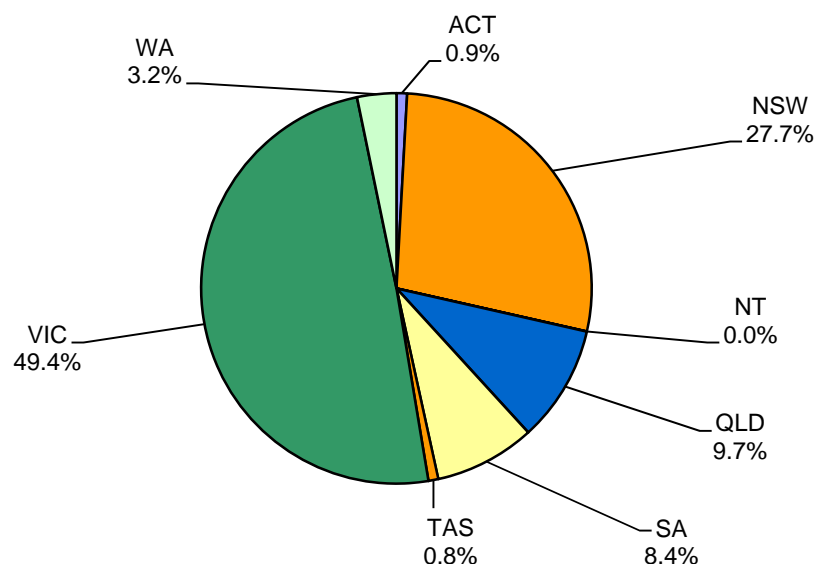
7 ANALYSIS OF CONSUMPTION AND RECOVERY BY STATE/TERRITORY

This section contains the analysis of each Australian jurisdiction’s consumption and recovery of plastics, as well as data on reprocessor numbers in each jurisdiction and interstate flows of waste plastics for reprocessing. Throughout this section of the report consumption data for each jurisdiction is estimated based upon the jurisdiction’s population as a proportion of the national population. The population data used for this purpose is provided in Table 5 on page 11.

7.1 Total plastics recovery by source state

The source state of recovered material is shown in Figure 28. Victoria dominates plastic recovery due to the high level of plastics manufacture in the state, resulting in significant generation and recovery of pre-consumer material. Victoria also has the largest number of plastics recyclers of any state.

Figure 28: Source state of recovered material



In 2011–12 a total of 54 tonnes of plastics were reported as recycled from the Northern Territory, a recycling rate of less than 1%. This included 40 tonnes exported and 14 tonnes reprocessed in NSW and is an increase from 2010–11 when no recycling was reported from this jurisdiction. Some of the reasons for the low recycling rate in NT are the lack of reprocessors in the Territory and the distances for transport making it an expensive exercise.

7.2 Reprocessor numbers and types by state

The total number of reprocessors in each state is presented in Table 11, as well as the numbers of reprocessors of each type of polymer by state. The number of reprocessors in each state and of each polymer type may not be the same, as many reprocessors handle more than one polymer type. No reprocessors were identified in the Australian Capital Territory or the Northern Territory.

Table 11: Total number of reprocessing sites by state

			Total						
			NSW	QLD	SA	TAS	VIC	WA	Total
Number of reprocessing sites in state			15	9	15	1	23	4	59
Polymer reprocessed		PIC							
Number of sites that reprocess a specific polymer in state	PET	1	3	2	1	0	5	1	11
	HDPE	2	8	3	3	1	11	1	27
	PVC	3	2	1	1	0	5	1	9
	L/LLDPE	4	7	3	3	1	9	1	23
	PP	5	5	2	3	1	10	0	19
	PS	6	5	4	1	0	5	1	16
	EPS	6	1	2	3	1	8	1	14
	ABS/SAN	7	4	2	2	0	4	0	11
	PU	7	2	0	0	0	0	0	2
	Nylon	7	2	1	1	0	1	0	5
Other	7	4	1	2	0	5	0	11	

Note: South Australian reprocessor information was provided by Zero Waste SA (ZWSA). ZWSA advised that 15 reprocessors were present in South Australia, however did not provide a breakdown by polymers reprocessed at each site. The breakdown presented in this table for South Australia for 2010–11

