

**Victorian Recycling Industries
Annual Survey
2006 – 2007**

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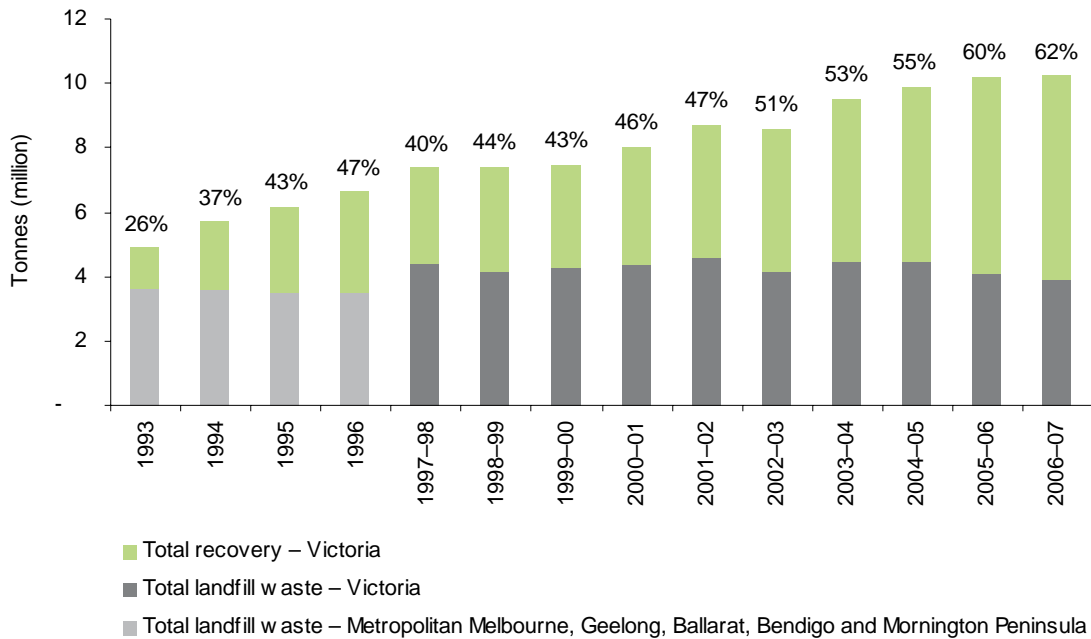
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Executive Summary

- > Victoria recovered a record 62% of the total solid waste stream in 2006–07, and reduced the quantity of waste sent to landfill by almost 4% (see Figure 1)
- > Recovery of material in Victoria for the 2006–07 financial year continued to grow and reached a new high of 6.36 million tonnes, which exceeded material recovered in the last financial year by approximately 4%

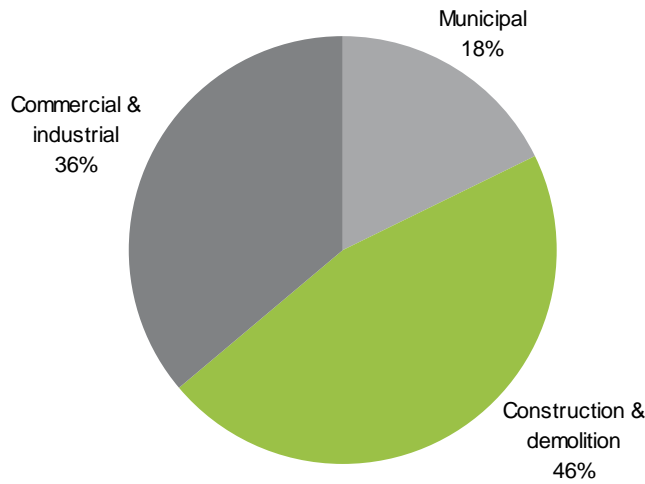
Figure 1 Waste generation and recovery rates, Victoria 1993 to 2006–07



- > Victoria's current reprocessing capacity is predominantly local, with 89% of waste material recovered in 2006–07 remaining in Victoria to be converted into new products by Victoria's reprocessors. The remainder was exported interstate or overseas for reprocessing
- > A large reported increase in timber, sawdust and other forestry residuals has seen the total quantity of organic waste material recovered and diverted from landfill in Victoria during the 2006–07 financial year reach a new high of approximately 750,000 tonnes, up 95% from the previous year
- > Aided by an upgrade of the Visy Recycling glass-sorting facility in 2005, glass recovery in Victoria has continued to grow, increasing by 20% to be greater than 200,000 tonnes recovered in 2006–07
- > Plastics recovery has increased by 2% to around 111,000 tonnes
- > A decrease in export steel has contributed to a 13% decrease in metal waste recovered for reprocessing during the period to 1.26 million tonnes

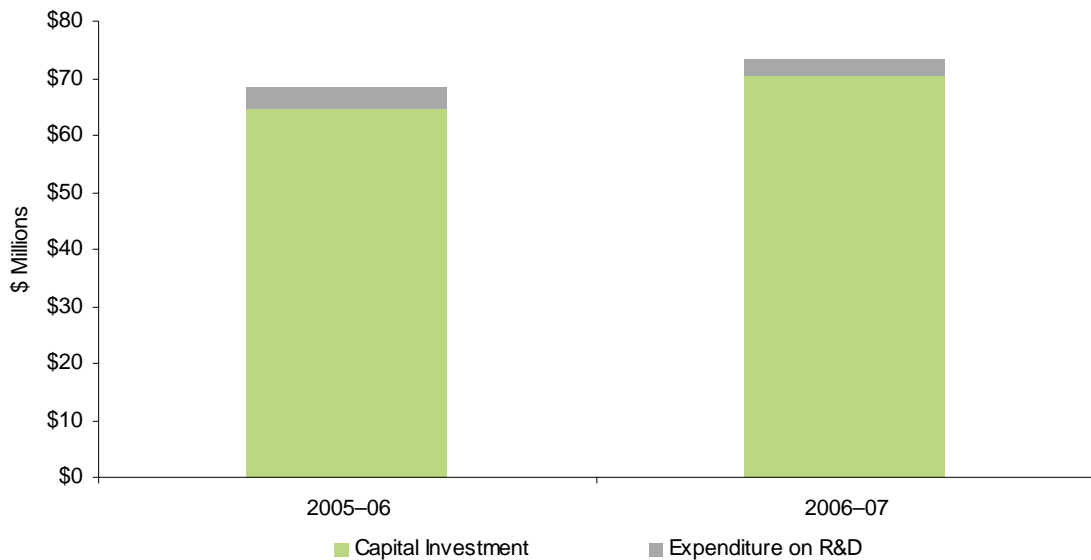
- > Eighty two percent of the material received for reprocessing during the 2006–07 financial year was sourced from industry (commercial and industrial and construction and demolition) (see Figure 2)

Figure 2 Sectors of secondary-use materials (by weight) received for reprocessing excluding imports, Victoria 2006–07



- > Life Cycle Analysis (LCA) modelling has shown the environmental benefits from reprocessing all material recovered in Victoria during 2006–07 would be equivalent to:
 - o saving more than 81 million gigajoules of energy
 - o preventing 4.2 million tonnes of greenhouse gases being emitted into the atmosphere
 - o saving 46 thousand megalitres of water
- > Victoria's reprocessing industries contributed more than \$73 million to the state's economy during 2006–07 through capital investment and expenditure on research and development (R&D) (see Figure 3).

Figure 3 Level of capital investment and expenditure on R&D by Victoria's reprocessing industries, Victoria 2006–07



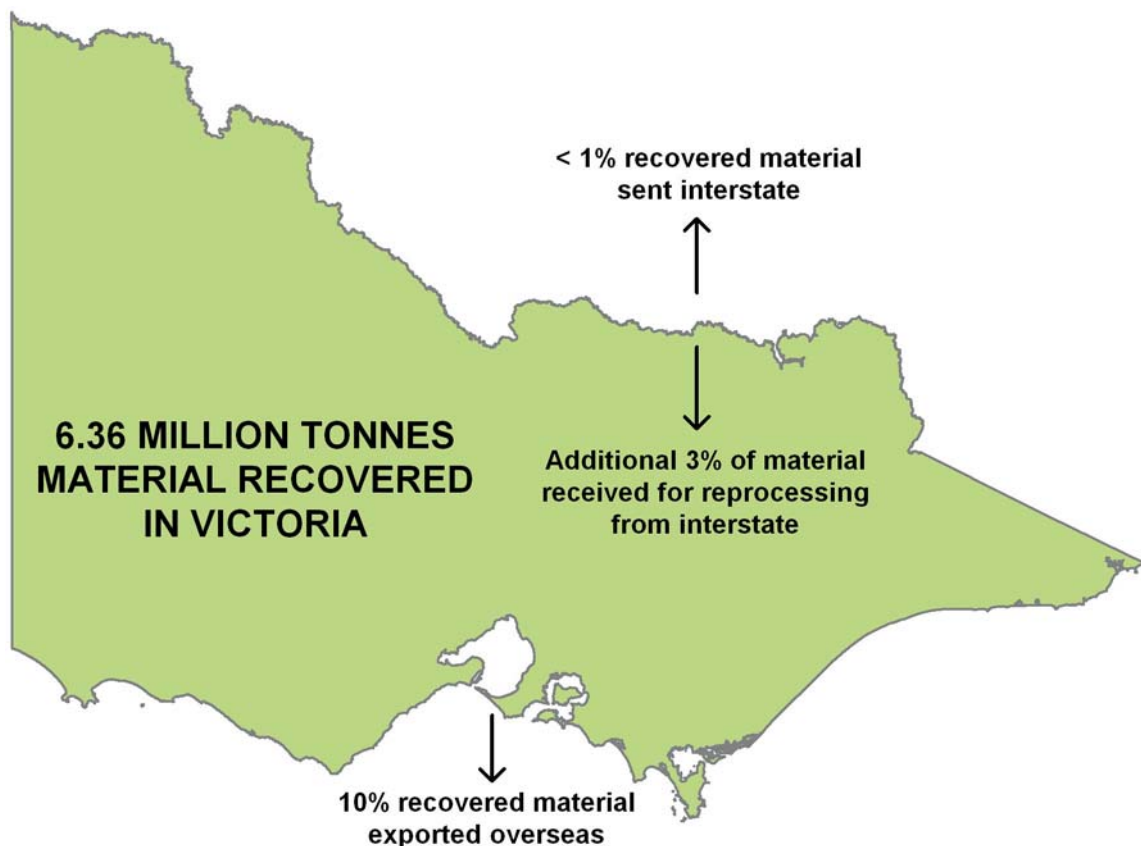
Introduction

As part of Sustainability Victoria's ongoing data collection and performance management program, information is collected annually on the Victorian reprocessing industry via a voluntary survey. Victorian reprocessors of secondary-use materials report on their reprocessing activities over the financial year for a number of purposes, including to:

- > monitor the performance of Victoria's recycling industry (reprocessors of waste materials) and material diversion from landfill each year and over time
- > provide an understanding of the current and historical state of waste material recovery and reprocessing across a number of sectors and material types
- > demonstrate the importance of the reprocessing industry to the Victorian economy
- > measure the performance of Victorian Government strategies
- > communicate the achievements of industry to government, business and the community
- > demonstrate the benefits of recycling.

Recycling and reprocessing are well established activities in Victoria. The reprocessing industry recovers a wide range of recyclable materials from the waste stream for conversion into new products. Recovered waste materials are generated mostly from within Victoria with a small amount received from interstate. While Victoria's current reprocessing capacity is predominantly local, some waste material is exported interstate or overseas for reprocessing (see Figure 4).

Figure 4 Flow of waste material for reprocessing, Victoria 2006–07



Waste materials are sourced from three sectors: construction and demolition (C&D); commercial and industrial (C&I); and municipal. The primary reprocessing industries in Victoria are:

- > smelters of aluminium and steel
- > crushing plants and auxiliary screening of concrete, brick, asphalt, and related materials
- > paper/cardboard and deinking pulp mills
- > composting facilities
- > glass product producers
- > rubber product manufacturers
- > plastics converters

These and other reprocessing operations contribute to the Victorian economy in terms of employment and investment and also generate a host of environmental benefits for the state. Reprocessing reduces greenhouse gases, saves water and energy, cuts air pollution and conserves resources and landfill space.

The survey, conducted during November 2007, sought data from 86 Victorian reprocessors, excluding 31 plastic reprocessors surveyed by Hyder Consulting as part of the *National Plastics Recycling Survey 2006*¹. A total of 64 reprocessors provided data for the survey (excluding the 31 plastics reprocessors), representing a 74% response rate. It is estimated that the 64 reprocessors represent greater than 90% of the tonnage recovered in Victoria.

Sustainability Victoria has sought to verify information provided in survey returns with individual reprocessors where required. However, Sustainability Victoria is not in a position to validate underlying data in the report. Findings in this report are therefore subject to the accuracy of data provided by individual reprocessors. As such, care should be taken when comparing yearly data. For more information on this study's approach, please refer to the detailed methodology in Appendix A.

