

UNDERSTANDING THE WASTE STREAM

Part 1: Statistical Overview

EcoRecycle Victoria
June 2000

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EXECUTIVE SUMMARY

EcoRecycle Victoria has commissioned numerous reports providing information and recommendations essential to the ongoing development of EcoRecycle's business plan. The objective of this research paper is to collate the key data from these reports and present them in one document. This includes compiling data on the tonnage of waste going to landfill for each stream (Municipal, Commercial & Industrial, and Construction & Demolition), composition of each waste stream and a comparison across industry sectors. This will assist in the identification of new and productive approaches for EcoRecycle Victoria programs and thus act as a key resource in the business planning process for 2000-2003. A total of 26 industry and landfill reports were reviewed from 1994 to drafts of 2000 reports.

The total waste disposed to landfill in Victoria in 1998/99 was 4,185,240 tonnes. This is an increase of 18% since 1992/93. (Some of this increase is due to the inclusion of all registered landfills in levy data collection from 1997/98. Prior to this, data was only collected for Melbourne, Ballarat, Bendigo, Mornington Peninsula and Geelong). Data on the split between municipal and industrial waste is only available up to 1996/97. Over that period, municipal waste fell by around 18%, while C&I waste increased by 10%.

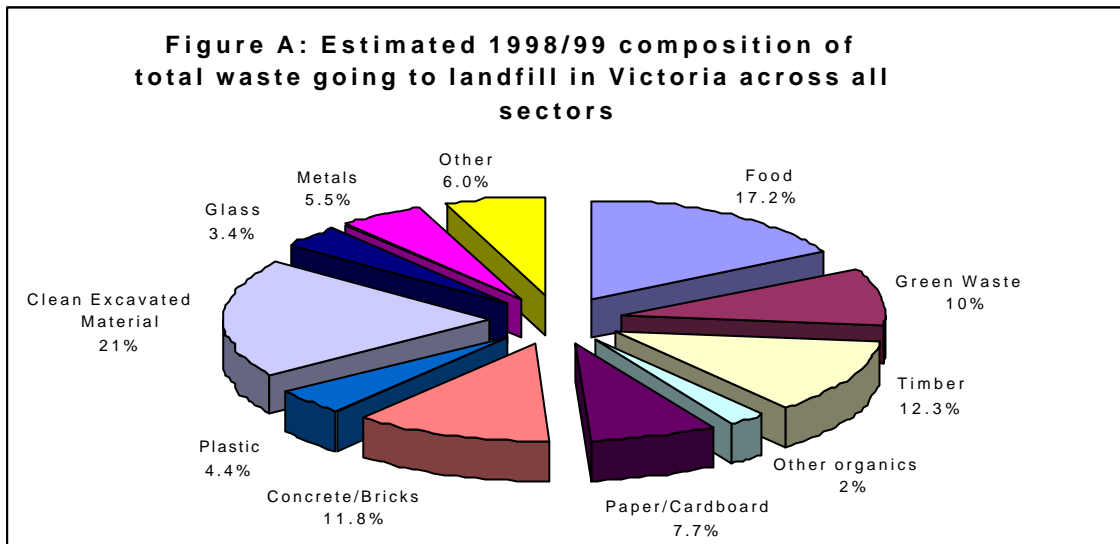
The waste going to landfill in 1998/99 by sector is estimated at:

Municipal	34%	(1.4 million tonnes)
Commercial and industrial	32%	(1.3 million tonnes)
Construction and demolition	34%	(1.4 million tonnes)

The Regions with the highest levels of waste disposal to landfill in 1998/99 were:

South Eastern metro	36%	(1.5 million tonnes)
Northern metro	19%	(785, 000 tonnes)
Western metro	14%	(590,000 tonnes)
Barwon	6%	(262, 000 tonnes)

The most common materials in the waste stream are clean excavated material, food waste, timber, concrete/bricks and green waste (see Figure A and Table A).



Source: Interpolation of 1999 EPA Waste Profile Study of Victorian Landfills, Golder Associates
 Total: 4,185,240 tonnes

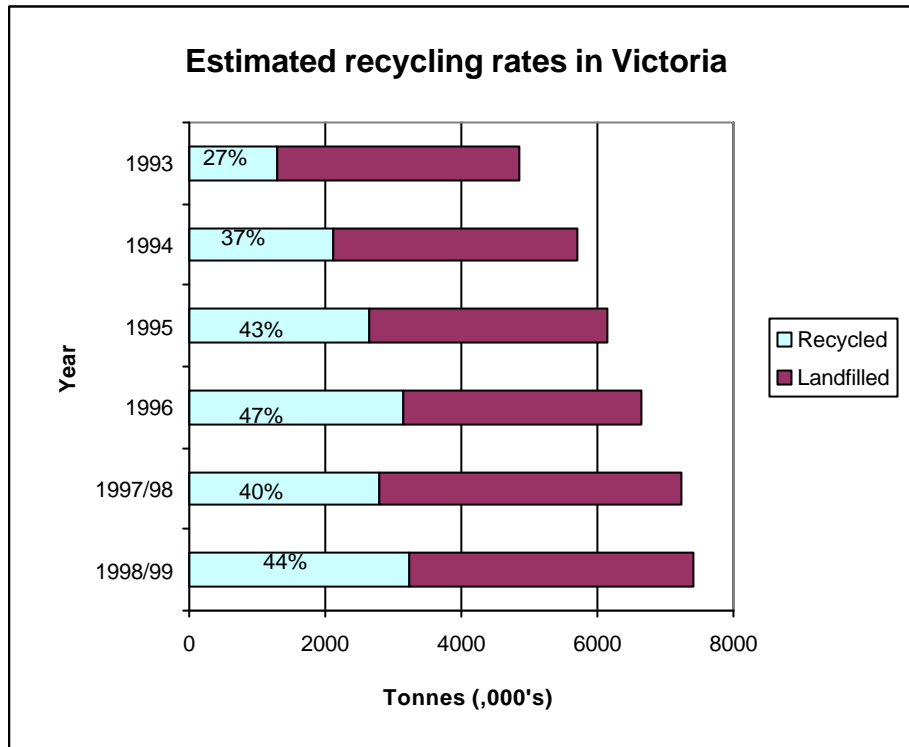
Table A: Estimated top six waste streams and their sources going to landfill

Material	C&D stream tonnes	C&I stream tonnes	Municipal stream tonnes	Total waste tonnes
1. Clean fill	776,948 (94%)	46,875 (6%)		823,823 (100%)
2. Food	-	178,124 (25%)	540,733 (75%)	718,857 (100%)
3. Timber	99,609 (19%)	325,444 (63%)	91,071 (18)	516,124 (100%)
4. Concrete/bricks	387,051 (78%)	108,481 (22%)	-	495,532 (100%)
5. Garden organics	31,306 (8%)	115,178 (29%)	253,291 (63%)	399,774 (100%)
6. Other wastes	128,068 (10%)	565,174 (46%)	537,887 (44%)	1,231,130 (100%)
TOTAL	1,422,982	1,339,276	1,422,982	4,185,240

Source: Interpolation of 1999 EPA Waste Profile Study of Victorian Landfills, Golder Associates

The total quantity of materials collected for recycling in Victoria has increased from 2,634,000 tonnes in 1995, to 3,242,000 tonnes in 1998/99 (an increase of 23%). In 1998/99, recycling represented a diversion rate of 44% (an increase of 4 percentage points from 1997/98 figures).

(Total waste stream = 7,421,000 tonnes, recycling waste stream = 3,2236,000 tonnes)



Source: Recycling rates calculated by EcoRecycle Victoria using data from the EPA landfill levy and 1998/99 Annual survey of Recycling Industries. Note: The data source changed in 1997/98 when the landfill levy was extended throughout Victoria. The lower diversion rate in 1997/98 and 1998/99 is likely to be due to the inclusion of waste from all of Victoria, not just metropolitan regions.

The highest quantities recycled in 1998/99 were for:

Concrete	899,000 tonnes	(28%)
Steel	513,000 tonnes	(16%)
Asphalt	371,000 tonnes	(11%)

The Survey of Recycling Industries for 1997/98 found that for companies providing data (47 companies):

- 1200 people were employed in recycling activities;
- gross annual turnover was \$250 million; and
- investment in infrastructure was \$700 million.