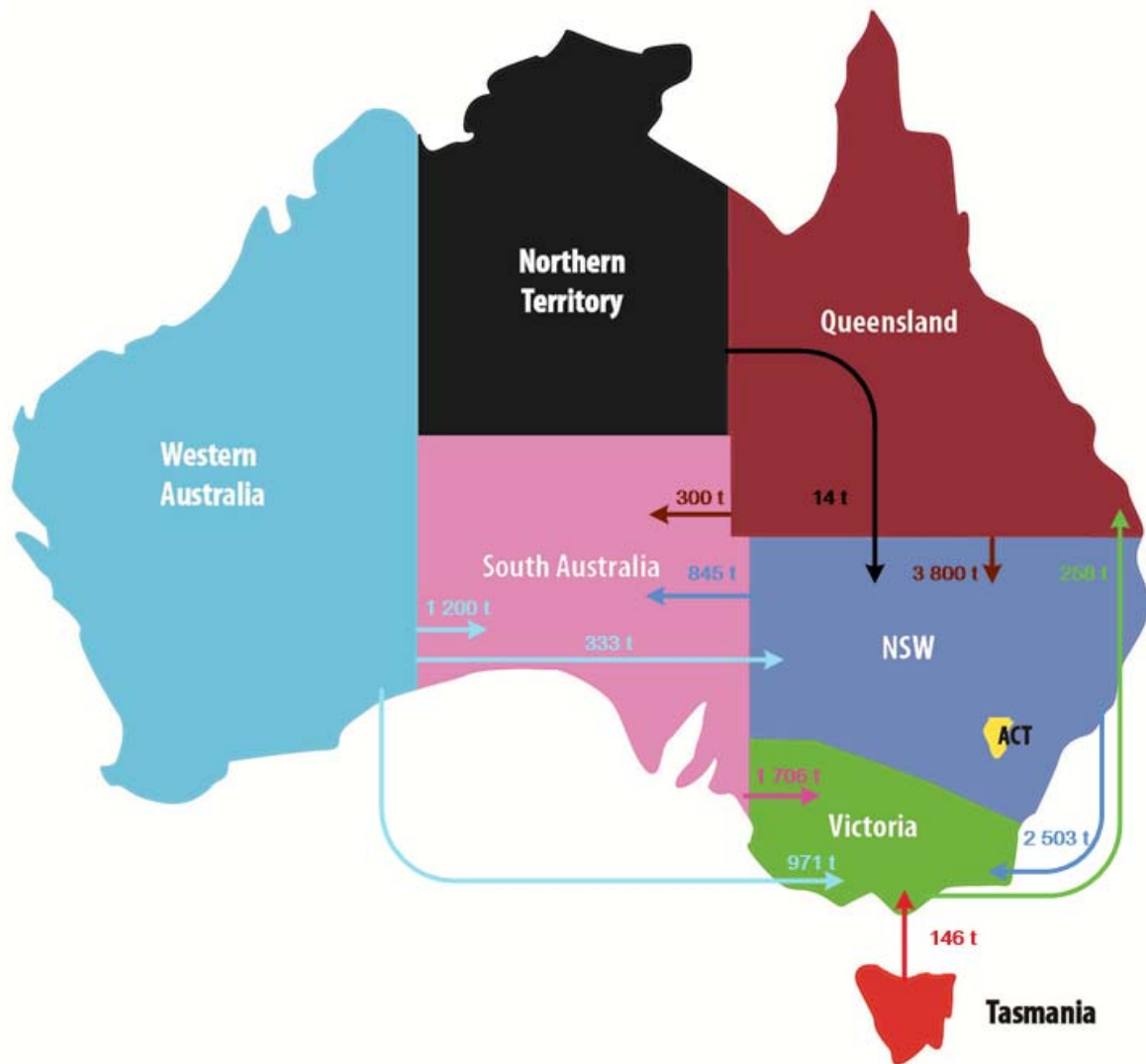
7.3 Interstate polymer flows

In Australia there were significant interstate flows of plastic recycle from the state of generation to the location of reprocessing, whether interstate or overseas as shown in Table 12. These flows are also mapped in Figure 29. Due to issues relating to the commercial confidentiality of data supplied by reprocessors, only net flows of plastics between states are provided.

Table 12: Interstate net flows and export of plastics for reprocessing

Location of reprocessing	State of recycle origin								Total
	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	
ACT									
NSW			14	3 800				333	4 146
NT									
QLD							258		258
SA		845		300				1 200	2 345
TAS									
VIC		2 503			1 706	146		971	5 326
WA									
Overseas	2 643	51 435	40	12 834	2 782	2 331	89 797	4 741	166 604

Figure 29: Origin and destination of recovered plastics (net state flows only)

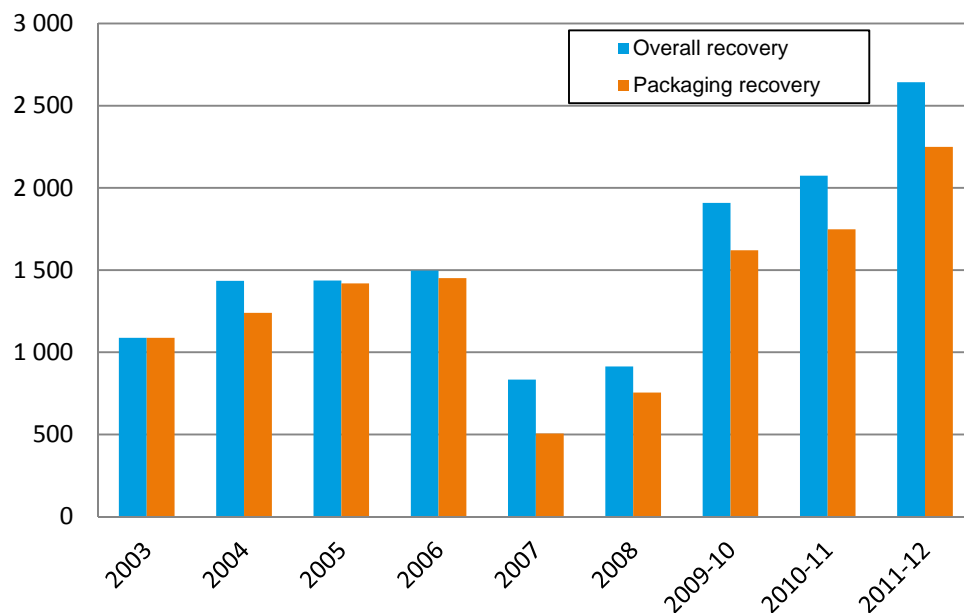


7.4 Consumption and recovery in the Australian Capital Territory

Overall plastics consumption in the ACT during the 2011–12 year was estimated as 24 393 tonnes, based upon a per capita estimation using national overall plastics consumption data. Overall recovery of plastics from the ACT during the same period was 2 643 tonnes, giving an overall plastics recycling rate of 10.8%. Detailed state level data was first collected for the 2003 calendar year.

ACT’s relatively low level of industrial activity results in low level consumption of plastics in industrial durables, packaging applications and pre-consumer industrial scrap generation. As overall consumption of plastics and packaging are calculated on a per capita basis, this may result in ACT consumption data being overstated with a corresponding negative impact upon recycling rates.

Figure 30: Annual plastics recovery in the ACT (tonnes)



Caution is advocated when assessing the ACT recycling rates, as some recycled material from the ACT may be included in reprocessing data reported for NSW. No actual plastics reprocessing takes place in the ACT.

Table 13: Total consumption and recycling in the ACT

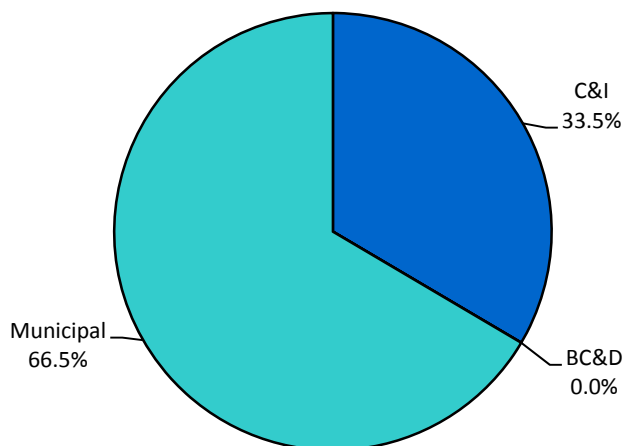
Year	Total consumption	Total recovery	Overall recycling rate	Packaging consumption	Packaging recovery	Packaging recycling rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
2003	24 533	1 088	4.4%	10 632	1 088	10.2%
2004	24 223	1 435	5.9%	10 171	1 240	12.2%
2005	23 645	1 436	6.1%	9 374	1 419	15.1%
2006	24 743	1 497	6.1%	9 444	1 451	15.4%
2007	27 519	833	3.0%	10 086	506	5.0%
2008	24 514	914	3.7%	9 070	755	8.3%
2009–10	23 994	1 909	8.0%	9 035	1 621	17.9%
2010–11	23 076	2 074	9.0%	8 571	1 748	20.4%
2011–12	24 393	2 643	10.8%	8 589	2 250	26.2%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 31 provides the split by source sector of recovered plastics from ACT for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