¹ Hyder Consulting (2006), *National Plastics Recycling Survey 2006*, report to the Plastics and Chemicals Industry Association

Total waste material recovered for recycling

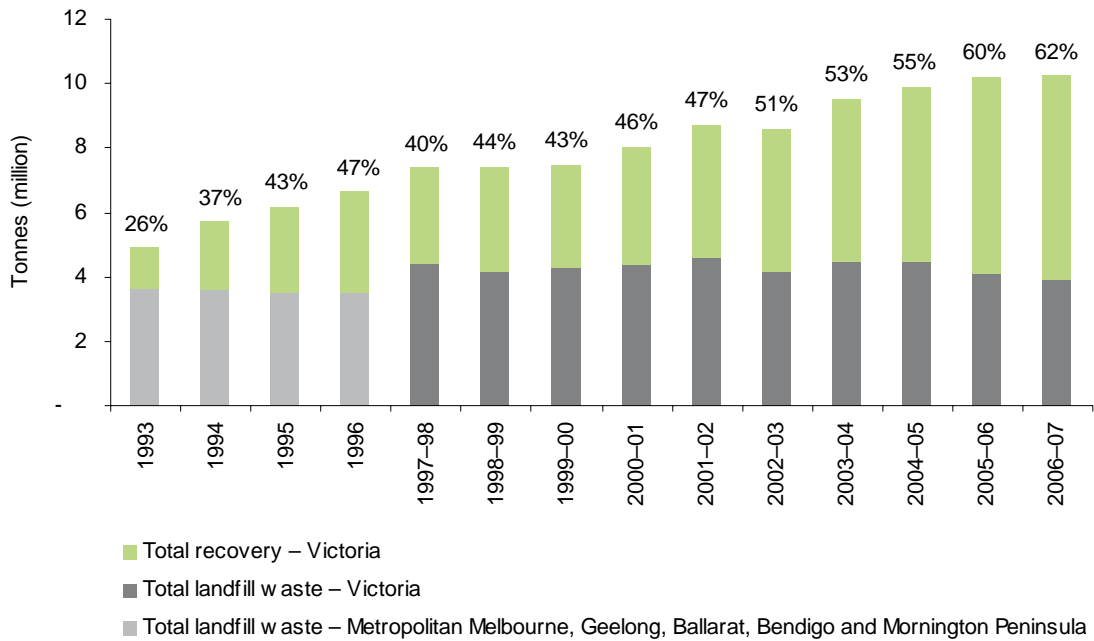
Recovery and trends

Victoria's diversion of waste material from landfill for reprocessing for the 2006–07 financial year increased to 6.36 million tonnes. This represents an increase of approximately 4% on the previous financial year and equates to an overall resource recovery (recycling) rate of 62%² (see Figure 5).

Solid waste being disposed to Victorian licensed landfills dropped to 3.92 million tonnes³, down almost 4% from 4.08 million tonnes (see Figure 5).

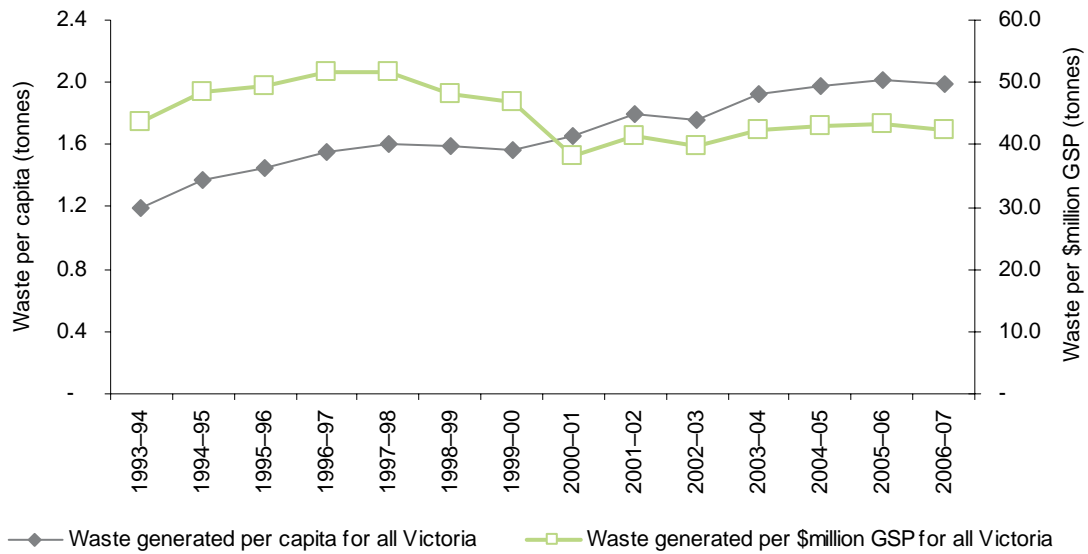
While recovery for recycling is an important step in sustainability, and is helping to reduce the amount of waste disposed to landfill, the overall trend is still one of increasing overall waste generation⁴.

Figure 5 Waste generation and recovery rates, Victoria 1993 to 2006–07



In the 2006–07 financial year waste generation per capita dropped below 2 tonnes and waste generation relative to Gross State Product (GSP) decreased slightly (see Figure 6).

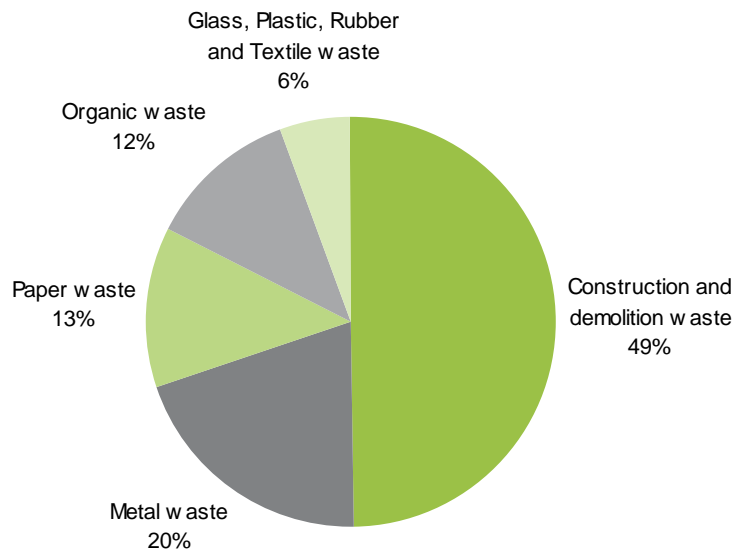
Figure 6 Total waste generation relative to economic and population trends, Victoria 1993–94 to 2006–07



Note: projected figures for GSP and population reported in previous years have been rebased with updated information. This has affected some of the data in Figure 6, especially the 2000-01 period.

The composition of waste material recovered in Victoria for reprocessing in the 2006–07 financial year is presented below in Figure 7. At 49% of total recovery (by weight), construction and demolition waste accounted for the greatest proportion of material recovered for reprocessing, which is an increase of 2% on last year.

Figure 7 Composition of material (by weight) recovered for reprocessing, Victoria 2006–07



A summary of waste material recovered in Victoria for reprocessing during the 2006–07 financial year is presented below in Table 1. Historical recovery data tonnages covering the past 10 years for each waste material type are presented in Appendix B.

Recovery of construction and demolition waste material continued to increase, passing 3 million tonnes. The total quantity of organic waste material recovered and diverted from landfill in Victoria during the 2006–07 financial year reached a new high of approximately 750,000 tonnes, up 95% from the previous year. This was mainly due to large increases in the recovery of timber, sawdust and other forestry residuals. Timber recovery returned to levels recovered before 2005–06 while sawdust and other forestry residuals declined from recorded tonnes in 2003–04 until now. Victorian metal waste recovery decreased by 13%, or 187,000 tonnes on the previous year's figure to a total of 1.26 million tonnes. This decline in metal waste recovery is predominately due to a decrease in the export of steel.

Table 1 Waste material recovered for reprocessing, Victoria 2006-07

Waste material	Total recovery in Victoria 2005-06	Total recovery in Victoria 2006-07	% Change on previous year
	tonnes		
Demolition and construction waste	2,912,944	3,170,113	9%
Metal waste	1,448,609	1,261,093	-13%
Paper / cardboard waste	1,087,233	821,951	-24%
Organic waste	387,817	754,464	95%
Glass waste	167,762	202,069	20%
Rubber waste	16,592	29,614	78%
Textile waste	2,387	7,671	221%
Plastic waste	109,407	111,450	2%
Total waste	6,132,751	6,358,425	4%

Sources of recyclables

Excluding tonnages received from imports where source sector is unknown, just under half of the waste materials received for reprocessing during the 2006–07 financial year was sourced from the construction and demolition (C&D) sector (see Figure 8). If commercial and industrial (C&I) materials are added to this, then the combined industry accounts for 82% of the waste materials received for reprocessing in Victoria. Up from last year's figure of 80%, this continues the growth trend, and reflects the recognised gains to business of recycling, particularly where large, homogenous streams of waste materials are available, such as concrete, steel and cardboard.

Figure 8 Sectors of secondary-use materials (by weight) received for reprocessing excluding imports, Victoria 2006–07

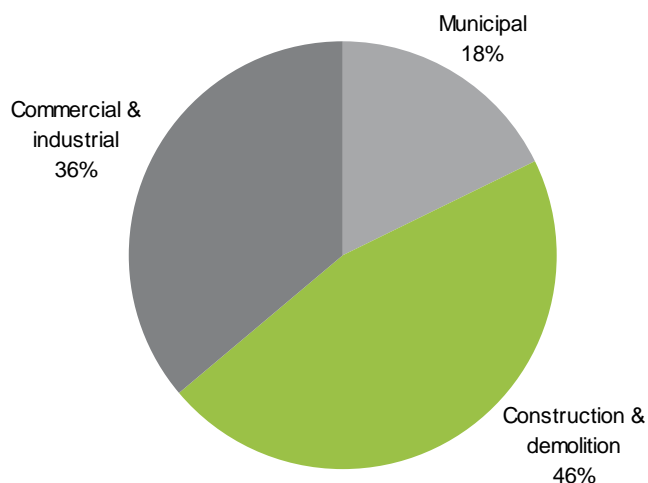


Table 2 below details the tonnes of waste material recovered in Victoria for reprocessing from each source sector plus imports.

Table 2 Source sectors of waste material received by reprocessors, Victoria 2006-07

Waste material	Municipal	Commercial & industrial	Construction & demolition	Imports
tonnes				
Construction and demolition waste	136,390	241,201	2,792,522	–
Metal waste	199,382	947,536	114,175	44,613
Paper / cardboard waste	290,168	531,783	–	70,008
Organic waste	284,264	441,286	28,914	6,600
Glass waste	169,889	32,180	–	60,964
Rubber waste	973	28,641	–	8,231
Textile waste	3,370	4,301	–	–
Plastic waste	39,029	64,908	7,513	4,037
Total waste	1,123,464	2,291,837	2,943,124	194,453

Note: Figures reported for the material received by source sector have been extrapolated to include the relative proportions derived from reported data and applied to surveys that did not provide a source sector for the different material types and export data from the Australian Bureau of Statistics. These proportions were not applied to imports.

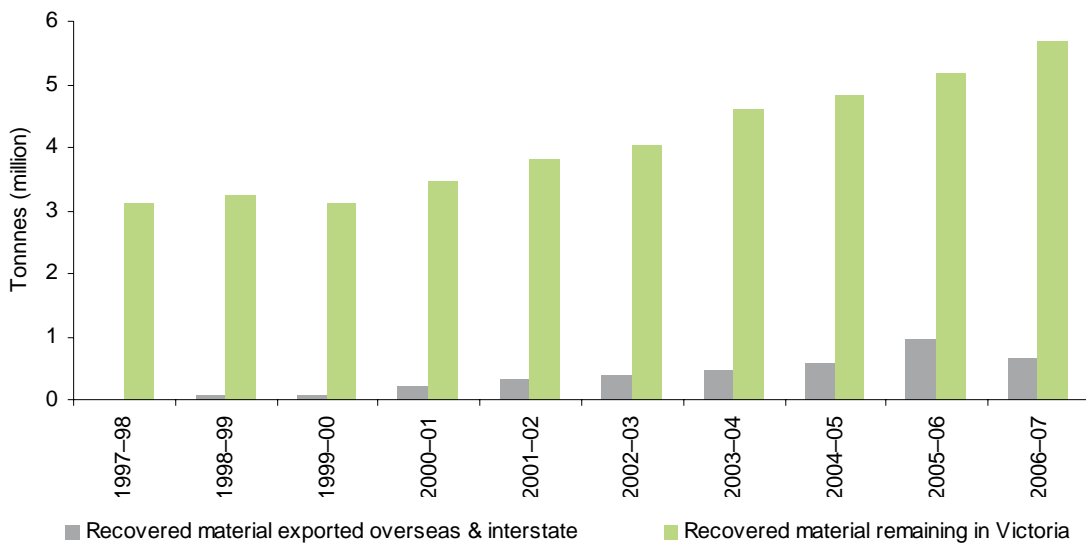
Reprocessing and exports

The survey results enable comparison between the quantity of waste material recovered for reprocessing locally in Victorian plants and that exported interstate or overseas for reprocessing. While exporting waste materials for reprocessing overseas is a growing industry, Victoria's current resource reprocessing capacity is predominantly local (see Figure 9). The key waste materials exported are scrap metals, wastepaper and plastics. These materials are globally traded commodities used in recycling operations worldwide.