Given that several large companies declined to give financial figures, the contribution of the recycling sector is more likely to be around \$400 million in turnover and \$1 billion in investment.

Conclusions

The data highlights a number of issues relevant to EcoRecycle Victoria programs:

- More emphasis should be placed on industrial waste, which makes up two-thirds of the waste stream, and was on an upward trend to 1996/97.
- Increased emphasis should be placed on the 4 categories of material which dominate the waste stream (excluding clean fill) – food, timber, concrete/ bricks and green waste.
- Organics (food waste, green waste, timber and other organics) should be the highest priority as they represent an estimated 41.5% of all waste going to landfill in Victoria.
- For construction and demolition waste, programs should focus on the categories of concrete/bricks and timber waste.
- For commercial and industrial waste, programs should focus on the categories of timber waste, food/kitchen waste and paper/cardboard.

1.0 INTRODUCTION

The primary waste categories considered were as follows:

- Municipal (including Domestic, Other Domestic and Council)
- Commercial and Industrial (C&I)
- Construction and Demolition (C&D)

Municipal waste is categorised in three major sub-streams, namely, domestic, other domestic and other Council. Domestic waste is that coming from municipal collection trucks (ie. mobile garbage bin collections). 'Other domestic' consists of hard waste and green waste collections, private traffic and household waste collected by commercial operators. 'Other Council' is waste comprised of litter, street sweepings and garden wastes. Detailed information on the domestic (household) waste stream is from the annual Beverage Industry Environment Council (BIEC) *Recycling Audit and Garbage Bin Analysis* (Figure 2.2.1).

All wastes generated by demolition, construction, earth moving and road construction industries are categorised as Construction and Demolition (C&D) wastes. All other wastes generated by business and commerce are categorised as Commercial and Industrial (C&I) wastes. This includes waste from schools, restaurants, manufacturing industries and offices.

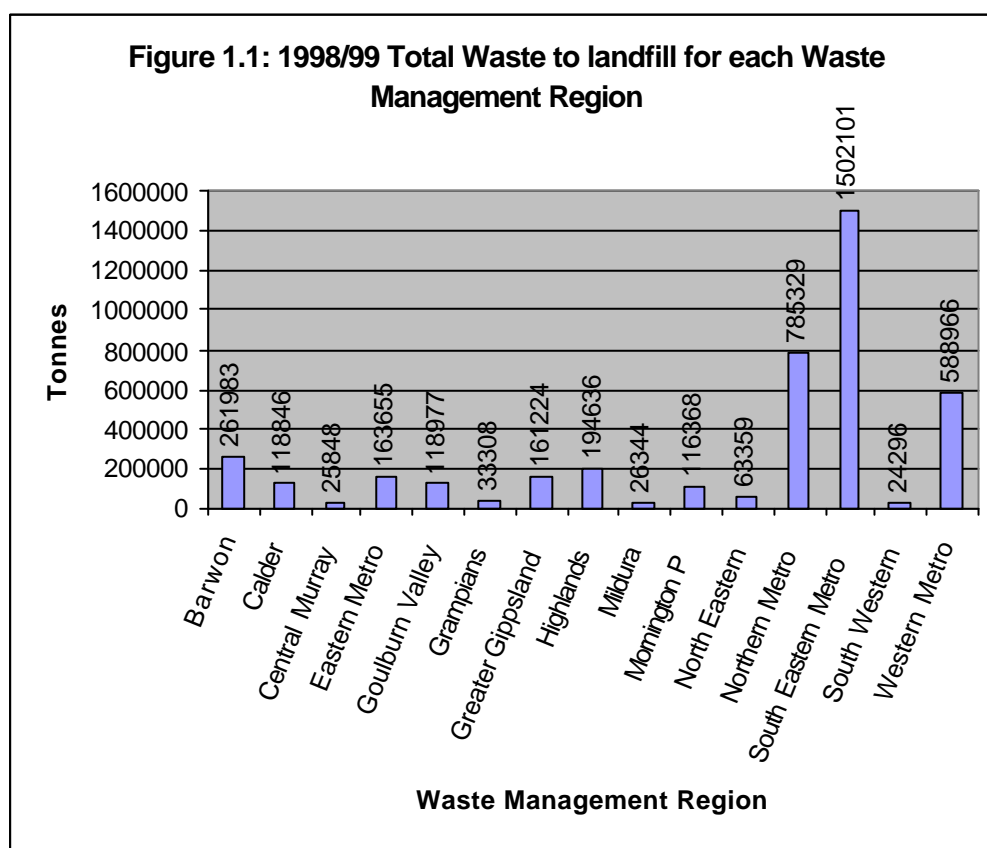
2.0 SOLID WASTE DATA

2.1 Composition of all waste going to landfill

Table 1.1: Total landfill waste for the Melbourne, Geelong, Ballarat, Bendigo and Mornington Peninsula area (1992/93 to 1996/97) and for Victoria (1997/98 to 1998/99)

Financial Year	Municipal Solid Waste (tonnes)	Total C&I and C&D waste (tonnes)	Total Solid Waste (tonnes)
1992/93	1,460,258 (41%)	2,097,428 (59%)	3,557,686 (100%)
1993/94	1,406,090 (39%)	2,213,691 (61%)	3,619,781 (100%)
1994/95	1,283,560 (36%)	2,305,491 (64%)	3,589,051 (100%)
1995/96	1,290,000 (37%)	2,218,000 (63%)	3,508,000 (100%)
1996/97	1,189,747 (34%)	2,297,395 (66%)	3,487,142 (100%)
1997/98	No Split	No Split	4,433,909
1998/99	No Split	No Split	4,185,240

Source: EPA Landfill Levy Data - EcoRecycle Victoria Website

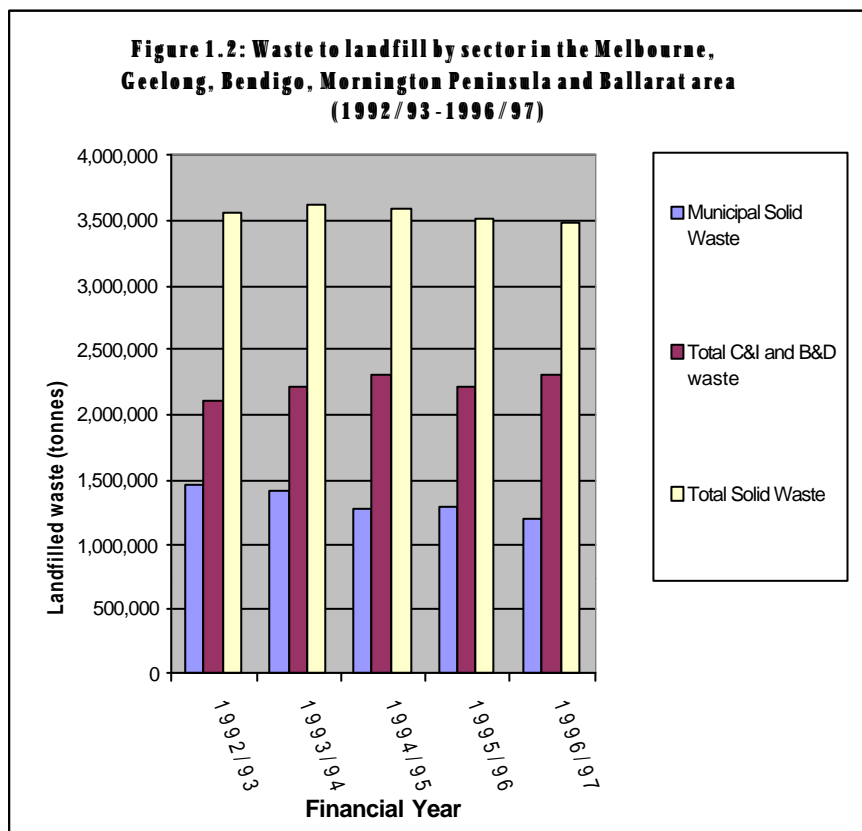


Source: EPA Landfill Levy Data

Table 1.2: Estimated division between C & D and C & I wastes

Financial Year	Estimated C & D waste (tonnes)	Estimated C & I waste (tonnes)	Total C&I and C&D waste (tonnes)	Source	Details of Survey
1992/93			2,097,428 (100%)	No source available to determine split	
1993/94	1,461,036 (66%)	752,655 (34%)	2,213,691 (100%)	Maunsell 1993 & 1994 <i>Waste Traffic and Composition Surveys Report for Melbourne Metro Area</i>	9 landfills surveyed 33,728 tonnes Period: 2 weekdays & 1 weekend
1994/95			2,305,491 (100%)	No source available to determine split	
1995/96			2,218,000 (100%)	No source available to determine split	
1996/97	1,200,000 (52%)	1,097,395 (48%)	2,297,395 (100%)	Nolan ITU 1998 <i>Construction & Demolition Waste Landfill Traffic and Compositional Surveys</i>	8 landfills in metro Melbourne & 2 provincial cities 2728 tonnes Period: 10 weekdays & 1 Saturday
1997/98			No Split		