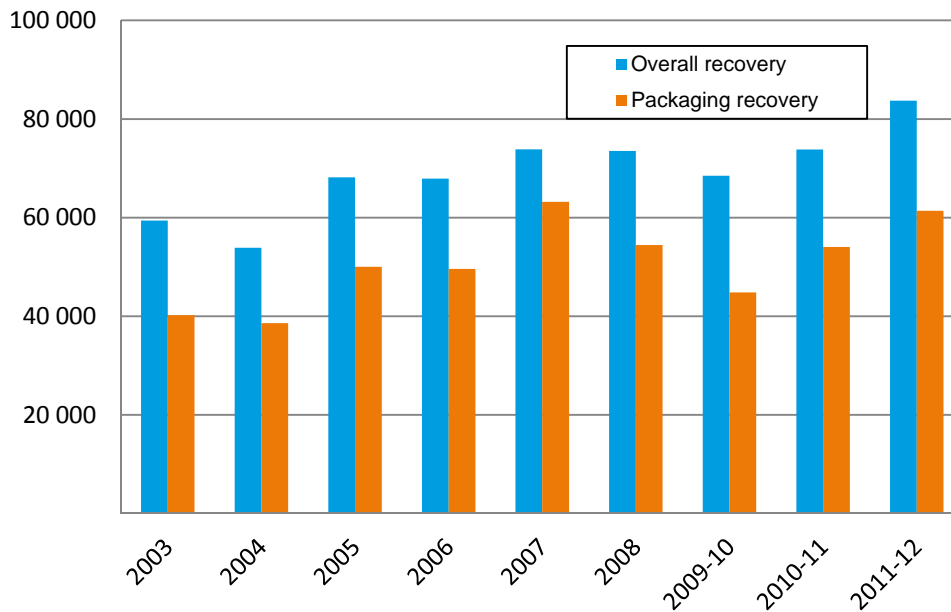
Figure 31: Recovery by source sector in the ACT



7.5 Consumption and recovery in New South Wales

Overall plastics use in NSW during the 2011–12 financial year was 474 664 tonnes, based on a per capita estimation of overall plastics consumption. This is an increase of 3 000 tonnes from 2010–11. Overall recovery of plastics during the same period was 83 713 tonnes, giving an overall recycling rate of 17.6%, up from 15.9% in 2010–11. Detailed data has been collected for NSW since 2003, as shown in Figure 32.

Figure 32: Annual plastics recovery in NSW (tonnes)



Plastics recycling rates in NSW reduced in 2009–10, largely due to the financial crisis, however they have recovered to record levels in 2011–12. The total recovery increase has been driven mainly by increased recyclate exports with local recovery falling slightly from 2010–11.

Table 14: Total consumption and recycling in NSW

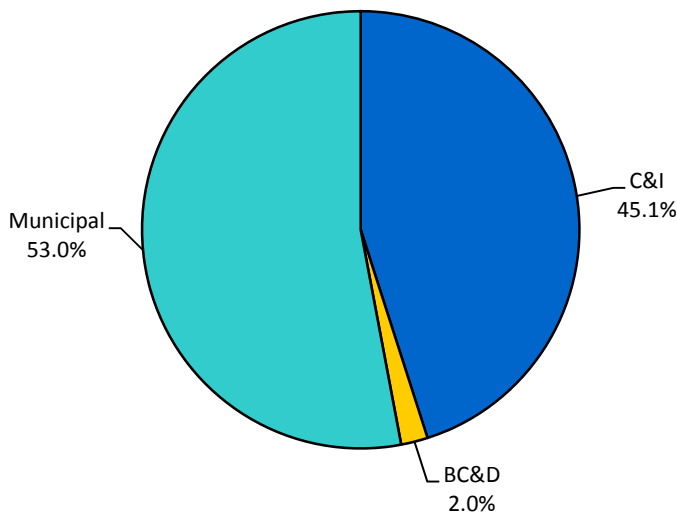
Year	Total consumption (tonnes)	Total recovery (tonnes)	Overall recycling rate (%)	Packaging consumption (tonnes)	Packaging recovery (tonnes)	Packaging recycling rate (%)
2003	510 751	59 396	11.6%	221 359	40 232	18.2%
2004	504 928	53 902	10.7%	212 012	38 601	18.2%
2005	492 404	68 163	13.8%	195 225	50 029	25.6%
2006	504 126	67 902	13.5%	192 415	49 596	25.8%
2007	559 335	73 841	13.2%	205 010	63 201	30.8%
2008	496 241	73 531	14.8%	183 602	54 444	29.7%
2009–10	484 576	68 508	14.1%	182 462	44 827	24.6%
2010–11	463 688	73 821	15.9%	172 219	54 062	31.4%
2011–12	474 664	83 713	17.6%	167 137	61 392	36.7%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 33 below gives the split by source sector of recovered plastics from NSW for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

Figure 33: Recovery by source sector in NSW



7.6 Consumption and recovery in the Northern Territory

Overall plastics use in the Northern Territory during the 2011–12 financial year was 15 290 tonnes, based on a per capita estimation of overall plastics consumption. This is an increase of approximately 600 tonnes from 2010–11. Reported recovery of plastics during the same period was 54 tonnes, giving an overall recycling rate of less than 1%. Of the recovery in the Northern Territory, 40 tonnes was exported for reprocessing. This is the first year that this separate section for the Northern Territory has been provided in this report.

Figure 34: Annual plastics recovery in the Northern Territory (tonnes)