For the 2006–07 financial year, almost 5.7 million tonnes of waste material was recovered in Victorian plants, representing an increase of 10% over the previous financial year.

Waste material exported for reprocessing experienced a decrease of 29% from 946,000 tonnes to approximately 668,000 tonnes during the 2006–07 period (see Figure 9). This can be largely attributed to a decrease in demand for scrap metals that saw a drop of around 300,000 tonnes exported overseas for reprocessing.

Figure 9 Waste material reprocessed in Victorian plants and exported overseas or interstate, Victoria 1997–98 to 2006–07

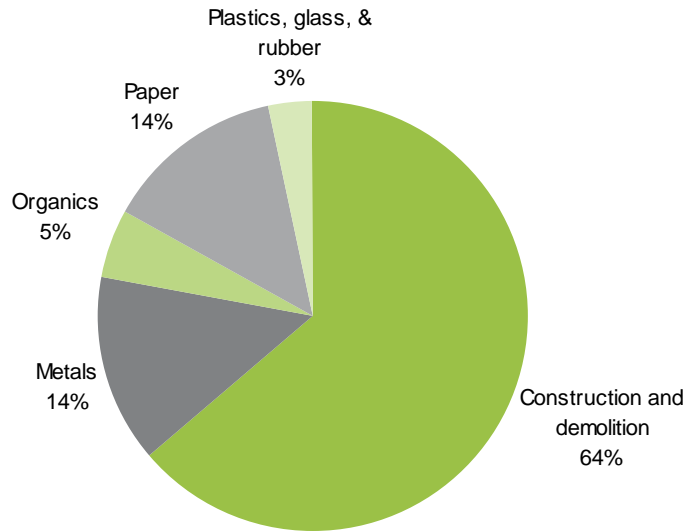


Product markets

Recovered waste materials once reprocessed are directed into different markets depending on the stage of life of that product. This section looks at the various markets for the reprocessed material.

Not all reprocessors completed this section of the survey. Around two thirds of material recovered for reprocessing was reported as being converted into a product. Of this reported product, construction and demolition made up 64% (see Figure 10).

Figure 10 Composition of product (by weight) reported from waste material recovered, Victoria 2006–07



Products from waste material types such as metals and rubber are generally sold into the manufacturing industry not as end-products but are used for manufacturing into a variety of other products. Products such as those produced from construction and demolition waste material are generally considered end-products and mainly sold directly back into the construction industry for a range of different applications.

Table 3 shows the amount of product reported and the market it was sold into. The majority of construction and demolition waste material recovered went back into the construction industry while metals, paper / cardboard, glass, and rubber are mainly sold into the manufacturing sector where they are made into a variety of other products.

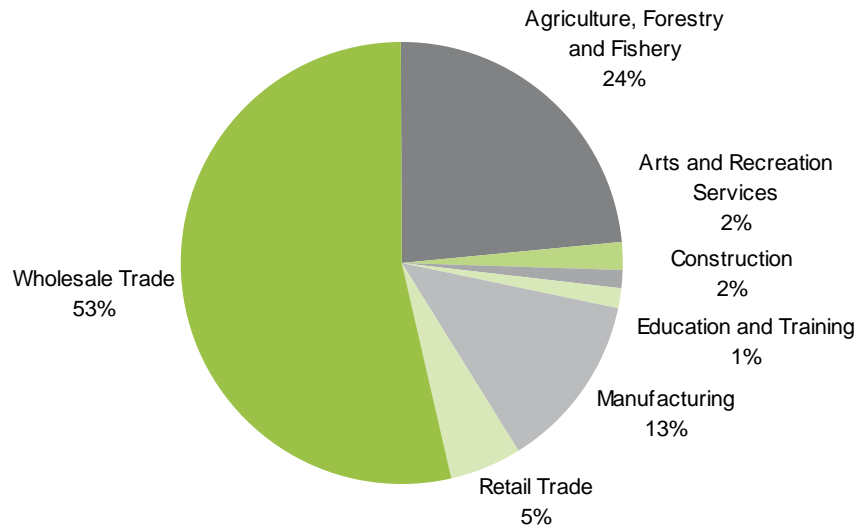
Table 3 Market share of product (by weight) from Victorian reprocessors, Victoria 2006-07

Market (ANZSIC)	Product (by weight) within waste material category						Total
	Demolition and construction	Metals	Paper / cardboard	Organics	Glass	Rubber	
	tonnes						
Agriculture, Forestry and Fishery	1,225	128	95,277	49,831	120	–	146,581
Arts and Recreation Services	–	–	–	4,165	–	–	4,165
Construction	2,603,120	–	1,328	3,305	–	4,376	2,612,129
Education and Training	–	–	–	2,989	–	–	2,989
Electricity, Gas, Water and Waste Services	500	–	–	–	–	–	500
Manufacturing	460	583,173	445,816	26,616	124,345	5,821	1,186,231
Mining	–	–	–	–	–	7	7
Other Services	397	–	49	–	–	–	446
Professional, Scientific and Technical Services	–	–	–	–	–	13	13
Retail Trade	–	–	–	11,475	–	–	11,475
Transport, Postal and Warehousing	–	–	30	–	–	13	43
Wholesale Trade	675	–	22,638	113,564	–	33	136,910
Total	2,606,377	583,301	565,138	211,945	124,465	10,263	4,101,489

Note: Not all reprocessors completed this section of the survey with around three quarters of material recovered for reprocessing reported as a product

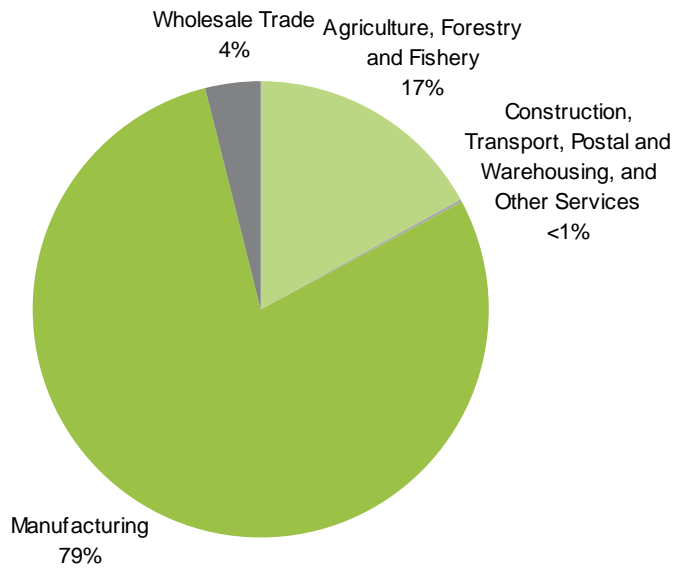
Of particular note is the variety of markets into which the products from organic reprocessing end up. Over half ended up in wholesale trade while the next largest proportion at 24% ended up in Agriculture, forestry and fishery (see Figure 11).

Figure 11 Market share of organic products (by weight), Victoria 2006–07



Seventy nine percent of paper / cardboard products were predominately consumed in the manufacturing industry as a raw material feedstock (see Figure 12).

Figure 12 Market share of paper products (by weight), Victoria 2006–07



Plastics that are recovered from the waste stream for recycling are reprocessed into a large range of valuable materials, with applications for recycled plastics continually growing in Australia. The *National Plastics Recycling Survey 2006* listed the main products derived from Australian plastics reprocessing operations, as shown in Table 4.

Table 4 Summary of end-products for reprocessed plastics, Victoria 2006

Plastics ID code	Polymer	Major uses	Minor uses
1	PET	Beverage bottles	Clothing, geo-textiles, yarn, strapping, pallets and fenceposts.
2	HDPE	Film, blow moulded containers, pipes	Irrigation tube, pallets, wheelie bins, cable covers, extruded sheet, moulded products, shopping and garbage bags, building and industrial film, slip sheets, drip sheets for water, wood substitutes and mixed plastics products (e.g. fence posts, bollards, kerbing, marine structures and outdoor furniture), vertical blind components, materials handling and roto-moulded water tanks.
3	PVC	Pipe, floor coverings	Hose applications and fittings, pipes including foam core pipes, profiles & electrical conduit, general extrusion and injection moulding, clothing, fashion bags and shoes.
4	LLDPE	Film (incl. builders & agricultural film, concrete lining, freight packaging, garbage bags, shopping bags), agricultural piping	Trickle products, vine cover, pallets, shrink wrap, roto-moulding, slip sheets, irrigation tube, shipping dunnage, fence posts, timber replacement products, and building industry applications.
5	PP	Crates, boxes and plant pots	Electrical cable covers, vertical blind components, building panels and concrete reinforcement stools (bar chairs & shims), furniture automotive parts, irrigation fittings, agricultural & garden pipe, drainage products and tanks, builders film, kerbing, bollards, concrete reinforcing and a wide variety of injection moulded products.
6	PS	Bar chairs and industrial spools	Office accessories, coat hangers, glasses, building components, industrial packing trays and wire spools.
6	EPS	Waffle pods used in building and wall panels	Bulk EPS boxes, Produce boxes, CD and DVD cases, synthetic timber applications, and extruded sheet (XPS) panelling.
7	ABS/SAN	Injection moulded products	A wide range of moulded products, sheet extrusion, coffin handles, drainage covers, and auto parts.
7	Polyurethane	Carpet underlay	Mattresses
7	Nylon	Injection moulding compound	Furniture fittings, wheels and castors.
7	Other and mixed	Agricultural piping	Fence posts, bollards, garden stakes, kerbing, marine structures, post & rail systems, scaffold pads, piggery boards, shipping dunnage, rail bridge transoms, outdoor furniture, bottle blowing and sheet extrusion.

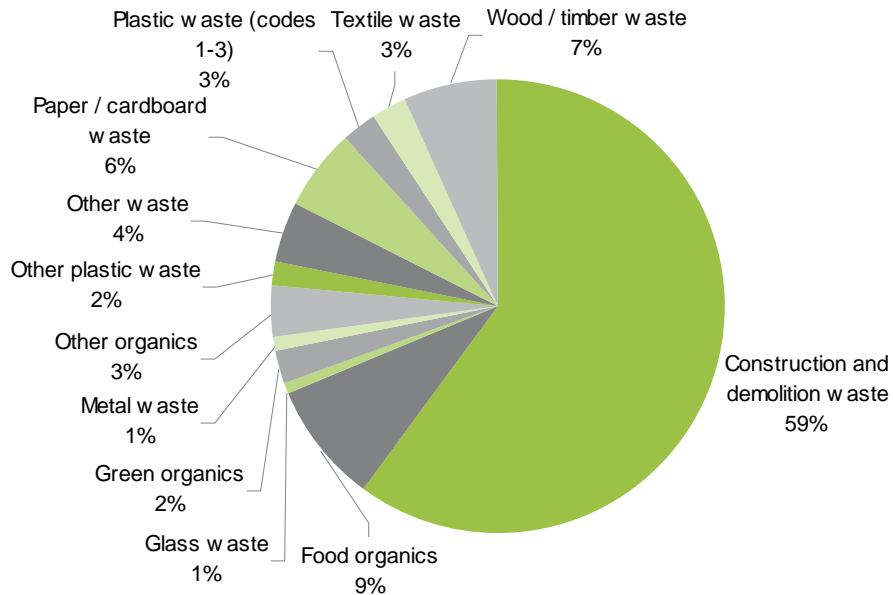
Source: *National Plastics Recycling Survey 2007*, report to the Plastics and Chemicals Industry Association.

Composition of Waste Material sent to Landfill

In May 2005, Sustainability Victoria commissioned a series of disposal based surveys in metropolitan and regional Victoria⁵. The project was designed to provide a profile of materials being disposed to landfill and to assist with the Towards Zero Waste Strategy.

The results from the audits indicate the following proportions (by weight) of the composition of various broad categories of material disposed to landfill (see Figure 13). Fifty nine percent of all material recorded from the disposal based waste survey was composed of construction and demolition waste compared to food organics, the next largest category with 9% of the total.