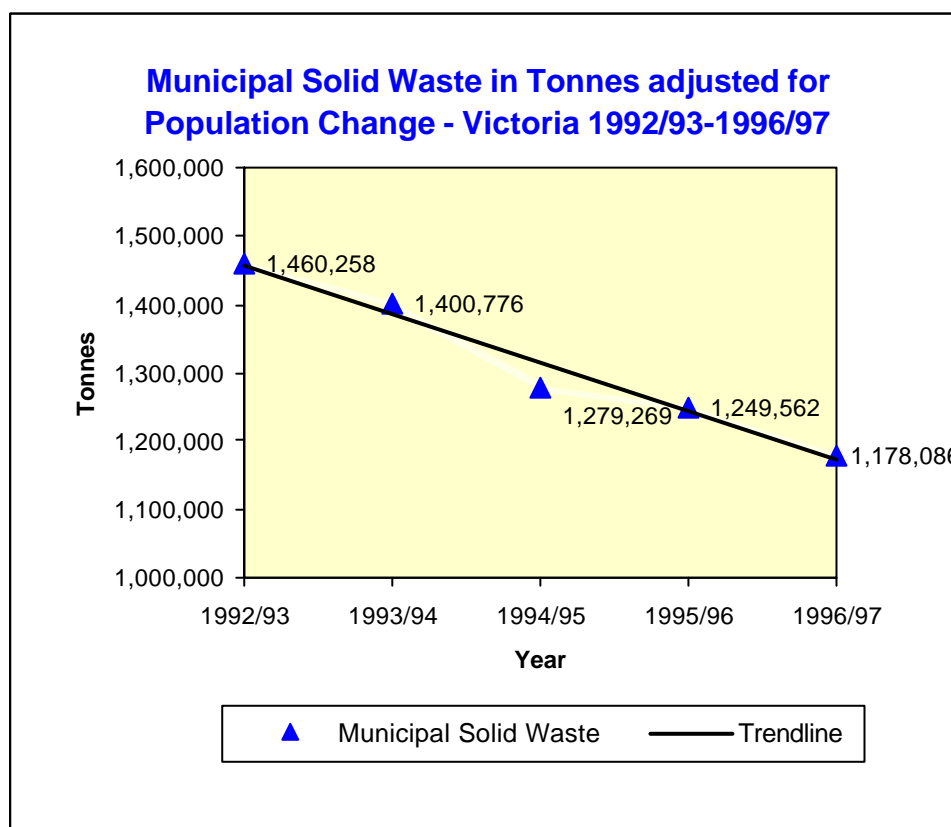
Source: EPA landfill levy data



Source: EPA landfill levy data

Municipal solid waste shows a gradual decline whilst C&D and C&I together show fluctuating trends. C&D and C&I waste had increased by 10%, while municipal waste had decreased by 18% over the five year period from 1992/93 to 1996/97. The total solid waste stream fell by 2% over the same period. The decrease in municipal waste is further emphasised when reviewing it adjusted for population change (Figure 1.3). As Victoria's population increased from 4,454,800 in 1992/3 to 4,560,800 in 1996/7, municipal waste decreased from 1,460,258 tonnes in 1992/3 to 1,189,747 tonnes in 1996/7. The graph shows that if the population had remained constant, the municipal waste tonnage would have further reduced to 1,178, 086 in 1996/7.

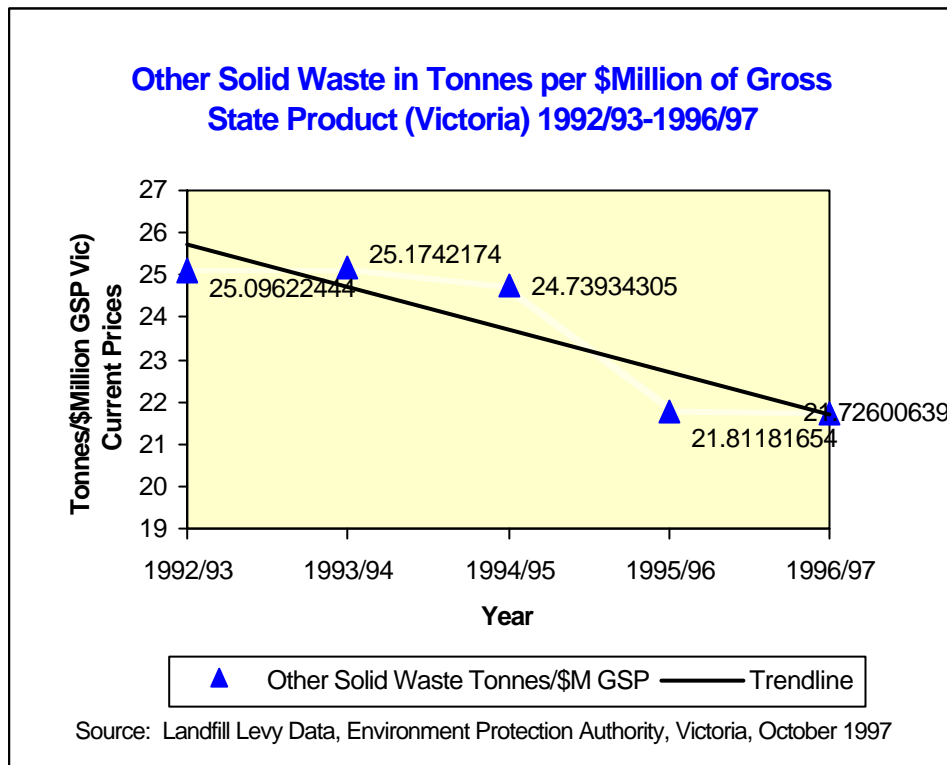
Figure 1.3



Source: Population Data: ABS Demographic Statistics No. 3101 & GSP Data: Vic Gvt Economic and Financial Policy Department

The increase in C&D and C&I waste from 2,097,428 tonnes in 1992/3 to 2,297,395 tonnes in 1996/7 should also be looked at in relation to economic activity. Industrial waste relative to economic activity decreased from 25.1 tonnes per million dollars of Gross State Product (GSP) in 1992/3 to 21.7 tonnes per million dollars of GSP in 1996/7 (Figure 1.4).