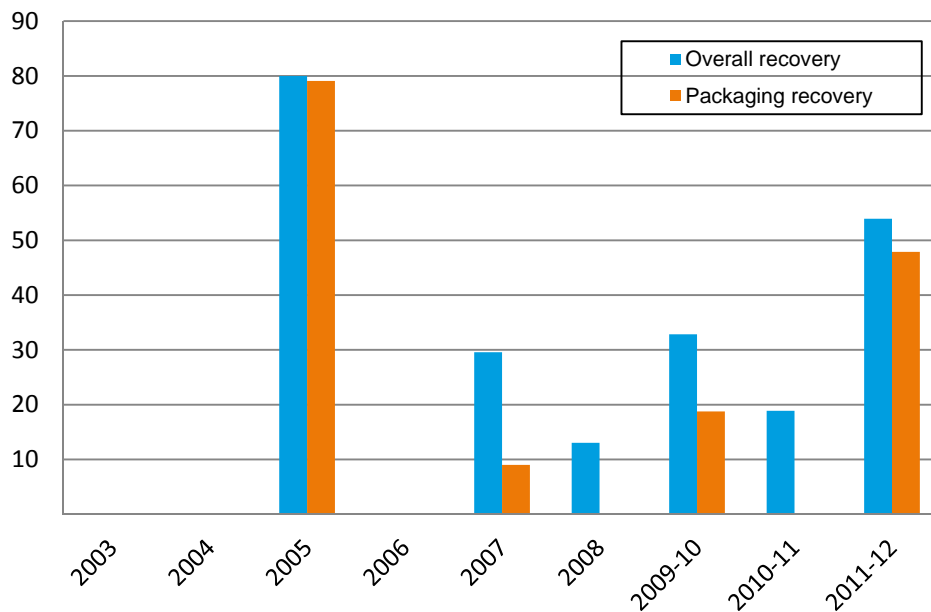


Table 15: Total consumption and recycling in the Northern Territory

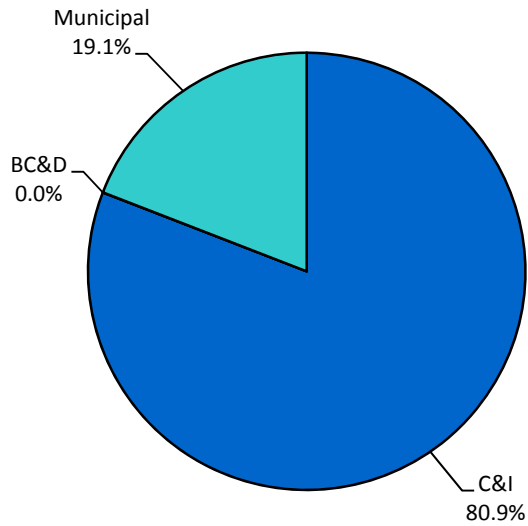
Year	Total consumption (tonnes)	Total recovery (tonnes)	Overall recycling rate (%)	Packaging consumption (tonnes)	Packaging recovery (tonnes)	Packaging recycling rate (%)
2011–12	15 290	54	0.4%	5 384	48	0.9%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 35 below gives the split by source sector of recovered plastics from the Northern Territory for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

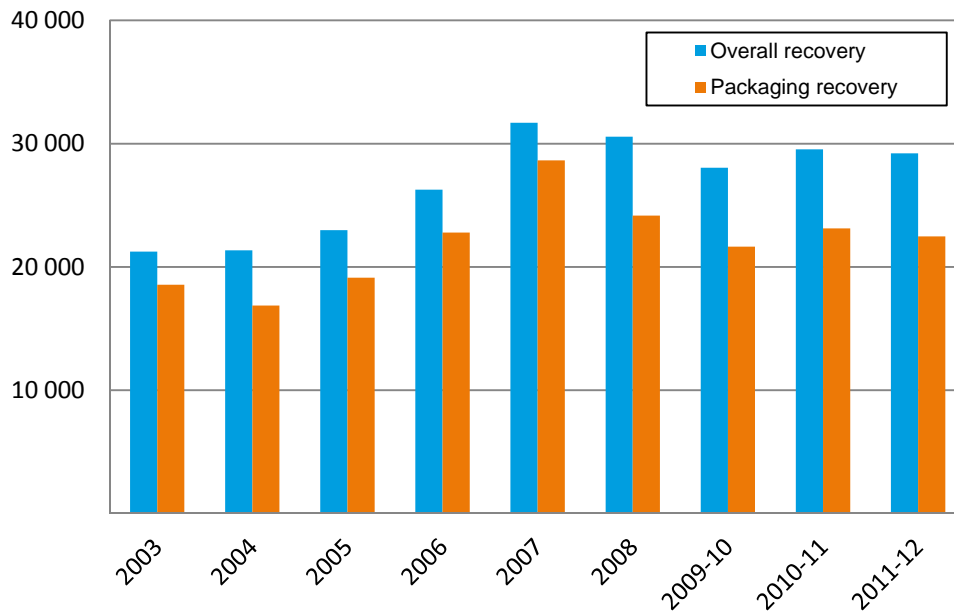
Figure 35: Recovery by source sector in the Northern Territory



7.7 Consumption and recovery in Queensland

Overall plastics consumption in Queensland during the 2011–12 year was 296 899 tonnes, based upon a per capita estimation using national overall plastics consumption data. Overall recovery of plastics from Queensland during the same period was 29 217 tonnes, giving an overall plastics recycling rate of 9.8%— steady from 2010–11. Detailed state level data was first collected for the 2003 calendar year.

Figure 36: Annual plastics recovery in Queensland (tonnes)



Higher recycling rates in 2007 and 2008 were likely driven by the record high prices for plastic recycle prior to the financial crisis, culminating at the end of 2008. The recovery that was evident in 2010–11 has been consolidated in 2011–12.

Table 16: Total consumption and recycling in Queensland

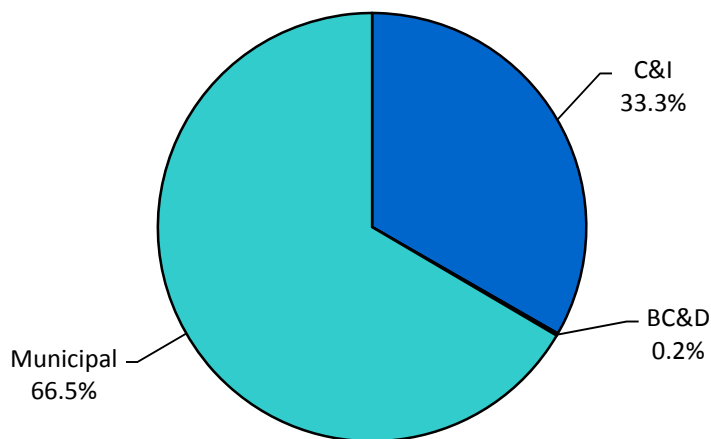
Year	Total consumption	Total recovery	Overall recycling rate	Packaging consumption	Packaging recovery	Packaging recycling rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
2003	292 026	21 249	7.3%	126 564	18 563	14.7%
2004	292 761	21 353	7.3%	122 926	16 871	13.7%
2005	289 596	22 984	7.9%	114 817	19 129	16.7%
2006	303 868	26 269	8.6%	115 980	22 795	19.7%
2007	341 423	31 699	9.3%	125 140	28 648	22.9%
2008	306 532	30 571	10.0%	113 413	24 165	21.3%
2009–10	305 241	28 052	9.2%	114 936	21 645	18.8%
2010–11	290 032	29 537	10.2%	107 722	23 121	21.5%
2011–12	296 899	29 217	9.8%	104 543	22 483	21.5%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 37 below gives the split by source sector of recovered plastics from Queensland for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