Figure 13 Composition of waste to landfill (by weight), Victoria 2005

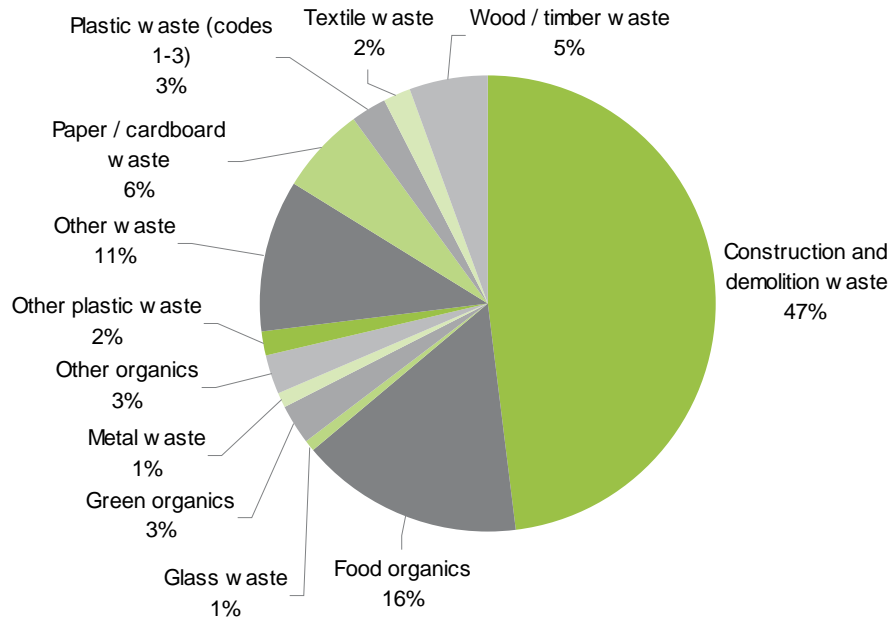


Note: composition chart excludes prescribed waste, rebated cover material of 15% (clean fill) for each tonne of waste deposited at a landfill, domestic kerbside collections and private loads from householders.

The disposal based waste survey did not include waste material from domestic kerbside collections. The food organics component may therefore be under reported. Anecdotal information from recent bin audits undertaken by a number of local governments, indicate that food organics may be as high as 50% of the total waste disposed through kerbside collection. Figure 14 represents the additional volumes of food organics from domestic kerbside collections added to the total material of waste to landfill. The additional food organics from domestic kerbside collections has almost doubled the relative proportion of this category in the landfill waste stream from 9% to 16%.

⁵ Disposal Based Waste Survey 2005, Sustainability Victoria

Figure 14 Composition of waste to landfill (by weight) including estimates from recent bin audits on domestic kerbside collection, Victoria 2005



Note: composition chart excludes prescribed waste, rebated cover material of 15% (clean fill) for each tonne of waste deposited at a landfill, and private loads from householders. Includes information from recent bin audits undertaken by a number of local governments, and applied to the domestic kerbside collection tonnages

Environmental benefits of resource recovery

The recycling industry is making a substantial contribution to the improvement of our environment by cutting greenhouse gas emissions, delivering significant energy and water savings, as well as conserving non-renewable virgin resources.

Some of the greatest environmental benefits of recycling are in the conservation of energy and natural resources and the prevention of pollution when a recycled material, rather than a raw material, is used to make a new product. Manufacturing material the second time around is much cleaner and less energy-intensive than the first.

Life Cycle Analysis (LCA) modelling⁶ has shown that by substituting secondary-use materials for virgin materials in 2006–07 the environmental benefits from reprocessing all material recovered would be equivalent to:

- > Victoria saving more than 81 million gigajoules of energy,
- > preventing more than 4.2 million tonnes of greenhouse gases being emitted into the atmosphere (equivalent to taking 690,000 cars off the road).
- > saving 46 thousand megalitres of water (enough to fill more than 18,000 Olympic-sized swimming pools)

Despite the increase in the amount of waste material recovered in 2006–07, environmental benefits are lower than compared to 2005–06 levels. This is mainly due to the decrease in recovering of metals and paper /cardboard. Recycling of metals reduces global warming and cumulative energy demand while recycling of paper / cardboard achieve savings in water by avoiding the production of virgin fibre pulps which are traditionally high water users.

By reducing air and water pollution and saving energy, recycling offers an important environmental benefit: it reduces emissions of greenhouse gases that contribute to global climate change. Recycling and composting reduce greenhouse gases by decreasing the energy needed to make products from raw materials, and by reducing methane emissions from landfills.

⁶ RMIT University, Centre for Design, *Life Cycle Impact Data for Resource Recovery from C&I and C&D Waste in Victoria*, September 2005

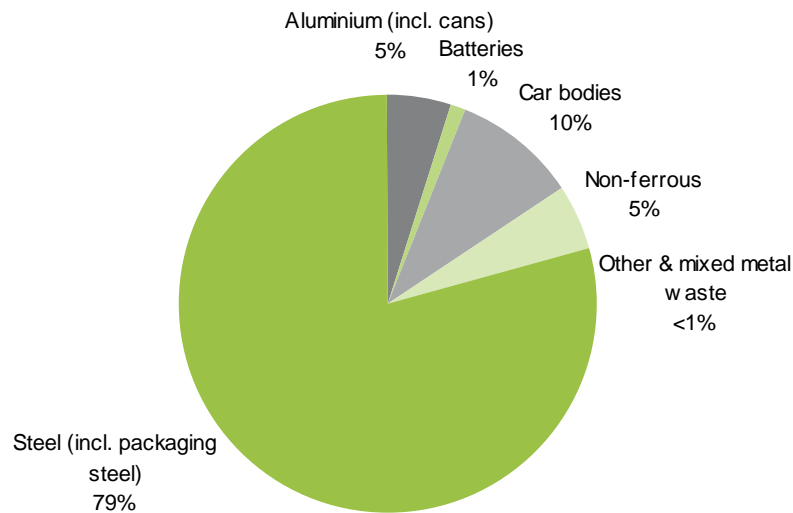
Metal waste

Recovery and trends

Victorian metal waste recovery decreased to around 1.26 million tonnes in 2006–07. This represents a decrease of 13% or 187,000 tonnes from 2005–06. This decrease is mainly due to a significant decrease in the exports of steel.

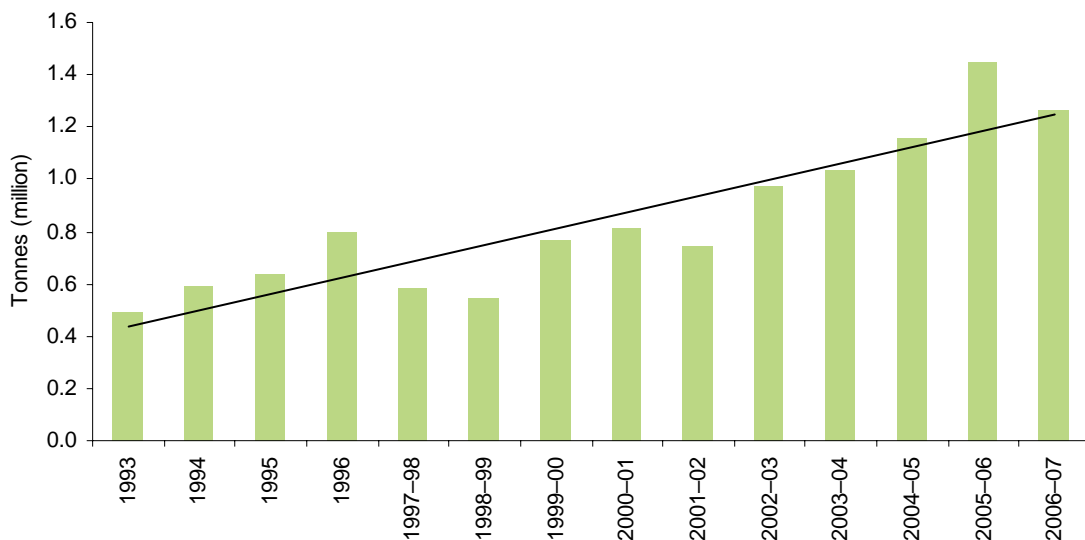
Figure 15 below shows that steel (including packaging steel) made up the greatest proportion of metal waste recovered. Car body recovery has increased and now accounts for over 10% of the total metal waste diverted from landfill compared to 5% in 2005–06.

Figure 15 Composition of metal wastes (by weight) recovered for reprocessing, Victoria 2006–07



The market for recyclable metals in the 2006–07 period remained strong, particularly for ferrous scrap despite the drop in exports. As has been the case for much of the past decade, export demand, coupled with the growth in domestic consumption, has led to steadily increasing prices.

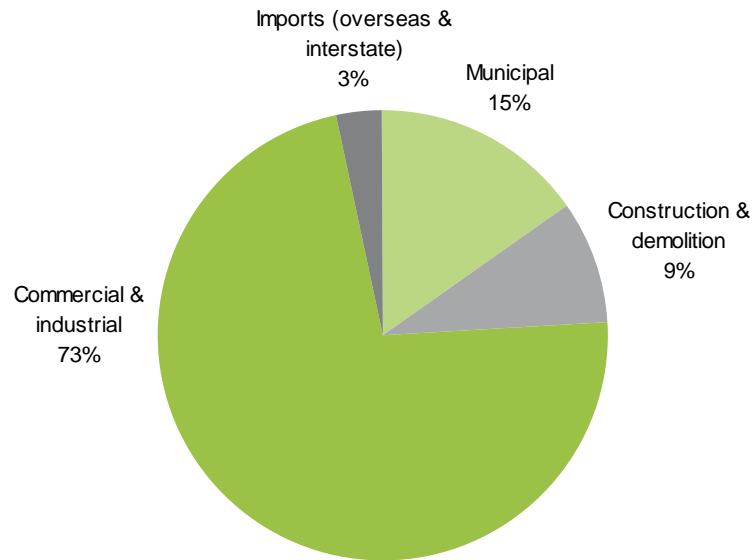
Figure 16 Metal waste recovered for reprocessing, Victoria 1993 to 2006–07



Sources of recyclables

Figure 17 shows that the sources of metal waste received for reprocessing is predominately from the commercial and industrial sector. The proportion of material sourced from interstate or overseas continues to decrease, from 10% in 2005–06 to 3% in 2006–07. Material sourced from the municipal sector is at 15% up 1% since the previous period.

Figure 17 Source sector of metal waste (by weight) received for reprocessing, Victoria 2006–07



Construction and demolition waste

Recovery and trends

Recovery of construction and demolition waste material during 2006–07 continued to increase, up 9% (almost 260,000 tonnes) to 3.17 million tonnes. Concrete still accounts for the majority of this material (52% by weight) despite the slight decrease in the amount of concrete recovered (see Figure 18). An increase in quantities was seen in all other material categories other than plasterboard, down 18% (see Table 5, Appendix B).

Figure 18 Composition of construction and demolition waste (by weight) recovered for reprocessing, Victoria 2006–07

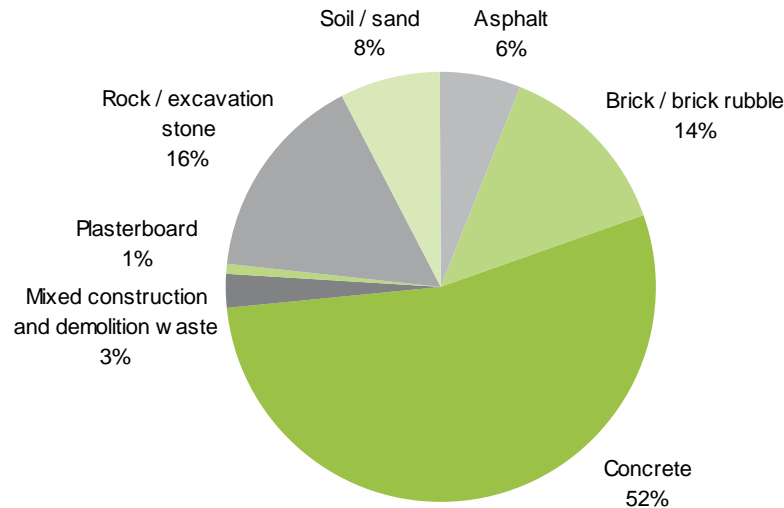
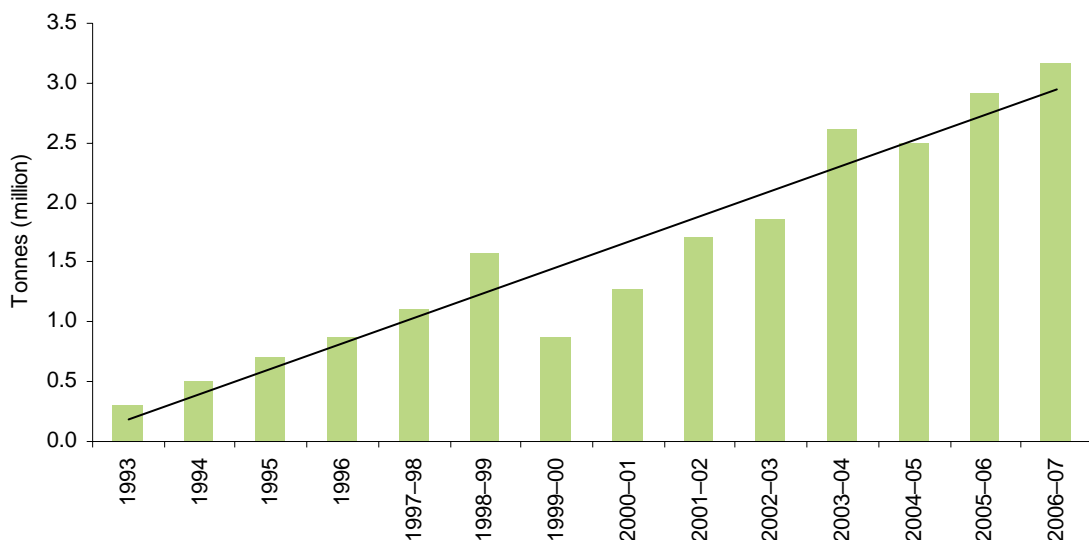


Figure 19 illustrates the historical trend in Victorian construction and demolition waste recovery. Recovery in 2006–07 continued the strong growth trend as displayed over recent years. Aiding this continued growth in recovery has been the increased processing capacity and demand, the growth and establishment of suburban collection points, and the extension of recycling services to the C&D sector.