Figure 1.4



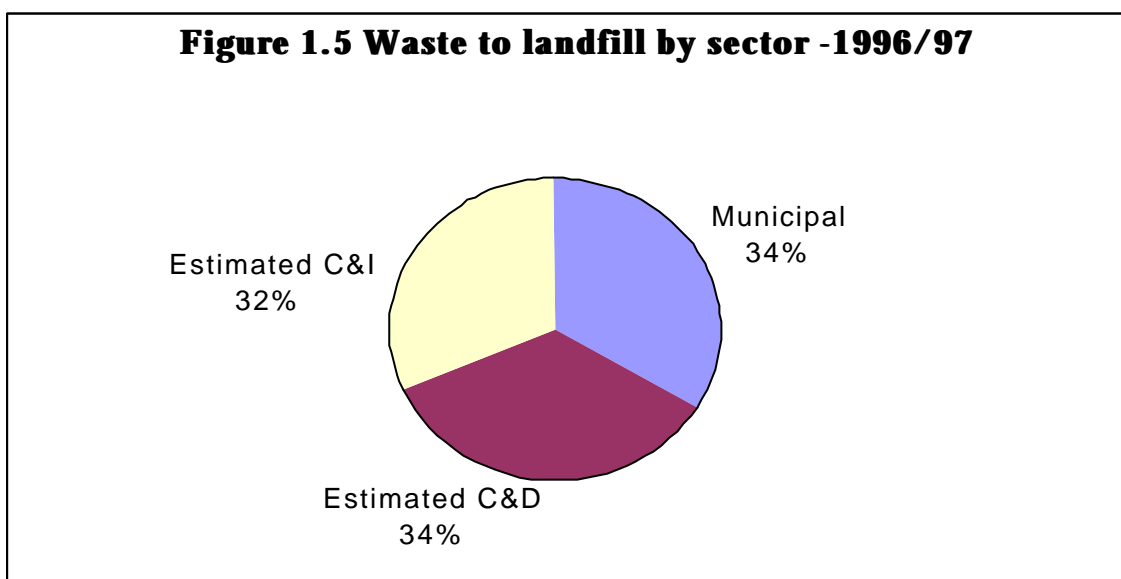
Source: Population Data: ABS Demographic Statistics No. 3101 & GSP Data: Vic Gvt Economic and Financial Policy Department

There is no annual data regarding the division between Construction and Demolition (C&D) and Commercial and Industrial (C&I). The estimated division of C&D and C&I was calculated using the ratio of 46% to 24% respectively. This figure was derived from the "Waste Traffic and Composition Surveys Report for Melbourne Metropolitan Area (RRRC) - Maunsell 1994". The method of data collection in the Maunsell 1994 report involved recording waste entering nine landfills in the Melbourne metropolitan area. Information was also obtained from the remaining thirty one landfills which were not previously surveyed. The nine landfills surveyed were taken over a period of 2 weekdays and one weekend in winter. These results were combined to obtain a weekly quantity of waste disposed of to landfills, categorised in the following waste streams:

- Construction and Demolition, 34, 376 tonnes/week at **46%** of the total weight
- Commercial and Industrial, 17, 466 tonnes/week at **24%** of the total weight
- Municipal, 22,606 tonnes/week at 30% of the total weight

From the above percentages, **the 1993/94 ratio of C&I and C&D is 1 to 1.95 or 34% to 66% respectively**. It is important to note that the 1994 Maunsell report figures are recorded at a point in time and thus are not as accurate as the landfill levy data recorded over a 12 month period. The most current data

for the estimated tonnage of the total waste attributed to C&D and C&I separately is for the 1996/97 financial year (1998 Nolan ITU). In this Nolan report, a total of 371 vehicles carrying C&D wastes (2718 tonnes) were surveyed. The annual C&D waste quantities going to the eight surveyed landfills within metropolitan Melbourne is estimated to be in the order of 1.2 M tonne. Thus the estimated **1996/97 ratio of C&I and B&D is 1.1 M tonne to 1.2M tonne, or 48% to 52% respectively**. Once again this estimate should be used with caution as it is derived from a small 'snapshot' in time and thus does not account for weekly and seasonal variations.



Total: 3,487,142 tonnes

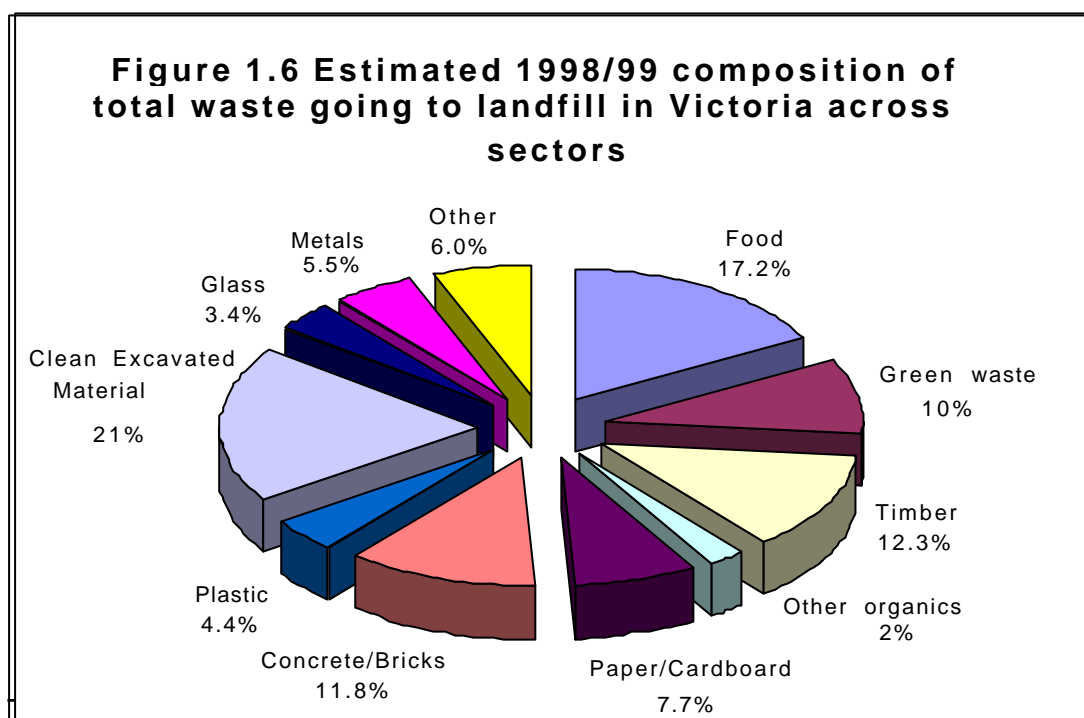
Source: C&I and C&D estimated ratio from Nolan ITU, "Construction and Demolition Waste Landfill Traffic and Compositional Surveys, July 1998" is applied to EPA Landfill Levy data for 1996/97.

The figures used to estimate the split between the three sectors for 1996/97 (Figure 1.3) was calculated using:

- EPA landfill levy data calculated that Municipal is 34%, C&I and C&D is 66% in the 1996/97 financial year.
- Nolan 1998 report estimated that the split between C&D and C&I is 52% and 48% respectively.

Accurate data has been unavailable due to the structure of the landfill levy where the only determinant between municipal solid waste and other solid waste has been the difference in cost, \$2/tonne and \$3/tonne respectively. For the 1997/98 financial year, the levy was charged at the flat rate of \$3/tonne of solid waste disposed of at landfills in metropolitan Melbourne, the Mornington Peninsula, Geelong, Ballarat and Bendigo. The 'No Split' comment in the above tables is due to the introduction of this flat rate charge. In addressing the issue of insufficient data of Victoria's landfill composition,

EcoRecycle in conjunction with EPA is in the process of implementing a Waste Categorisation System at landfills.



Source: EcoRecycle interpolation of 1999 EPA Waste Profile Study of Victorian Landfills, Golder Associates

Organics (food waste, green waste, timber and other organics) represent an estimated 41.5% of all waste going to landfill in Victoria (see Figure 1.6). The top five waste streams are listed in Table 1.3.