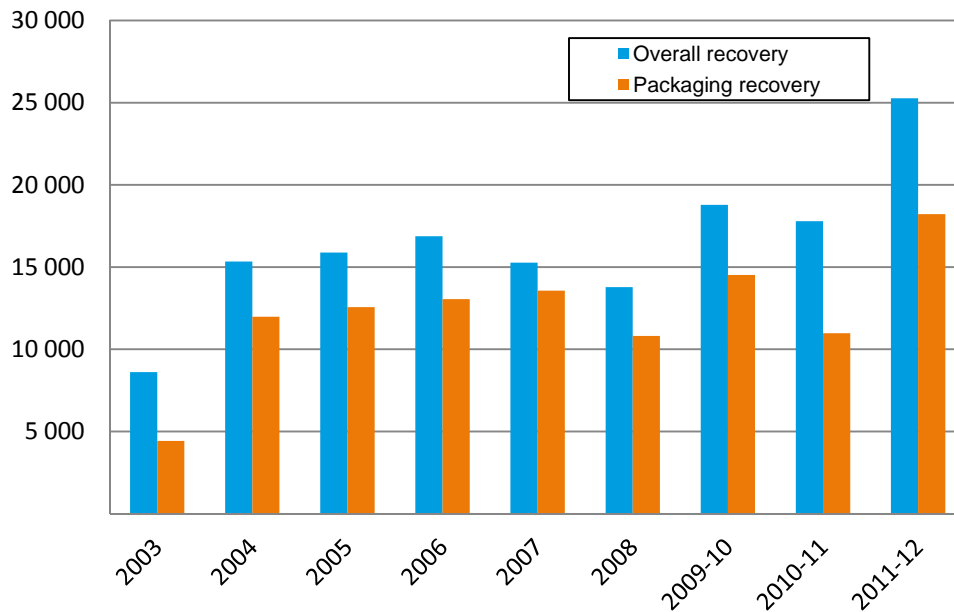
Figure 37: Recovery by source sector in Queensland



7.8 Consumption and recovery in South Australia

Overall plastics consumption in South Australia during the 2011–12 year was 107 740 tonnes, based upon a per capita estimation using national overall plastics consumption data. Overall recovery of plastics from SA during the same period was 25 270 tonnes, giving an overall plastics recycling rate of 23.5%. Detailed state level data was first collected for the 2003 calendar year.

Figure 38: Annual plastics recovery in SA (tonnes)



Anecdotally, it is understood that more plastics are being diverted from WA to SA for reprocessing than have been reported. This could account for some of the increase in 2011–12 recycling for SA.

Table 17: Total consumption and recycling in SA

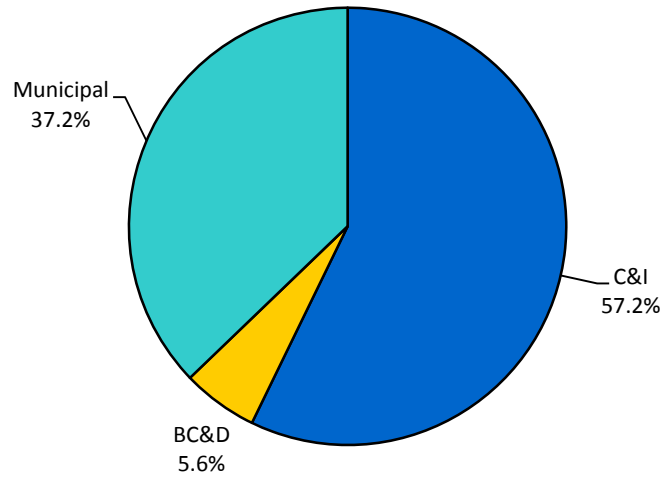
Year	Total consumption	Total recovery	Overall recycling rate	Packaging consumption	Packaging recovery	Packaging recycling rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
2003	116 458	8 607	7.4%	50 473	4 427	8.8%
2004	114 871	15 341	13.4%	48 233	11 978	24.8%
2005	111 920	15 887	14.2%	44 373	12 565	28.3%
2006	115 877	16 881	14.6%	44 228	13 055	29.5%
2007	128 541	15 275	11.9%	47 113	13 567	28.8%
2008	113 606	13 778	12.1%	42 032	10 814	25.7%
2009–10	111 079	18 783	16.9%	41 826	14 520	34.7%
2010–11	105 231	17 794	16.9%	39 084	10 972	28.1%
2011–12	107 740	25 270	23.5%	37 937	18 217	48.0%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 39 below gives the split by source sector of recovered plastics from SA for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12. Some BC&D sourced plastics go for energy recovery in SA.

Figure 39: Recovery by source sector in SA

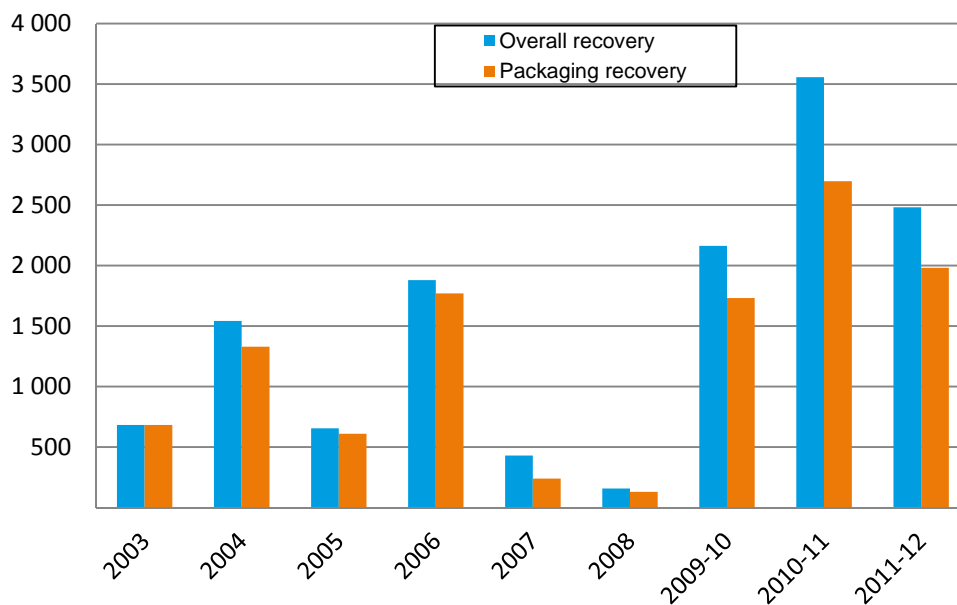


7.9 Consumption and recovery in Tasmania

Overall plastics consumption in Tasmania during the 2011–12 year was 33 337 tonnes, based upon a per capita estimation using national overall plastics consumption data. Overall recovery of plastics from Tasmania during the same period was 2 481 tonnes, giving an overall plastics recycling rate of 7.4%. Detailed state level data was first collected for the 2003 calendar year.

Tasmanian recycling rates have increased off a very low base and will have improved over the last few years as kerbside and commercial collection systems have matured.