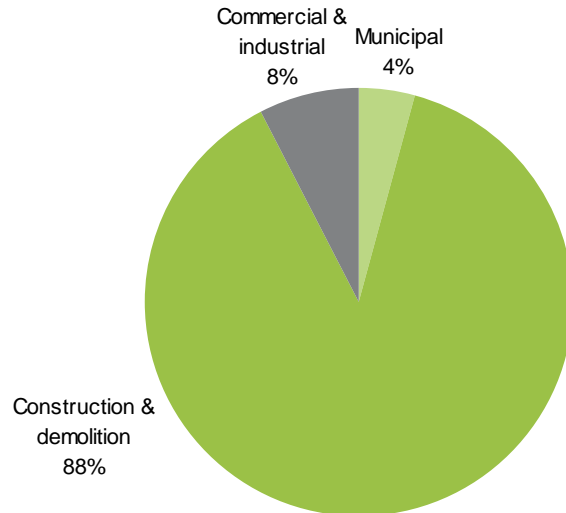
Figure 19 Construction and demolition waste recovered for reprocessing, Victoria 1993 to 2006–07



Sources of recyclables

Material from the construction and demolition sector understandably makes up the bulk of recovery (88%), while a small amount still continues to come through the other two sectors (see Figure 20).

Figure 20 Sources of construction and demolition waste (by weight) received for reprocessing, Victoria 2006–07



Concrete, brick rubble, asphalt, rock and excavation stone were primarily sourced from construction and demolition activities at commercial and civil sites, which provide high-volume, largely homogenous streams of materials.

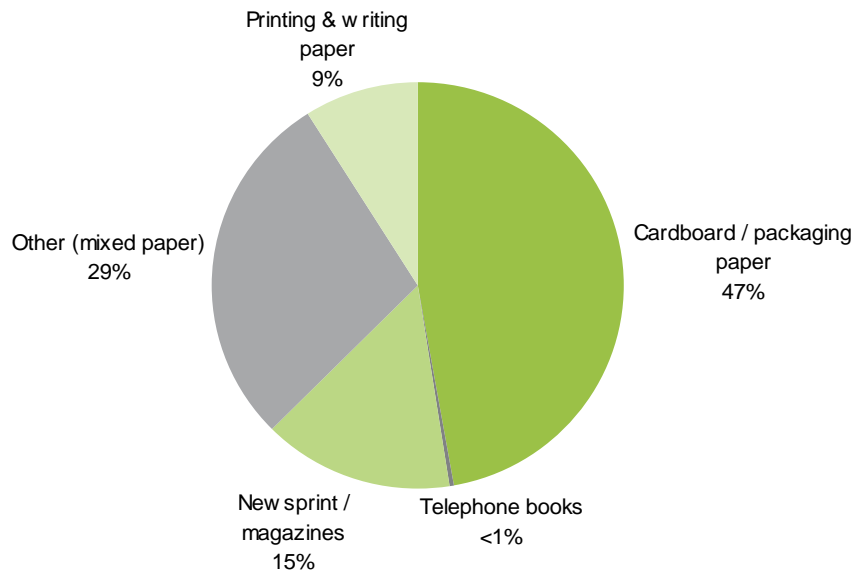
Most of the plasterboard recycled in Victoria is sourced from manufacturers as process off-cuts. However, an increasing number of waste service providers are recovering waste plasterboard from construction projects and diverting it for recycling.

Paper / cardboard waste

Recovery and trends

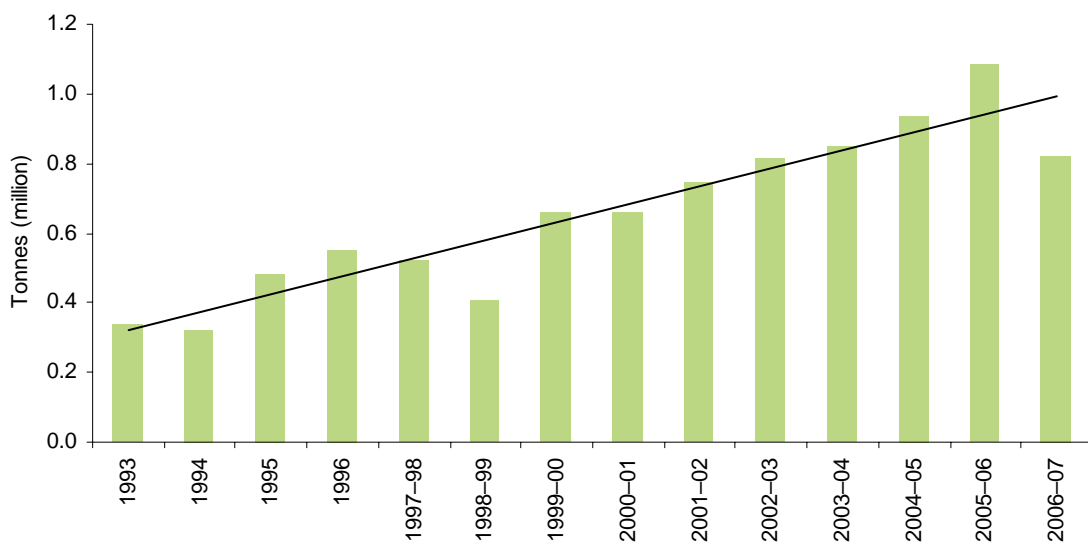
The total amount of wastepaper recovered for recycling in Victoria has dropped 24% to around 820,000 tonnes. This is due to over reported figures for the past two years in categories Newsprint / magazines and Printing & writing paper. These amounts have not been able to be quantified. Paper and cardboard packaging represent the largest proportion, 47% of all waste paper recovered (see Figure 21).

Figure 21 Composition of paper / cardboard waste (by weight) recovered for reprocessing, Victoria 2006–07



Most categories of waste paper recovered reported a drop in quantities collected with the exception of Other (mixed paper) which continued strong growth in recovery. Other (mixed paper) category increased by 64% to just under 240,000 tonnes in 2006–07 and now accounts for 29% of total paper and cardboard recovery. The Other (mixed paper) category may have increased because of reprocessors inability to properly categorise the waste paper stream recovered. This may also explain the experienced decrease in other waste paper categories.

Figure 22 Paper / cardboard waste recovered for reprocessing, Victoria 1993 to 2006–07

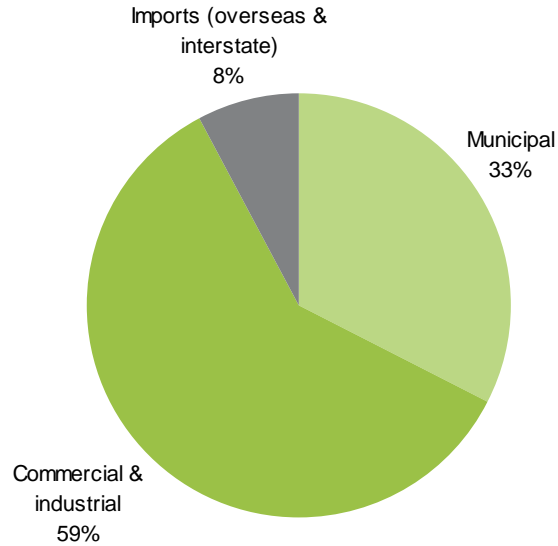


Note: Figures for periods 2004–05 and 2005–06 have been over reported but these amounts have not been able to be quantified

Sources of recyclables

The largest proportion (nearly 60%) of wastepaper received for reprocessing in 2006–07 was sourced from the commercial and industrial sector (see Figure 23). Wastepaper sourced from the municipal sector (kerbside recycling) remained stable and accounts for one third of all wastepaper recovered.

Figure 23 Source sectors of paper / cardboard waste (by weight) received for reprocessing, Victoria 2006–07



Retailers and industrial facilities are important suppliers of cardboard and paper packaging to reprocessors, while most printing and writing paper comes from commercial collections from offices and schools.

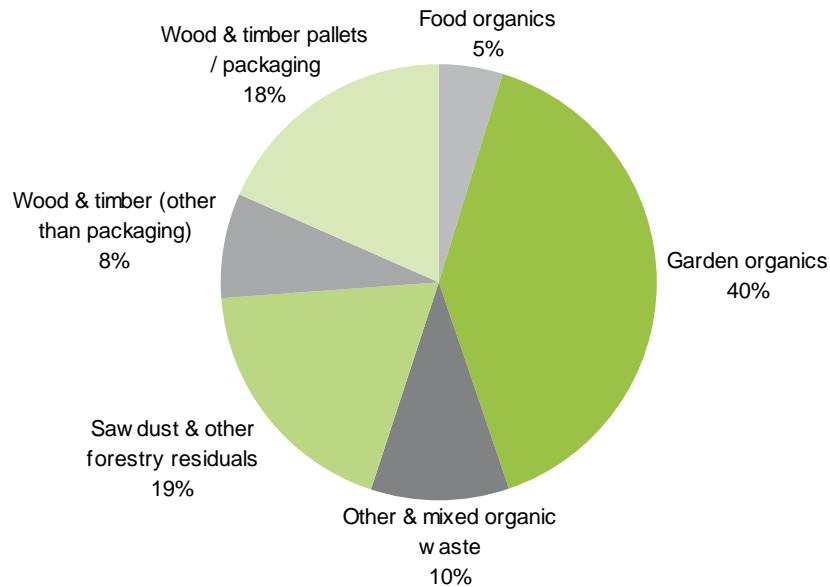
Telephone books and other (mixed paper), by contrast, were sourced predominantly from the municipal sector. These materials are mostly discarded in the home and are readily retrieved from the kerbside recycling system.

Organic waste

Recovery and trends

The total quantity of organic waste material recovered and diverted from landfill in Victoria during the 2006–07 financial year reached a new high of approximately 750,000 tonnes, up 95% from the previous year. Figure 24 shows that the majority of organic waste material recovered is in the form of garden organics (40%) compared to food organics which makes up only 5% of the total.

Figure 24 Composition of organic waste (by weight) recovered for reprocessing, Victoria 2006–07



The large increase in organic material recovered since 2005–06 was largely due to increases seen in timber, sawdust and other forestry residuals. As seen in Table 5 (Appendix B), timber recovery has returned to levels recovered before 2005–06 while sawdust and other forestry residuals declined from recorded tonnes in 2003–04 until this survey period. The current survey includes a new reprocessor of sawdust and other forestry residuals which contributed to the increase in volumes along with an existing reprocessor that increased their recovery of material in this category.

Quantities of garden organics collected through the municipal sector were up on the previous year to its second highest level recorded since the survey began (see Table 2), even though material recovered from green organic kerbside collection⁷ was down due to the drought. The quantities of food organics recovered have continued to grow over the past four years with 35,000 tonnes recovered in 2006–07.