Table 1.3 Estimated top six waste streams and their sources going to landfill

Material	C&D stream tonnes	C&I stream tonnes	Municipal stream tonnes	Total waste tonnes
1. Clean fill	776,948 (94%)	46,875 (6%)		823,823 (100%)
2. Food	-	178,124 (25%)	540,733 (75%)	718,857 (100%)
3. Timber	99,609 (19%)	325,444 (63%)	91,071 (18%)	516,124 (100%)
4. Concrete/bricks	387,051 (78%)	108,481 (22%)	-	495,532 (100%)
5. Garden organics	31,306 (8%)	115,178 (29%)	253,291 (63%)	399,774 (100%)
6. Other wastes	128,068 (10%)	565,174 (46%)	537,887 (44%)	1,231,130 (100%)
TOTAL	1,422,982	1,339,276	1,422,982	4,185,240

Source: EcoRecycle interpolation of 1999 EPA Waste Profile Study of Victorian Landfills, Golder Associates

2.2 Composition of each waste stream

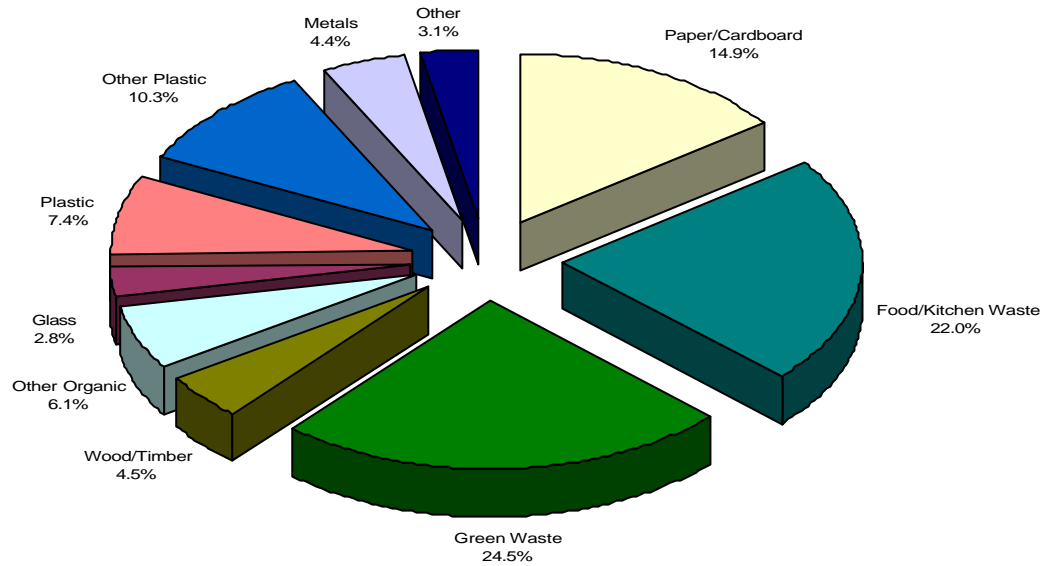
The following pie graphs are from the EPA *Waste Profile Study of Victorian Landfills* prepared by Golder Associates, September 1999 and the *Waste Traffic and Composition Surveys Report for Melbourne Metropolitan Area* by Maunsell Pty Ltd, July 1994. The EPA survey was conducted over a four week period (17 May 1999-11 June 1999) covering 35 landfill sites across Metropolitan Melbourne and Regional Victoria. The sites surveyed receive approximately 65% of all waste going to landfill in Victoria. Additional data from Maunsell was included due to the limitations of the EPA study (ie. very small sample size).

It is important to note the limitations of the EPA study. These include

- The data does not represent waste received at individual landfills or particular waste regions in Victoria.
- Due to the small number of samples used, the information presented can only be considered indicative.
- Comparability with past studies is limited due to the difference in rationale, sampling regimes and time of the survey.
- The collected data does not take into consideration weekly variations at individual landfills, nor does it consider seasonal variations.

Municipal Waste

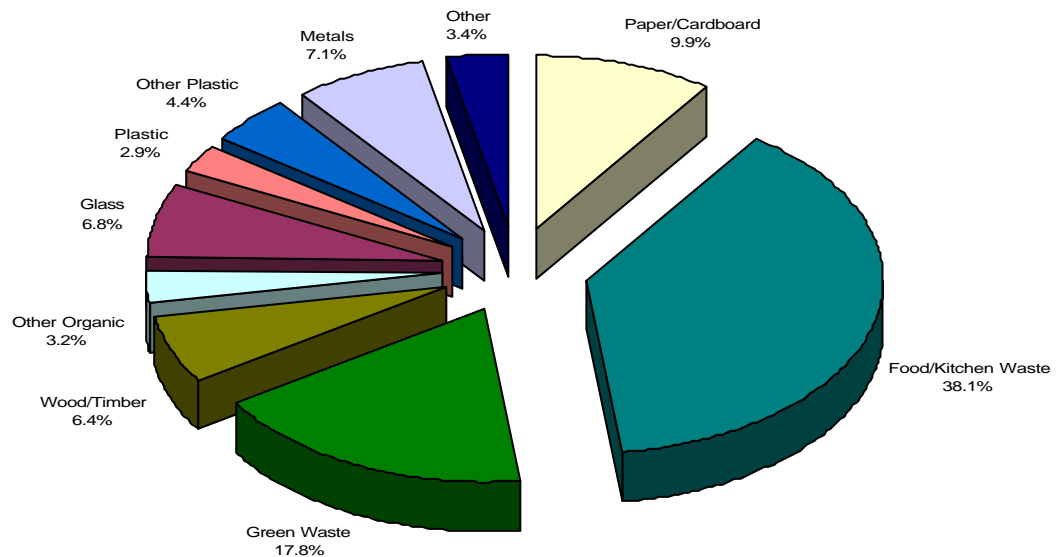
Figure 2.1 Municipal Waste % by Volume (17 May - 11 June 1999)



Total municipal volume surveyed: 45.63 m³

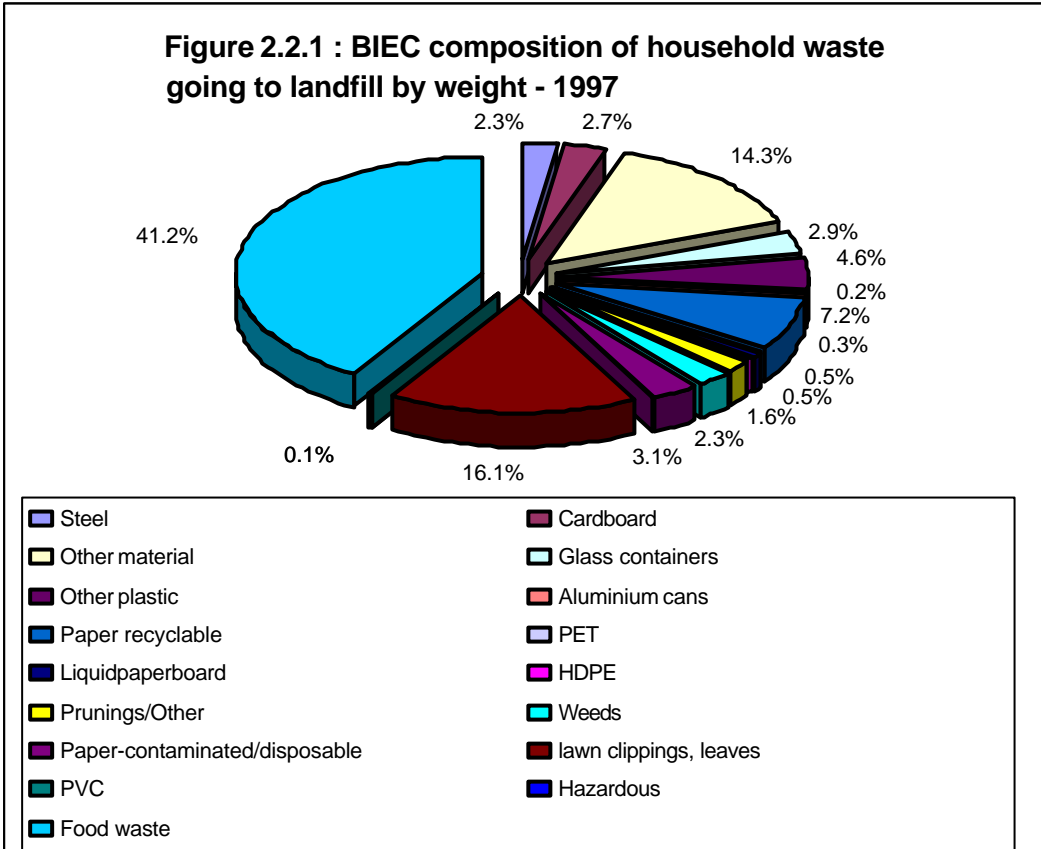
Source: EPA Waste Profile Study of Victorian Landfills, 1999