Figure 40: Annual plastics recovery in Tasmania (tonnes)



The low recycling rates in 2007 and 2008 were possibly due to the recovery and internal domestic shipping of plastic packaging from Tasmania to Victoria, for which the source state (i.e. Tasmania) was not correctly categorised in Customs data. This issue will possibly re-occur in future years, so the calculation method has been adjusted to estimate Tasmanian exports independently in the future, to verify Customs' data.

Table 18: Total consumption and recycling in Tasmania

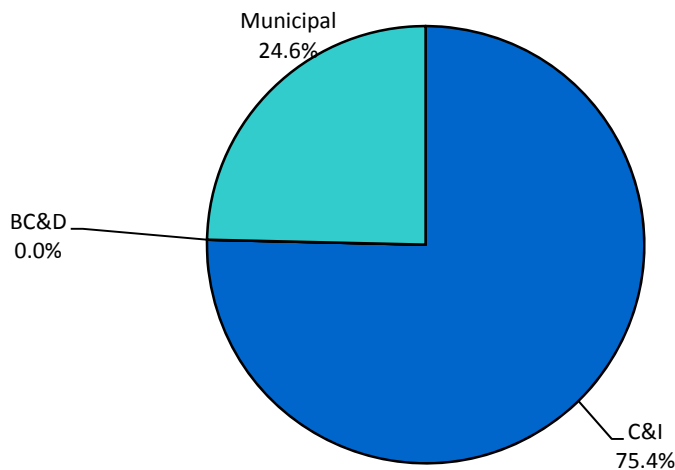
Year	Total consumption	Total recovery	Overall recycling rate	Packaging consumption	Packaging recovery	Packaging recycling rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
2003	36 502	682	1.9%	15 820	682	4.3%
2004	36 152	1 543	4.3%	15 180	1 329	8.8%
2005	35 263	655	1.9%	13 981	609	4.4%
2006	36 158	1 879	5.2%	13 801	1 769	12.8%
2007	40 034	430	1.1%	14 674	239	1.6%
2008	35 257	157	0.4%	13 045	129	1.0%
2009–10	34 050	2 163	6.4%	12 821	1 731	13.5%
2010–11	32 473	3 557	11.0%	12 061	2 697	22.4%
2011–12	33 337	2 481	7.4%	11 738	1 982	16.9%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 41 presents the split by source sector of recovered plastics from Tasmania for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

Figure 41: Recovery by source sector in Tasmania



7.10 Consumption and recovery in Victoria

Overall plastics consumption in Victoria during the 2011–12 year was 366 137 tonnes, based upon a per capita estimation using national overall plastics consumption data. Overall recovery of plastics from Victoria during the same period was 149 455 tonnes, giving an overall plastics recycling rate of 40.8%. Detailed state level data was first collected for the 2003 calendar year.

Victoria has extensive kerbside recycling coverage which almost uniformly accepts plastics types 1-6 or 1-7. It is also the home state for nearly half the plastics reprocessors in Australia (by number) and a great deal of plastics manufacturing occurs in Victoria with its correspondingly high level of (highly sought-after) pre-consumer recycle recovery.

Figure 42: Annual plastics recovery in Victoria (tonnes)

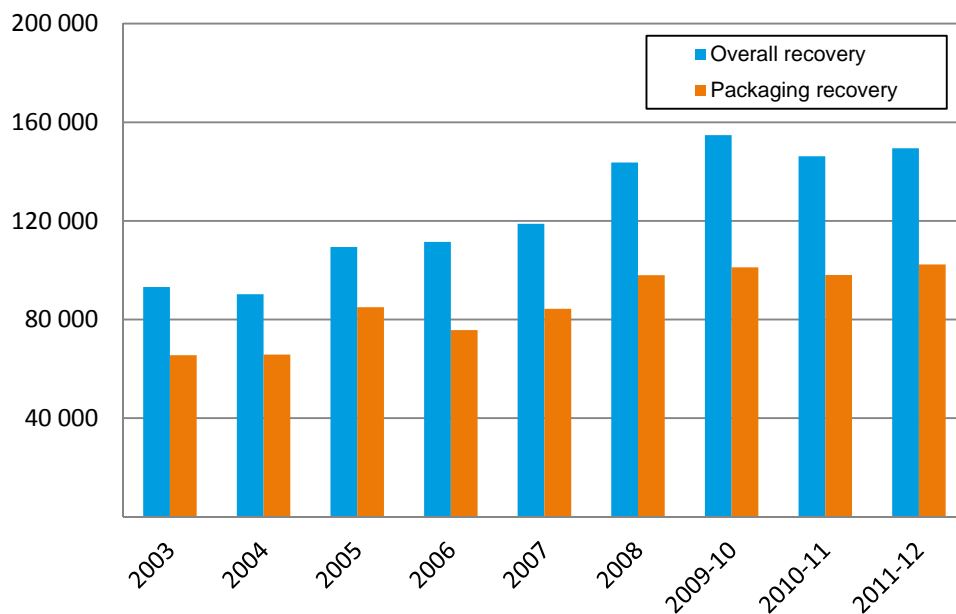


Table 19: Total consumption and recycling in Victoria

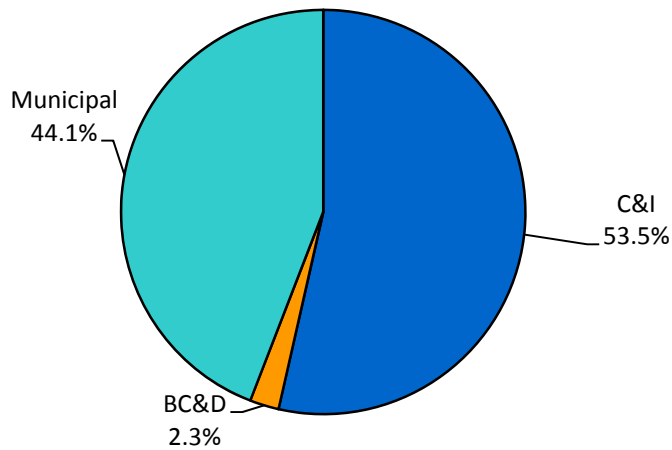
Year	Total consumption	Total recovery	Overall recycling rate	Packaging consumption	Packaging recovery	Packaging recycling rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
2003	376 278	93 196	24.8%	163 079	65 536	40.2%
2004	373 639	90 281	24.2%	156 886	65 796	41.9%
2005	365 693	109 407	29.9%	144 987	84 992	58.6%
2006	379 863	111 450	29.3%	144 986	75 718	52.2%
2007	423 607	118 803	28.0%	155 262	84 349	54.3%
2008	378 083	143 649	38.0%	139 885	97 991	70.1%
2009–10	371 910	154 807	41.6%	140 039	101 183	72.3%
2010–11	356 147	146 204	41.1%	132 278	98 052	74.1%
2011–12	366 137	149 455	40.8%	128 923	102 334	79.4%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 43 below gives the split by source sector of recovered plastics from Victoria for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