⁷ Victorian Local Government Annual Survey 2006–07

Figure 25 Organic waste recovered for reprocessing, Victoria 1993 to 2006–07

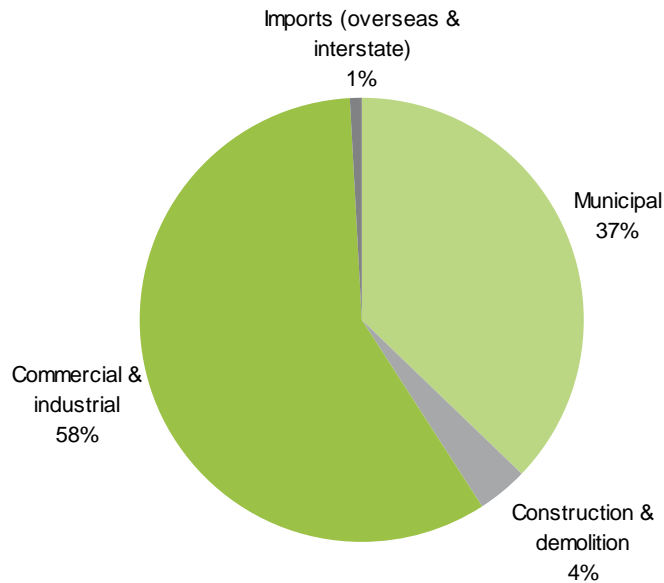


Note: Figures released prior to the 2002–03 financial year include prescribed industrial waste

Sources of recyclables

The larger proportion of organic waste material received for reprocessing in 2006–07 was sourced from the commercial and industrial sector (see Figure 26) with the majority of this material coming from timber, sawdust and other forestry residuals. The municipal sector (kerbside recycling) accounts for most of the rest with garden organics making up 98% of material recovered in this sector.

Figure 26 Source sectors organic waste (by weight) received for reprocessing, Victoria 2006–07

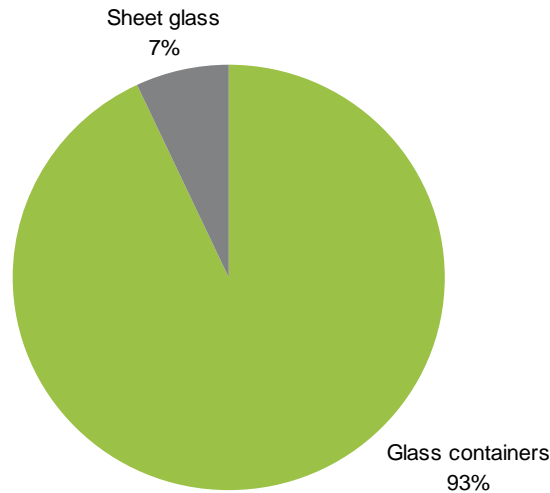


Glass waste

Recovery and trends

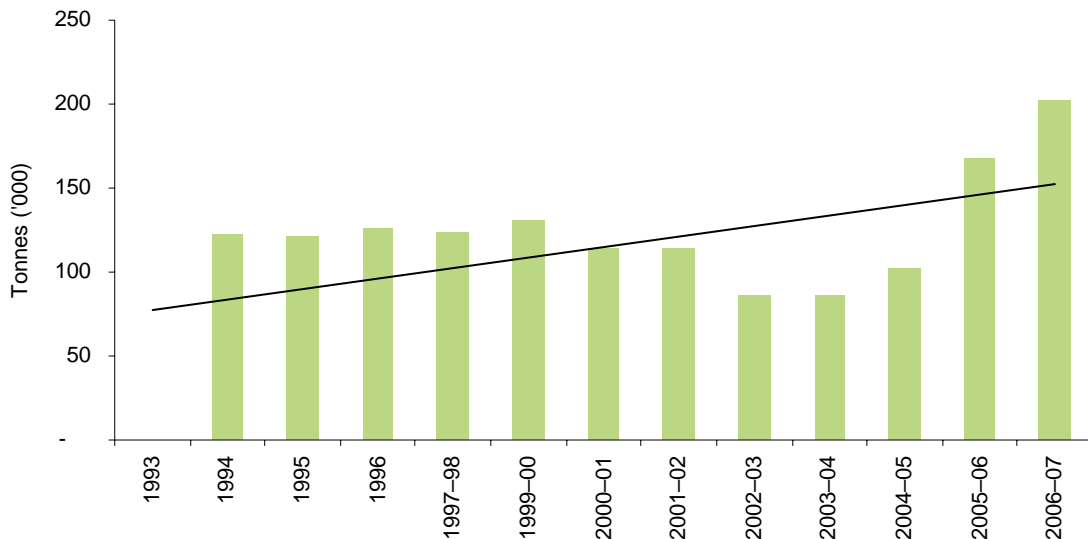
The total quantity of glass recovered for reprocessing in Victoria in the 2006–07 financial year exceeded 200,000 tonnes. Glass containers (bottles and jars) constituted the majority of glass recovered at 93% of the total (see Figure 27). Glass recovery increased by 20% during the 2006–07 period.

Figure 27 Composition of glass (by weight) recovered for reprocessing, Victoria 2006–07



During the 2005–06 period VISY Recycling upgraded the glass recovery facility at Laverton. This plant is the only facility of its kind in Australia with the ability to optically sort glass. The facility sorts mixed and broken glass into different colours and removes contaminants such as ceramics, pyrex and stones to produce high-quality glass for recycling⁸. This upgrade in facility contributed significantly to the increase seen in glass recovery in 2005–06 and 2006–07 (see Figure 28).

Figure 28 Glass recovered for reprocessing, Victoria 1994 to 2006–07



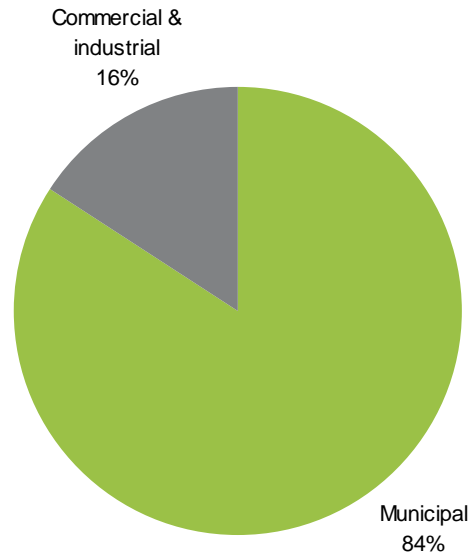
Note: Figures released for the 1998–99 financial year have been excluded from figure 27 as they are inaccurate

⁸ VISY Recycling (2005)

Sources of recyclables

Of the glass received for reprocessing during 2006–07, the majority was sourced from the municipal sector (84%) principally glass containers collected through kerbside recycling systems (see Figure 29).

Figure 29 Source sectors of glass (by weight) received for reprocessing, Victoria 2006–07



Sheet glass, by contrast, was received largely from the commercial and industrial sector in the form of windscreens, broken windows and off-cuts from the manufacture of glass products.

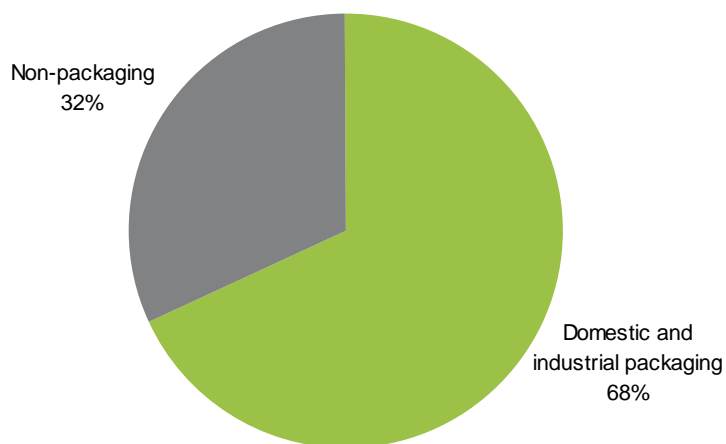
Plastic waste

Recovery and trends

The Plastics and Chemicals Industry Association (PACIA) collects data annually on plastics reprocessing as part of its National Plastics Recycling Survey. Sustainability Victoria has incorporated the PACIA results⁹ into this report.

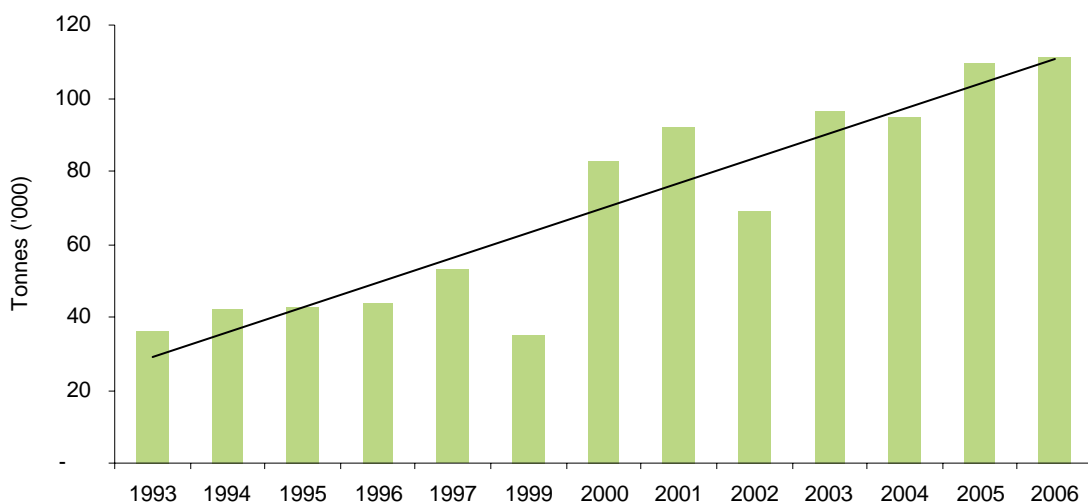
Victoria is still the leading Australian state in plastics recovery, due primarily to the recycling of large amounts of pre-consumer industrial manufacturing scrap. Plastics recovery in Victoria has increased by 2% to 111,000 tonnes for the 2006 calendar year (see Figure 31). The report states that plastics consumption in Victoria during this period was around 380,000 tonnes, based on a per capita estimation using national overall plastics consumption data. This gives an overall plastics recovery rate in Victoria of 29.3%.

Figure 30 Composition of plastic waste (by weight) recovered for reprocessing, Victoria 2006



Domestic and Industrial packaging continues to dominate the recovered material (68%) despite a 10% decrease in composition from the previous financial year (78%) (see Figure 30).

Figure 31 Plastic waste recovered for reprocessing, Victoria 1993 to 2005



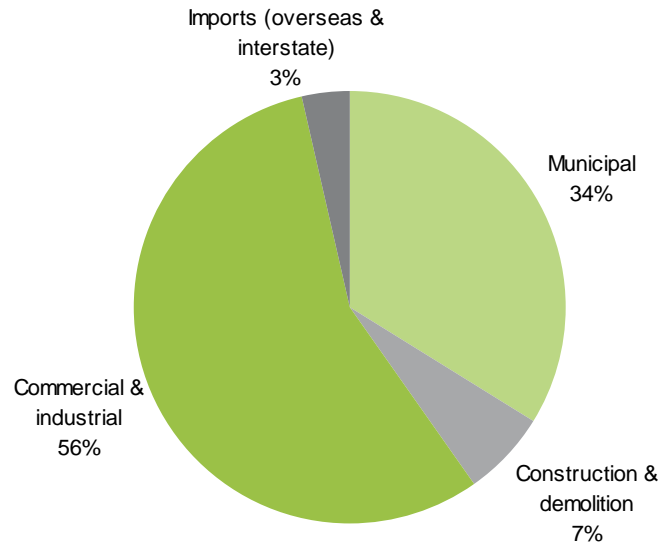
Note: Figures released for the 1998–99 financial year have been excluded from the survey this year as they are inaccurate

⁹ Hyder Consulting (2007), *National Plastics Recycling Survey 2006*, report to the Plastics and Chemicals Industry Association

Sources of recyclables

The majority of plastics recycled during 2006 were sourced from the commercial and industrial sector (see Figure 32), due to the large manufacturing sector in the state. Most of the remaining plastic was sourced from the municipal sector, predominantly domestic packaging collected through kerbside recycling systems. Victoria is recovering more post-consumer domestic plastic than any other state in Australia.