Figure 2.2 Municipal Waste % by Tonnage (17 May - 11 June 1999)



Total municipal tonnage surveyed: 9.21 tonnes

Source: EPA Waste Profile Study of Victorian Landfills, 1999

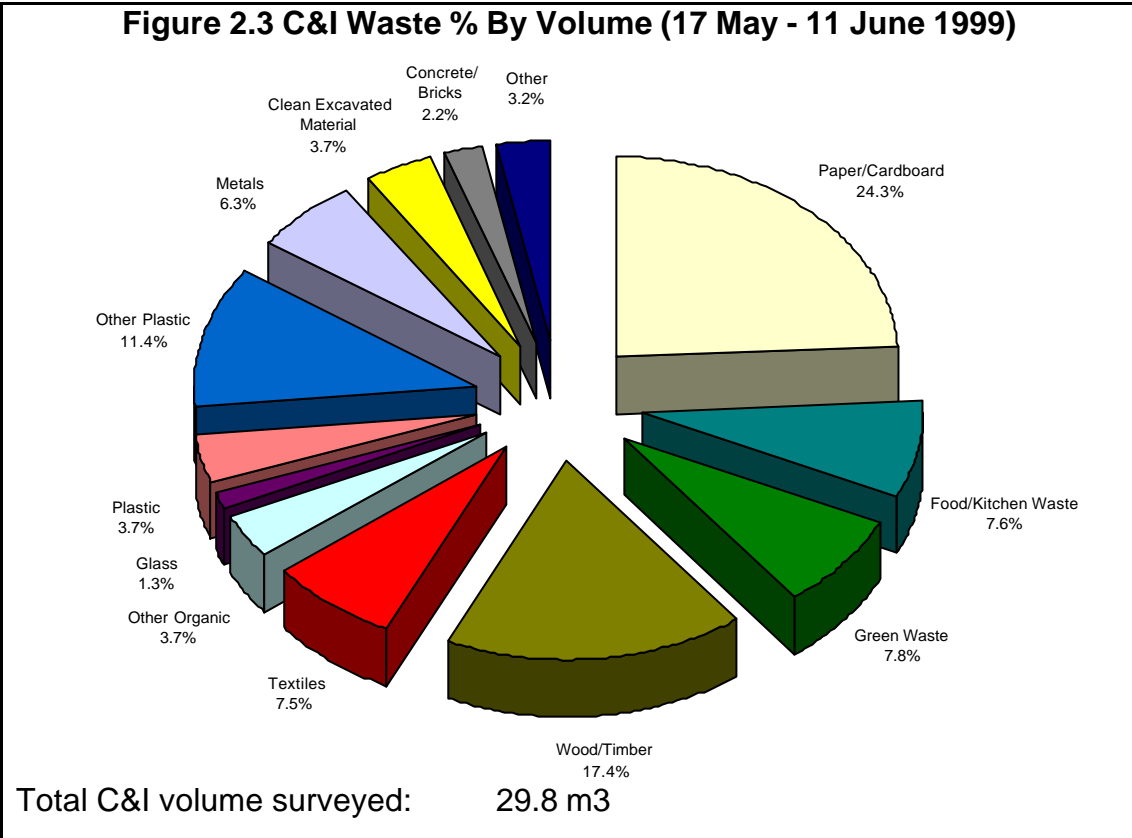


Source: BIEC Recycling and Garbage Bin Audit, 1998 (www.ecorecycle.vic.gov.au)

The BIEC report gives a more detailed analysis of household waste to landfill as it encompasses the waste disposal habits and recycling behaviour of 9000 households across 30 municipalities. The BIEC audit (Figure 2.2.1) and the EPA profile study (Figure 2.2) show similar results with food waste and green waste contributing to over 50% of the waste going to landfill.

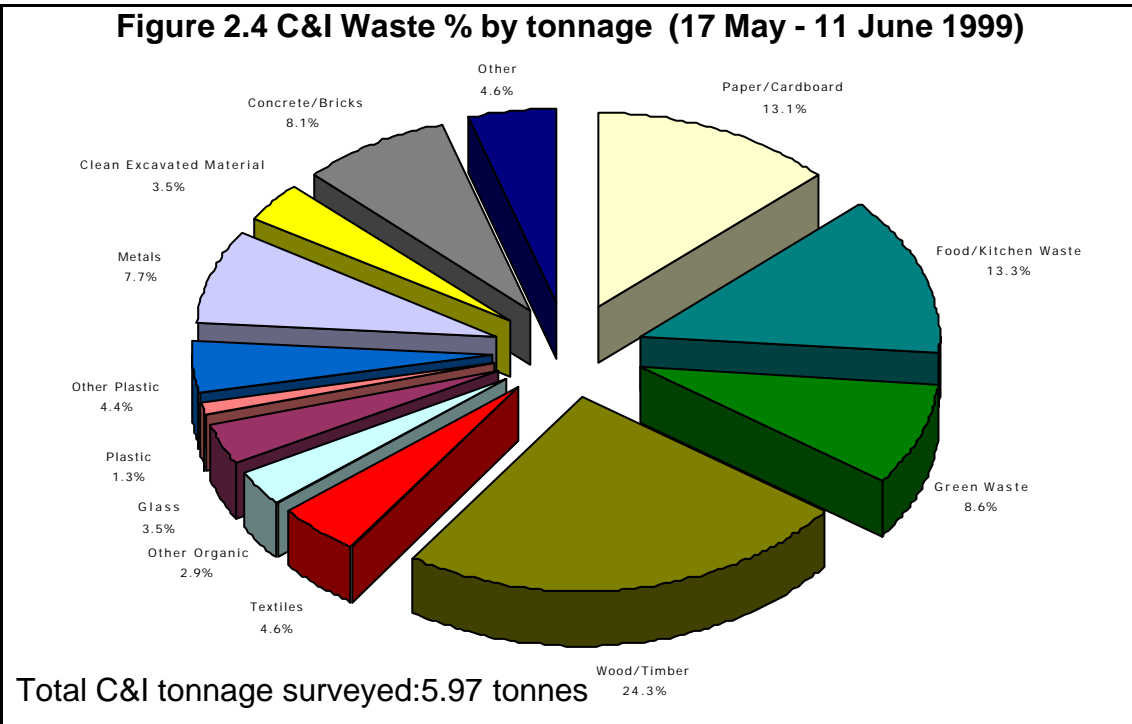
Commercial and Industrial Waste

Figure 2.3 C&I Waste % By Volume (17 May - 11 June 1999)



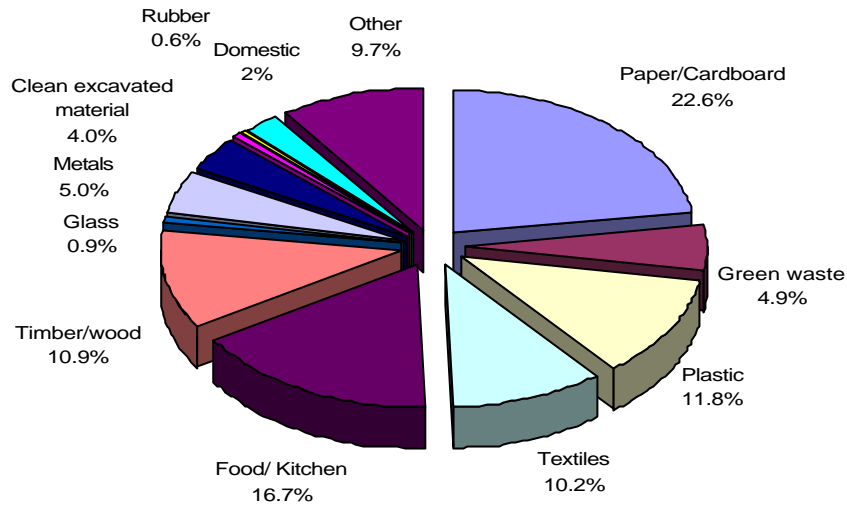
Source: EPA Waste Profile Study of Victorian Landfills, 1999

Figure 2.4 C&I Waste % by tonnage (17 May - 11 June 1999)