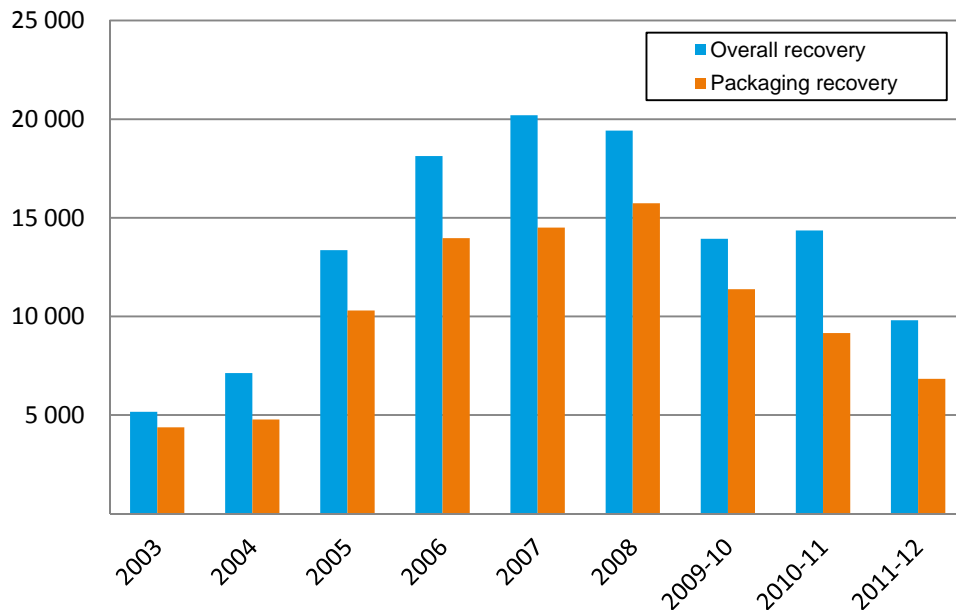
Figure 43: Recovery by source sector in Victoria



7.11 Consumption and recovery in Western Australia

Overall plastics consumption in Western Australian during the 2011–12 financial year was 158 230 tonnes, based upon a per capita estimation using national overall plastics consumption data. Overall recovery of plastics from WA during the same period was 9 801 tonnes, giving an overall plastics recycling rate of 6.2%. Detailed state level data was first collected for the 2003 calendar year.

Figure 44: Annual plastics recovery in WA (tonnes)



There has been an apparent sharp drop in plastics recycling in 2011–12. This is in part due to a contraction in the local reprocessing market, with the closure during the year of two significant reprocessors. Follow-up investigations on the local reprocessing market supported that it has contracted, and it is expected that more plastics went to landfill in WA in 2011–12 than was the case in 2010–11. This particularly relates to lower quality plastics that were previously reprocessed in WA, but are not suitable for export, either overseas or interstate. However, WA based reprocessor numbers increased in 2012–13, and it is expected that the amount of plastic recovered in WA will steadily increase from 2012–13 onwards.

Table 20: Total consumption and recycling in WA

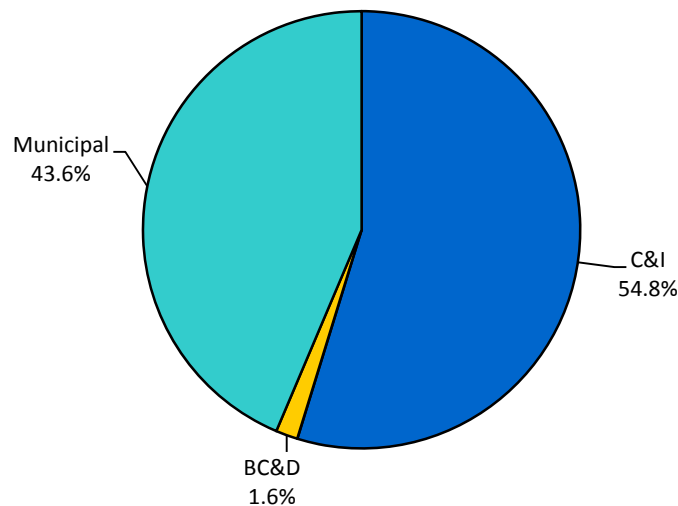
Year	Total consumption	Total recovery	Overall recycling rate	Packaging consumption	Packaging recovery	Packaging recycling rate
	(tonnes)	(tonnes)	(%)	(tonnes)	(tonnes)	(%)
2003	149 736	5 166	3.5%	64 895	4 376	6.7%
2004	149 267	7 125	4.8%	62 675	4 770	7.6%
2005	146 836	13 357	9.1%	58 216	10 303	17.7%
2006	153 033	18 132	11.8%	58 410	13 967	23.9%
2007	172 056	20 198	11.7%	63 063	14 501	23.0%
2008	155 329	19 419	12.5%	57 470	15 738	27.4%
2009–10	154 881	13 938	9.0%	58 319	11 380	19.5%
2010–11	147 741	14 354	9.7%	54 873	9 159	16.7%
2011–12	158 230	9 801	6.2%	55 715	6 832	12.3%

Notes: 1. Consumption of plastics into durable applications is the difference between total consumption and packaging consumption.

2. Recovery of plastics from durable applications is the difference between total recovery and packaging recovery.

Figure 45 below gives the split by source sector of recovered plastics from WA for the commercial and industrial; building, construction and demolition; and municipal sectors during 2011–12.

Figure 45: Recovery by source sector in WA



8 MARKETS FOR RECYCLATE

8.1 Market conditions for obtaining recyclate

The following is a synthesis of comments received (not direct quotes) from a number of plastics reprocessors, with respect to the market conditions for used plastics during the 2011–12 financial year:

- The local market continues to be highly competitive as in 2010–11 with several reprocessors going out of business in 2011–12.
- Local market generally remains competitive in sourcing waste material in competition with export.
- A number of recyclers source from few suppliers with long-standing relationships – these suppliers have continued even as other suppliers have cut back.

8.2 Market conditions for sale of recyclate

The following is a summary of the feedback received from a number of plastics reprocessors with respect to the market conditions for the sale of plastic recyclate:

- As with last year a significant proportion of reprocessors reported continuing very difficult conditions.
- Mixed reports on demand, but mostly continuing high demand for clean good quality recyclate, however in many cases demand is the limiting factor to reprocessing volumes.
- The export market is becoming highly competitive and increasingly regulated, particularly around recyclate quality and contamination. Contaminated mixed plastics loads to China are now regularly rejected.
- Again, across most polymers there was a squeeze between scrap purchase prices and sale price for recyclate. This issue has increased over the last few years.