Figure 32 Source sectors of plastic waste received for reprocessing, Victoria 2006

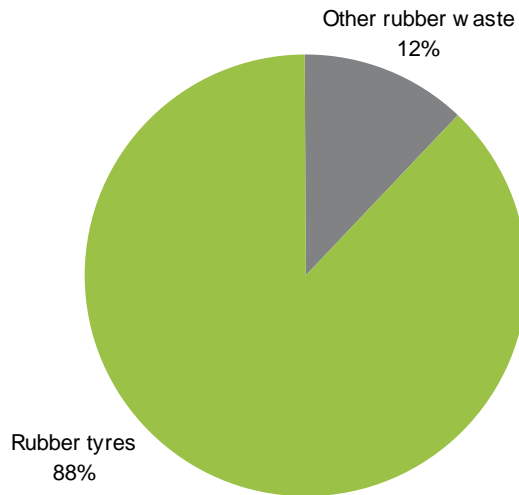


Rubber waste

Recovery and trends

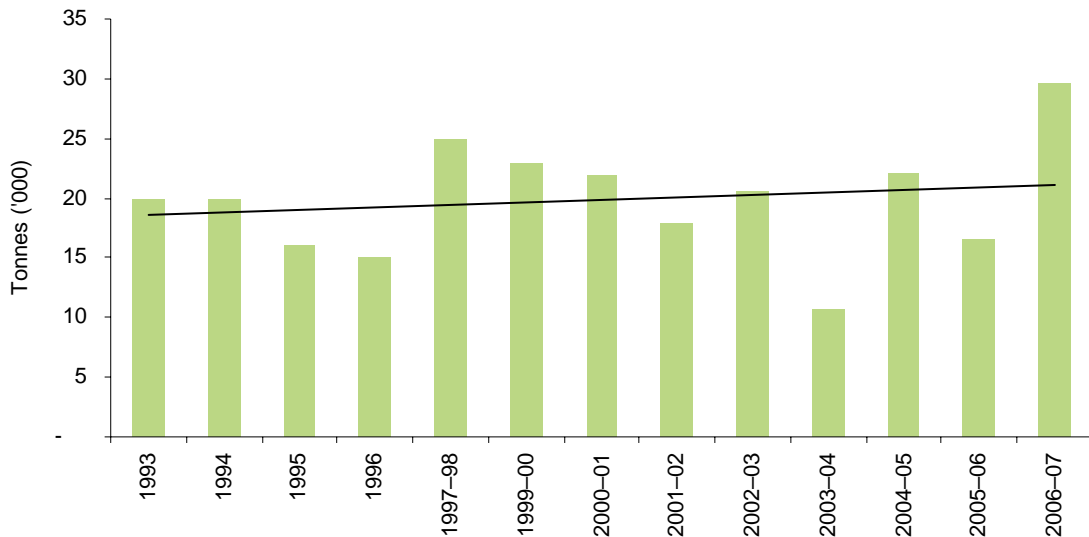
Almost 30,000 tonnes of rubber waste was recovered in Victoria during the 2006–07 financial year, up 78% from the previous year. Figure 33 shows that tyres constituted the majority of rubber diverted from landfill for reprocessing representing 88% of the total. ‘Other rubber waste’, typically tyre buffings, tread ends, uncured rubber and extrusion waste, accounted for the remainder.

Figure 33 Composition of rubber waste (by weight) recovered for reprocessing, Victoria 2006–07



Data has fluctuated greatly over previous years of the survey. A number of key reprocessors responded to the survey for 2006–07. The total reported for this survey period more accurately reflects the state of rubber recycling in Victoria than in previous years (see Figure 34).

Figure 34 Rubber waste recovered for reprocessing, Victoria 1993 to 2006–07

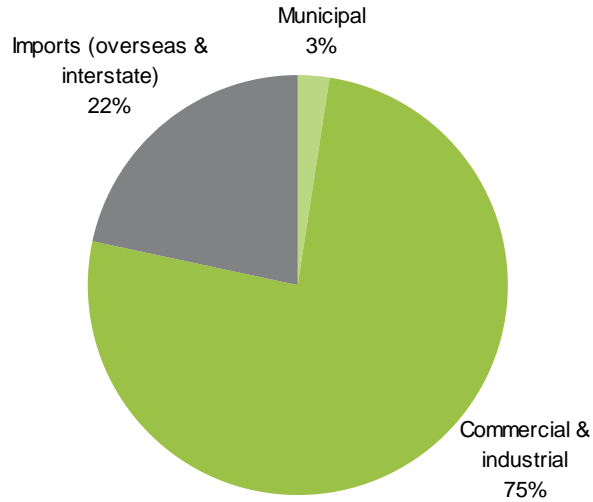


Note: Figures released for the 1998–99 financial year have been excluded from the survey this year as they are inaccurate

Sources of recyclables

Most of the rubber waste received for reprocessing during 2006–07 (75%) was sourced from the commercial and industrial sector (see Figure 35). This was largely rubber tyres received from businesses that provide a collection service to manufacturers and retailers. The original source of the rubber prior to collection is unknown although it could be assumed that a large proportion are from domestic vehicles. A large proportion of rubber continues to be imported for reprocessing.

Figure 35 Source sectors of rubber waste (by weight) received for reprocessing, Victoria 2006–07

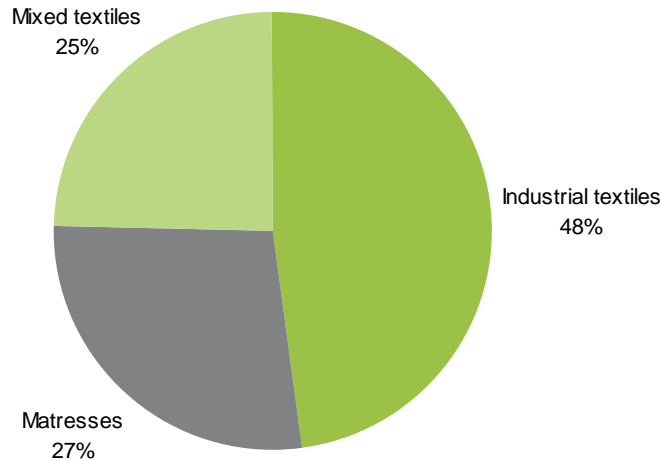


Textile waste

Recovery and trends

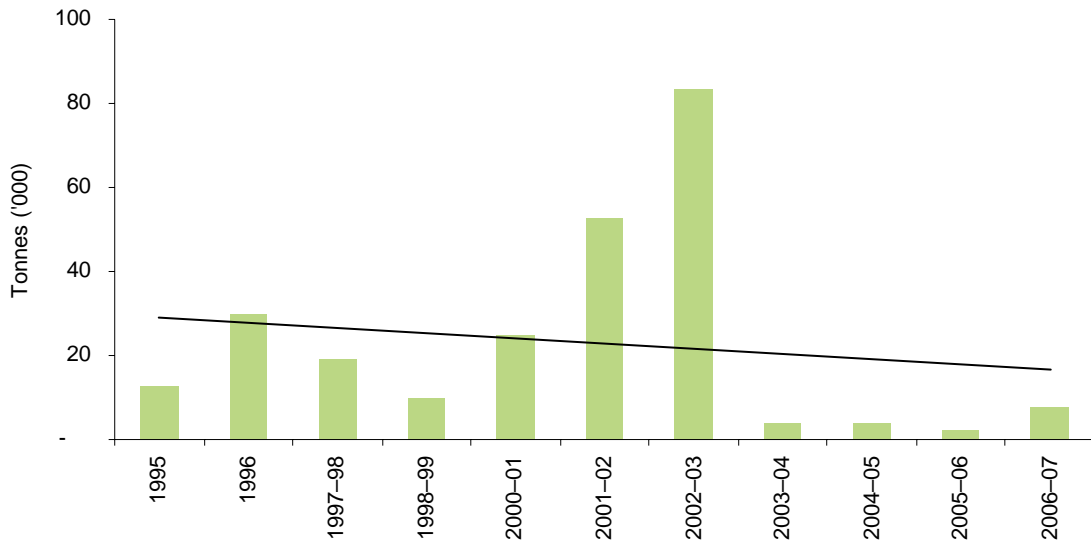
For the 2006–07 financial year, more than 7,000 tonnes of textile waste was recovered for reprocessing. Industrial textiles accounted for just under half of the material recovered (see Figure 36).

Figure 36 Composition of textile waste (by weight) recovered for reprocessing, Victoria 2006–07



Textile recovery has fluctuated greatly since the survey began (see Figure 37). Care should be taken when making comparisons with some historical data as it is considered unreliable. This is because data was reported by a very small proportion of textile reprocessors to the survey. This makes it difficult to make any assumption about the nature and historical trends in the industry.

Figure 37 Textile waste recovered for reprocessing, Victoria 1993 to 2006–07



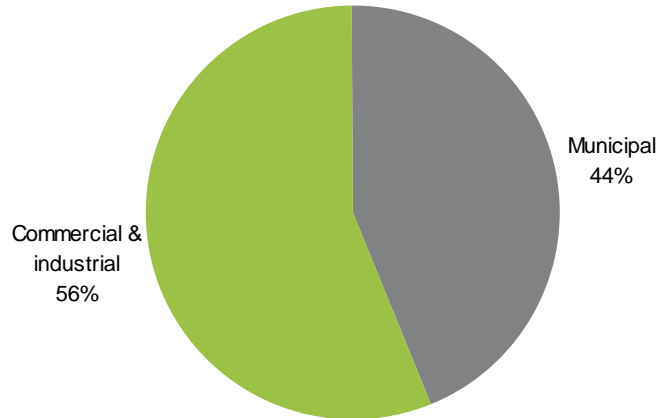
Note: Figures released for the 1999–2000 financial year have been excluded from the survey as they are extreme compared to other years. Care should be taken when making comparisons with previous years as previous year data is considered unreliable.

It should be noted that recent data does not include textiles reused in their original state, such as clothing sold through second-hand or charity stores or clothing exported as relief aid which may have been the case in some previous years.

Sources of recyclables

The survey results show that over half of all material received by Victoria's textile reprocessors was sourced from the commercial and industrial sector with the remainder sourced from the municipal sector (see Figure 38).

Figure 38 Source sectors of textile waste (by weight) received for reprocessing, Victoria 2006–07

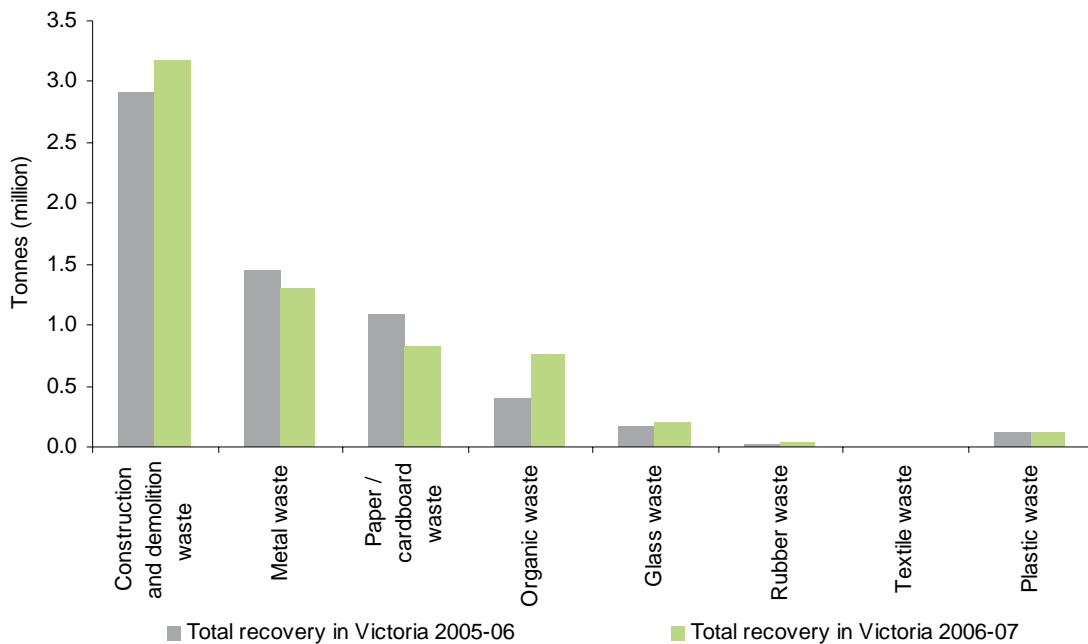


Conclusion

The survey, conducted during November 2007, sought data from 86 Victorian reprocessors. A total of 64 reprocessors provided data for the survey representing a 74% response rate. The results of the survey indicated Victoria's diversion of waste material from landfill for reprocessing for the 2006–07 financial year increased to 6.36 million tonnes. This represents an increase of approximately 4% on the previous financial year and equates to an overall resource recovery (recycling) rate of 62%.

Construction and demolition waste accounted for the greatest proportion of material recovered for reprocessing (see Figure 39), which was an increase of 2% on last year. The next two largest categories being metal waste and paper / cardboard waste both showed decreases in the amount of material recovered by 13% and 24% respectively. Metal waste recovery had a significant decrease in exports while paper / cardboard waste decreased due to over reported figures for the past two years. The total quantity of organic waste material recovered and diverted from landfill in Victoria during the 2006–07 financial year reached a new high of approximately 750,000 tonnes, up 95% from the previous year. Timber recovery returned to levels recovered before 2005–06 while sawdust and other forestry residuals declined from recorded tonnes in 2003–04 until now. The quantities of food organics recovered have continued to grow over the past four years with 35,000 tonnes recovered in 2006–07.