Source: EPA Waste profile study of Victorian landfills, 1999

Figure 2.5: 1994 Maunsell C&I weekly waste composition



Total C&I waste surveyed: 17, 466 tonnes

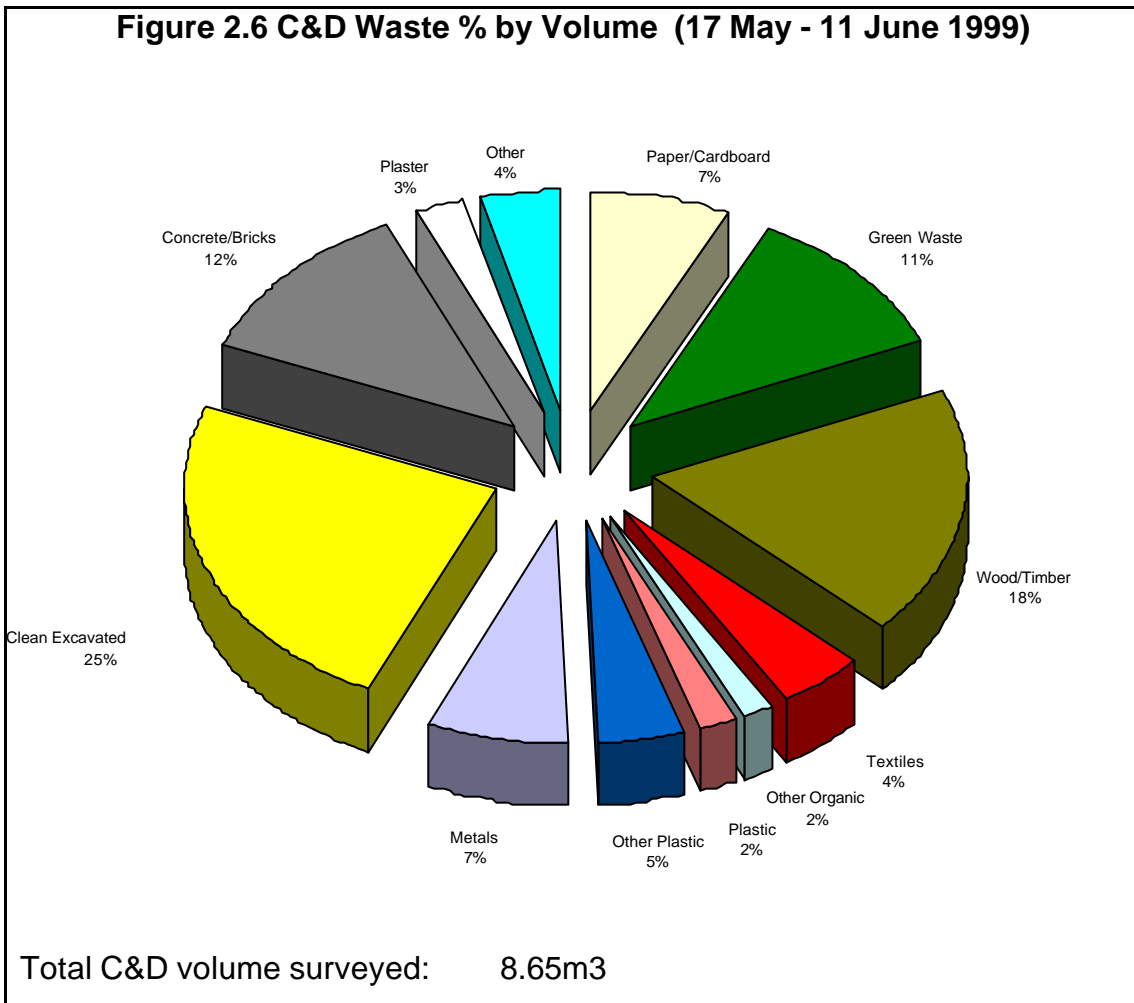
Source: Maunsell Pty Ltd, *Additional Waste Surveys for Melbourne Metropolitan Area*, July 1994, RRRC

Snapshots of the composition of C&I waste to landfill

1994 Maunsell Report			1999 EPA Waste Profile Study		
<u>Survey Period: 7-11 July 1994</u>			<u>Survey Period: 17 May-11 June 1999</u>		
1.	Paper/Cardboard	22.6%	1.	Timber	24.3%
2.	Food/Kitchen	16.7%	2.	Food/Kitchen	13.3%
3.	Plastic	11.8%	3.	Paper/Cardboard	13.1%
4.	Timber	10.9%	4.	Green waste	8.6%
<i>Total: 17 466 tonnes</i>			<i>Total: 5.97 tonnes</i>		

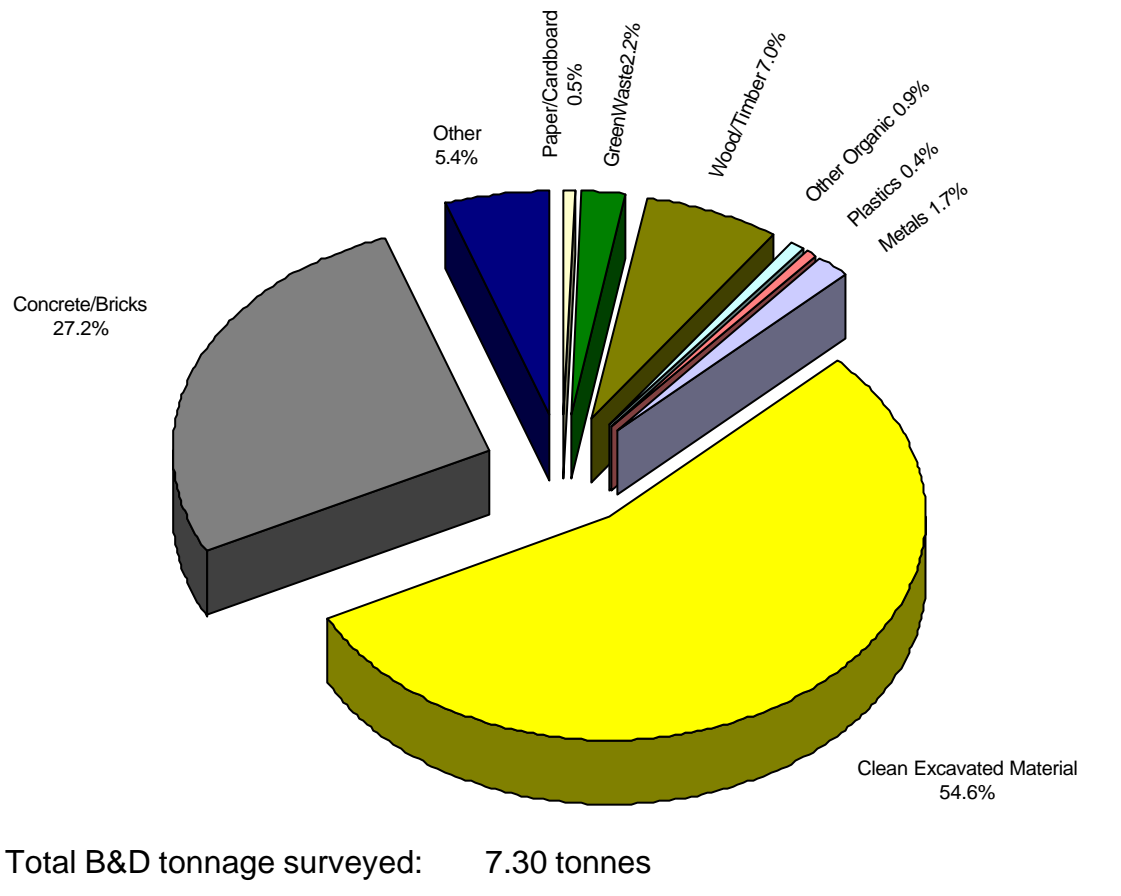
When comparing Figure 2.4 with Figure 2.5, the difference in survey duration and sample size ultimately contributes to large variations in the composition of C&I waste. The 1999 EPA Waste Profile Study is based on a significantly smaller sample size, which raises questions about its validity in providing a good representation of the composition of C&I waste going to landfill. However, the above results also reflect expected trends such as the decrease in paper/cardboard and plastic due to greater infrastructure for paper/cardboard and plastic recycling. A result common to both studies is that food/kitchen waste is the second largest waste material.