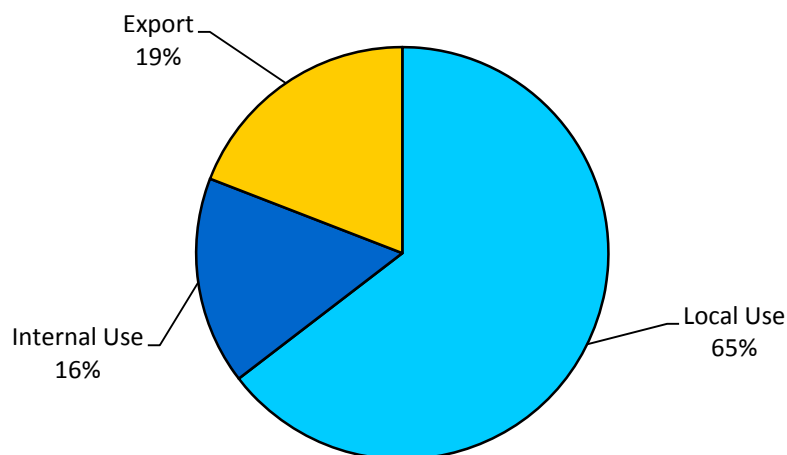
8.3 Destination of plastics reprocessed in Australia

Of the material reprocessed in Australia, the majority (65%) was used within Australia (local use) for the manufacture of new products. An example of local use is a reprocessor selling reprocessed plastic to a local manufacturer for manufacture of new products.

During 2011–12, approximately 19% of plastics reprocessed within Australia was then sold directly to overseas buyers. Most of which was sold to the Asian market. China remained the most prolific purchaser of Australian reprocessed recyclate. An example of export is a company reprocessing a material within their Australian operations and selling to a buyer in China.

Approximately 16% of all material reprocessed within Australia is used internally by the company that reprocessed it. An example of internal use is a company that receives post-consumer packaging from elsewhere, then granulates and cleans the material, which is then re-used within their own manufacturing operations, e.g. the manufacture of high post-consumer recycled content builders' film.

Figure 46: Destination for plastics reprocessed in Australia



8.4 End market uses

After reprocessing, recycled plastics are used to manufacture new products, with the new applications often very different from those of the original use. The applications for recycled plastics are continually growing in Australia. Outlined in Table 21 are the typical uses of recycled plastics in Australia.

Table 21: Typical uses of recycled plastics in Australia

Polymer	Major uses of recycled polymer	Minor uses of recycled polymer
PET	Beverage bottles, geo-textiles	Timber substitutes, pallets and fence posts.
HDPE	Films, pallets, wheelie bins, irrigation hose and pipes	Cable covers, extruded sheet, moulded products, shopping and garbage bags, slip sheets, drip sheets for water, wood substitutes and mixed plastics products (e.g. fence posts, bollards, kerbing, marine structures and outdoor furniture), materials handling and roto-moulded water tanks.
PVC	Pipe, floor coverings	Hose applications and fittings, pipes including foam core pipes, profiles and electrical conduit, general extrusion and injection moulding, clothing, fashion bags and shoes.
L/LLDPE	Film (incl. builders' and agricultural film, concrete lining, freight packaging, garbage bags, shopping bags), agricultural piping	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.
ABS/SAN	Injection moulded products	Automotive components, laminate edging, sheet extrusion, coffin handles, drainage covers, auto parts and a range of injection moulded products.
Polyurethane	Carpet underlay	Mattresses
Nylon	Injection moulded products	Furniture fittings, wheels and castors and a range of injection moulded products.
Other and mixed	Timber substitute products in general and piping	Fence posts, bollards, garden stakes, kerbing, marine structures, post and rail systems, scaffold pads, piggery boards, shipping dunnage, rail bridge transoms.

9 GLOSSARY / ABBREVIATIONS

ABS/SAN	Acrylonitrile Butadiene Styrene and Styrene Acrylonitrile (PIC 7)
ACS	Australian Customs Service
Agricultural (Ag)	Material from agricultural sources
Automotive (Auto)	Material from the automotive industry
Building Construction and Demolition (BC&D)	Material from the construction, refurbishment and building demolition industries
Commercial and Industrial (C&I)	Material from all commercial and industry sources other than building and demolition
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 for use.
Converter	Company which converts polymer resin into plastic products
Diversion rate	Recycling as a proportion of end-of-life disposal
Domestic	Material from domestic (household) sources
Domestic reprocessing	Material reprocessed within Australia
Durable	Long-term use item; not designed to be 'disposable'
Electrical and Electronic (E&E)	Material from the E&E manufacturing industry or from post-consumer E&E waste
EPS	Expanded Polystyrene (PIC 6)
Export for reprocessing	Material sent for reprocessing overseas
HDPE	High Density Polyethylene (PIC 2)
Household / Domestic	Material from household or non-industrial consumer sources
In the gate	Material entering a facility for reprocessing. This may include material that is unusable due to contamination.
Internal use	Recyclate processed and used within the one company
L/LLDPE	Both Low Density Polyethylene and Linear Low Density Polyethylene (PIC 4)
LDPE	Low Density Polyethylene (PIC 4)
LLDPE	Linear Low Density Polyethylene (PIC 4)
Local use	Recyclate used within Australia by an Australian company in the manufacture of a new product
Local/Locally	In Australia
Municipal	Household material plus material from public place recycling
Other	Polymers other than those individually analysed; includes nylon, polyurethane, polycarbonate and polyesters
Packaging	Plastic 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
PET	Polyethylene Terephthalate (PIC 1)
PU or PUR	Polyurethane (PIC 7)
Post-consumer domestic	Used material from household sources. Mostly packaging material from kerbside recycling collections
Post-consumer industrial	Used material from non-household sources

PP	Polypropylene (PIC 5)
Pre-consumer industrial	Scrap off-cuts and off-specification items in the manufacturing industry which are not used by the consumer which are collected for reprocessing at a different site. Does not include material that is recycled directly back into manufacturing processes at the same site. Does not include material that has reached the end consumer, whether domestic or industrial.
PS	Polystyrene (PIC 6)
PVC	Polyvinyl Chloride (PIC 3)
Recovered (out the gate)	Material that has been reprocessed and is destined for some further use.
Recovery	The amount of material collected for recycling
Recyclate	Recycled product ready for use in a new product
Recycling	The process of collection, sorting, reprocessing, transport for reprocessing and the manufacture of new products
Reprocessing	Process by which used material is converted into reusable raw material
Resin	Raw polymer material
Virgin	All-new polymer material containing no recycled material
Waste plastics export	Export of baled used plastics material sent off-shore for reprocessing
XPS	Extruded polystyrene (PIC 6)

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