Figure 39 Waste material recovered for reprocessing in Victoria 2005-06 and 2006-07



Waste material received from the construction and demolition (C&D) sector and commercial and industrial (C&I) sector combined accounted for 82% of the waste materials received for reprocessing excluding imports. Victoria's current resource reprocessing capacity is predominantly local with 89% of material recovered remaining in Victoria while waste material exported for reprocessing experienced a decrease of 29%.

Overall resource recovery in Victoria continued to increase and is heading towards targets set by the Victorian Government.

Appendix A Survey methodology

The survey, conducted during November 2007, sought data from 86 Victorian reprocessors, excluding 31 plastic reprocessors surveyed by Hyder Consulting as part of the *National Plastics Recycling Survey 2006*¹⁰. A total of 64 out of the 86 reprocessors provided data for the survey, representing a 74% response rate. It is estimated that these responses covered 90% of the industry by tonne of recovered waste material.

This survey focuses only on the amount of material recovered for reprocessing and not on other stages of the material life cycle such as collection, sorting, and manufacturing to avoid double counting. This survey does not include materials that have been collected and baled only or resold in their original state for reuse, such as clothing sold through second-hand or charity stores. The omission of reuse is not intended to underrate the importance of this activity, but to avoid double counting of material data and provide parameters for the quantification of recycling.

Victorian reprocessors of secondary-use materials (excluding plastic reprocessors) were identified and e-mailed or mailed a survey developed for each industry category. The survey asked respondents to provide information for the 2006–07 financial year on the:

- > amount of material being diverted from landfill (recovered) for reprocessing including,
 - o tonnes received by their Victorian site
 - o tonnes received from other reprocessing facilities
 - o tonnes imported and exported for reprocessing both interstate and overseas
 - o tonnes stockpiled (unprocessed and processed)
 - o tonnes reprocessed on-site.
- > amount of material disposed to landfill due to contamination or as processing waste
- > sector from which the recovered material for reprocessing was received
- > major products made from their reprocessing operations and the subsequent markets (defined by the ANSIC codes) to which the products are sold
- > number of full-time equivalent staff directly employed in the company's recycling operations
- > level of expenditure on research and development as well as capital investment for activities associated with the reprocessing of secondary-use materials.

With the exception of rubber, no data was included on materials used in energy recovery facilities.

Additional information was sought from the Australian Bureau of Statistics on the export of waste material from Australia to overseas markets for reprocessing during the 2006–07 financial year. This data aimed to capture material exported from companies not surveyed by Sustainability Victoria, such as export traders.

Data on plastics recovery in Victoria was obtained from the Plastics and Chemicals Industries Association (PACIA) annual survey, *National Plastics Recycling Survey 2006*, and incorporated into this report.

¹⁰ Hyder Consulting (2006), *National Plastics Recycling Survey 2006*, report to the Plastics and Chemicals Industry Association

Data on solid waste disposed to Victorian licensed landfills was sourced from the EPA Victoria landfill levy returns. This figure represents the amount of waste accepted at licensed Victorian landfills, excluding material used as cover. The *Environment Protection Act 1970* provides a rebate for cover material of 15% (at the relevant municipal rate) for each tonne of waste deposited at a landfill. The figure shown was calculated by taking the tonnes of material received at landfills (including cover material sourced off site) and reducing this by 15% to allow for cover material. It is noted that some landfills source cover material on-site (e.g. from quarrying activities) and that this is not measured in the tonnes of waste received at landfills. Where landfills have claimed a recycling rebate, this has been subtracted from the figures. Prescribed waste (including low level contaminated soil) deposited to landfill, including where used as cover, is not included in this figures. A number of reviews of landfill levy returns are currently being undertaken and therefore this data may be subject to change.

The survey measures and reports on data from responding reprocessors. No estimates are undertaken for non-responding companies. Variation from year to year could be due to the number of, and the size of the non-responding units and the impact they have on the overall data collected. All attempts have been made to include the large reprocessing operations to ensure that variation from year to year is minimised. Data was aggregated for reporting purposes at the state level to retain confidentiality.

In the report, food organics recovery data from 2002–03 no longer includes any prescribed industrial waste figures such as meat waste generated from rendering processes or grease traps. Evaluation and cross-referencing of reported and actual data has led to an adjustment of previous financial year data.

The changes in survey design from 2005–06 to 2006–07:

- > Survey upgraded from a word based survey form into an excel survey form
- > Source sector categories refined to three categories; Municipal, Construction and Demolition, and Commercial and Industrial
- > Product market categories defined using the Australian and New Zealand Standard Industry Classifications (ANZSIC).

Appendix B Waste materials recovered for reprocessing

Table 5 Waste material recovered in Victoria for reprocessing over the past 10 years, Victoria 1997–98 to 2006–07

Waste material	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	% change
											2005–06 to 2006–07
Tonnes ('000)											
Metal waste											
Aluminium (incl. cans)	9	12	35	44*	33	41	62	88	83	63	-24%
Batteries	-	-	-	-	29*	35	30	33	34	15	-55%
Car bodies	-	-	-	-	-	60	80	65	78	120	55%
Non-ferrous	20	21	35	24*	12*	28*	13	19	19	65	240%
Other & mixed metals	-	-	-	-	-	-	-	-	-	1	
Steel (incl. packaging steel)	550	513	698	745*	667	807	848	951	1,234	997	-19%
Total metal waste	579	546	768	813*	741*	971*	1,032	1,157	1,448	1,261	-13%
Construction and demolition waste											
Asphalt	125	371	59	68	65	84	170	162	139	190	36%
Brick/brick rubble	126	271	228	318*	293	250	425	395	385	438	14%
Concrete	834	899	577	811	942	1,161	1,525	1,477	1,734	1,695	-2%
Mixed Demolition and Construction	-	-	-	-	-	-	-	-	-	81	
Plasterboard	20	27	5	4	8	21	22	24	27	22	-18%
Rock / Excavation stone	-	-	-	56	359	293	428	367	419	505	20%
Soil & Sand	-	-	2	16*	49	42	49	68	209	239	14%
Total construction and demolition waste	1,105	1,568	871	1,273*	1,716	1,852	2,618	2,492	2,913	3,170	9%

* Evaluation and cross-referencing of reported and actual data has led to an adjustment of previous financial year data.

Note: Food organics recovery data from 2002–03 no longer includes any prescribed industrial waste figures such as meat waste generated from rendering processes or grease traps..

Table 5 continued

Waste material	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	% change
											2005–06 to 2006–07
Tonnes ('000)											
Paper / Cardboard waste											
Cardboard/paper packaging	382	271	490	388*	332*	414	366	376	461	389	-16%
Newsprint / Magazines	139	137	173	133*	187*	196	194	200	232	122	-47%
Printing & Writing Paper	-	-	-	141*	136*	174	246	262	238	73	-69%
Telephone Books	-	-	-	-	-	10	10	9	10	2	-81%
Other (mixed paper)	-	-	-	-	91*	24	34	90	146	236	62%
Total paper / cardboard waste	521	408	663	662*	746*	818	850	937	1,087	822	-24%
Organic waste											
Timber	30	148	49	151	171*	169	171	229	84	196	132%
Food Organics	316	146	206	222	202	22	14	13	26	35	38%
Garden organics	183	120	230	273	213	217	108	310	214	302	41%
Sawdust / forestry residuals	-	8	21	22	47	111	76	26	35	144	314%
Other	23	33	4	7	10	10	5	40	29	77	169%
Total organic waste	552	455	510	675	643*	529	374	618	388	754	95%
Glass waste											
Glass containers	110	158	116	100	100	73	73	83	143	188	32%
Sheet / Laminated Glass	14	10	15	14*	14	12	13	20	25	14	-44%
Total glass waste	124	168	131	114*	114	85	86	103	168	202	20%

* Evaluation and cross-referencing of reported and actual data has led to an adjustment of previous financial year data.

Note: Food organics recovery data from 2002–03 no longer includes any prescribed industrial waste figures such as meat waste generated from rendering processes or grease traps.

Table 5 continued

Waste material	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	% change
											2005-06 to 2006-07
Tonnes ('000)											
Plastic waste	53	10	35	83	92	69	96	95	109	111	2%
Rubber waste	25	77	23	22*	18	21	11	22	17	30	78%
Textiles waste	19	10	153	25*	53	84	4	4	2	8	221%
Other waste	-	-	20	12	-	-	-	-	-	-	
Total all waste materials	2,978	3,242	3,174	3,679*	4,123*	4,429*	5,072	5,427	6,133	6,358	4%

* Evaluation and cross-referencing of reported and actual data has led to an adjustment of previous financial year data.

Note: Food organics recovery data from 2002-03 no longer includes any prescribed industrial waste figures such as meat waste generated from rendering processes or grease traps.

Appendix C Glossary

Commercial and industrial (C&I) waste: Comprises solid waste generated by the business sector as well as solid waste created by state and federal government entities, schools and tertiary institutions. Unless otherwise noted, C&I waste does not include waste from the construction and demolition (C&D) sector.

Commingled materials: Materials all mixed together, such as plastic bottles with glass and metal containers. Commingled recyclable materials require sorting after collection before they can be recycled.

Construction and demolition (C&D) waste: Includes waste from residential, civil and commercial construction and demolition activities, such as fill material (e.g. soil), asphalt, bricks and timber. C&D waste excludes construction waste from owner/occupier renovations, which is included in the municipal waste stream. Unless otherwise noted, C&D waste does not include waste from the C&I sector.

Garden organics: Organics derived from garden sources e.g. grass clippings and tree prunings.

High density polyethylene (HDPE): A member of the polyethylene family of plastics, used to make products such as milk bottles, pipes and shopping bags. HDPE may be coloured or opaque.

Kerbside collection: Collection of household recyclable materials (separated or commingled) that are left at the kerbside for collection by local council collection services.

Landfill: Sites that are licensed by the EPA Victoria for the disposal of materials (both waste and potentially recyclable materials). Also known as tips.

Linear low density polyethylene (LLDPE): A member of the polyolefin family of plastics, LLDPE is a strong and flexible plastic usually used in film for packaging, bags and for industrial products such as pressure pipe.

Low density polyethylene (LDPE): A member of the polyolefin family of plastics, LDPE is a flexible material usually used as film for packaging or as bags.

Mulch: Any composted or non-composted organic material, excluding plastic, which is suitable for placing on soil surfaces to restrict moisture loss from the soil and to provide a source of nutrients to aid plant growth.

Municipal waste: Solid waste generated from domestic premises (garbage and hard waste) and council activities such as street sweeping, litter collection and street tree lopping. Also includes waste dropped off at transfer stations and construction waste from owner/occupier renovations.

Non-ferrous metals: Those metals that contain very little or no iron (e.g. copper, brass and bronze).

Polyethylene terephthalate (PET): A clear, tough, light and shatterproof type of plastic, used to make products such as soft drink bottles, film packaging and fabrics.

Polypropylene (PP): A member of the polyolefin family of plastics. PP is light, rigid and glossy and is used to make products such as washing machine agitators, clear film packaging, carpet fibres and housewares.

Polystyrene (PS): A member of the styrene family of plastics, PS is easy to mould and is used to make refrigerator and washing machine components. It can be foamed to make single-use packaging, such as cups, meat and produce trays.

Polyvinyl chloride (PVC): A member of the vinyl family of plastics, PVC can be clear, flexible or rigid and is used to make products such as fruit juice bottles, credit cards, pipes and hoses.

Post-consumer material: Material generated by households or commercial, industrial or 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.

Pre-consumer material: Material diverted from the waste stream during a manufacturing process. Excluded is reutilisation of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Prescribed waste and prescribed industrial waste: Those wastes listed in the Environment Protection (Prescribed Waste) Regulations 1998 and subject to requirements under the industrial waste management policy (prescribed industrial waste) 2000. EPA Victoria closely regulates these wastes because of their potential adverse impacts on human health and the environment. Prescribed wastes carry special handling, storage, transport and often licensing requirements, and attract substantially higher disposal levies than non-prescribed solid wastes.

Recovered material: Material that would have otherwise been disposed of as waste, but has instead been collected and recovered (reclaimed) as a material input, in lieu of a new primary material, for a recycling or manufacturing process.

Recovery rate: The recovery rate is the percentage of materials recovered for reprocessing from the total quantity of waste generated.

Recycling (term): used to cover a wide range of activities, including collection, sorting, reprocessing and manufacture into new products

Reprocessing: Changing the physical structure and properties of a waste material that would otherwise have been sent to landfill, in order to add financial value to the processed material and enable it to be reused.

Solid waste: Non-hazardous, non-prescribed solid waste materials ranging from municipal garbage to industrial waste.

Waste generation: Generation of unwanted materials including recyclables as well as garbage.

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