Construction and Demolition



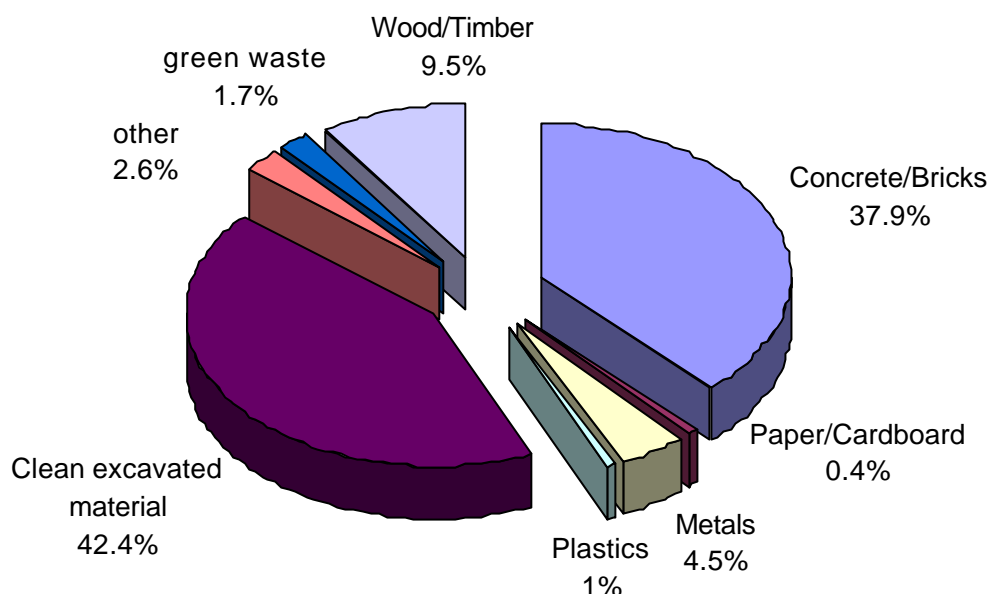
Source: EPA Waste Profile Study of Victorian Landfills, 1999

Figure 2.7 C&D Waste % by Tonnage (17 May - 11 June 1999)



Source: EPA Waste Profile Study of Victorian Landfills, 1999

Figure 2.8: 1998 Composition of C&D Waste at Metropolitan Landfills by weight



Total C&D waste surveyed: 2606 tonnes (10 weekdays & 1 Saturday)
 Source: Nolan ITU, Construction and Demolition Waste Landfill Traffic and Compositional surveys, 1998

Snapshots of the composition of C&D waste to landfill

1998 Nolan ITU C&D Report		1999 EPA Waste Profile	
Study		Study	
<u>Survey Period: April 6 -April 24 1998</u>		<u>Survey Period: 17 May - 11 June 1999</u>	
1.Clean Excavated Material	42.4%	1.Clean Excavated Material	54.6%
2. Concrete/Bricks	37.9%	2. Concrete/Bricks	27.2%
3. Timber	9.5%	3. Timber	7.0%
<i>Total: 2606 tonnes</i>		<i>Total: 7.30 tonnes</i>	

Both these reports illustrate similar results in the composition of C&D waste going to landfill. The numerical figures should be read with caution due to the small sample sizes of both surveys. The figures should be interpreted as qualitative data reflecting the proportions of different materials with respect to one another.

3. INDUSTRY SECTORS

3.1 Commercial and Industrial Sector

In 1997, EcoRecycle commissioned Maunsell Pty Ltd to provide recommendations on the organisation's data collection requirements. This led to a series of industry sector surveys. To date, sector surveys have been completed for supermarkets, offices, cafes & restaurants, clothing manufacturers, furniture manufacturers, shopping centres, automotive industries, electrical appliances and accommodation sectors. These industry sectors were recommended because they were considered to be the sources of the major waste categories at that time; paper/cardboard, food waste, timber and textiles.

Table 3.1 demonstrates that the target materials should be:

- Food waste (Supermarkets and Cafes & Restaurants)
- Cardboard (Clothing Manufacturers)

The major waste types of other industry sectors that have not been surveyed to date are listed in Table 3.2 and Table 3.3.

Table 3.1: Waste Generation and recycling rates in each industry sector

Material	Super markets (22 surveyed)	Offices (22 surveyed)	Cafes & Restaurants (25 surveyed)	Clothing Manufacturers (17 surveyed)
GLASS				
Quantity generated (Kg/week)	46.7	50.9	1862.1	12.1
Proportion of all wastes generated	0.26%	2.73%	24.12%	0.35%
% recycled	6.1%	23.6%	96.4%	2%
CARDBOARD				
Quantity generated (Kg/week)	8680.1	171.6	1596.4	789
Proportion of all wastes generated	47.34%	9.2%	20.68%	22.54%
% recycled	98.5%	38.9%	81.1%	62.2%
PLASTIC FILM				
Quantity generated (Kg/week)	463.3	15.8	166.7	118.1
Proportion of all wastes generated	2.53%	0.85%	2.16%	3.37%
% recycled	23.0%	1.3%	0%	23.4%
PAPER				
Quantity generated (Kg/week)	222.4	1068	253.5	120.8
Proportion of all wastes generated	1.21%	57.26%	3.28%	3.45%
% recycled	5.6%	79.5%	16.4%	1.9%
VEGETABLE/ FRUIT				
Quantity generated (Kg/week)	6234.2	82	2127.9	61.1
Proportion of all wastes generated	34.00%	4.4%	27.56%	1.75%
% recycled	2.8%	0%	0%	0%
OTHER				
Quantity generated (Kg/week)	2688.8	476.8	1713.7	2399.5 (Fabric =2293.8 where only 7.2% is recycled)
Proportion of all wastes generated	14.66%	25.56%	22.2%	68.54%
Total quantity generated (Kg)	18335.5	1865.1	7720.3	3500.6
Total % Recycled of all the waste types	55.8%	61.7%	41.5%	20.2%

Source: Maunsell July 1998, Commercial & Industrial Sector Waste Generation and Recycling surveys

What is EcoRecycle Victoria doing in the C&I Sector?

- EcoRecycle Victoria has produced 27 case studies outlining industry waste reduction initiatives. These case studies feature a broad range of companies, such as Kodak Australia, Myer Grace Bros, VicRoads and Alcoa of Australia.
- Sector waste surveys have been completed for offices, supermarkets, textiles, automotive, electrical appliances, accommodation and cafes and restaurants.
- Waste Reduction Manuals have been completed for Manufacturers, Health Care and Higher Education, including training sessions.
- The 'Waste Not - Want Not' guide has been produced - a simple guide for manufacturers on how to conduct a basic waste audit.
- 'Food for Thought' - A practical guide on waste reduction for food outlets has been produced, accompanied by training sessions.
- A Code of Practice for Shopping Bags has been negotiated with the Australian Supermarkets Institute.
- Industrial packaging fact sheets and reusable transport packaging case studies are currently being prepared.

Table 3.2: Major waste types of each manufacturing sector

Food, Beverage & Tobacco Manufacturing	Textile Clothing & Footwear	Wood & Paper Product Manufacturing	Printing Publishing & Recorded Media	Petroleum, Coal & Associated Product Manufacturing	Non-Metallic Mineral Product Manufacturing	Metal Product Manufacturing	Machinery and Equipment Manufacturing	Furniture Manufacturing
Cardboard and Paper	Textiles	Timber off-cuts and sawdust	Wooden Pallets	Cardboard	Cardboard	Metals	Cardboard	Pine and other timber offcuts
Food Wastes	Cardboard and Paper	Cardboard and Paper	Liquid Chemical wastes	Wooden Pallets	Wooden Pallets	Sludges	Plastic Films	Cardboard
Animal by-products	Plastic	Plastic Film	Oily/solvent rags	Plastic Offcuts from plastic product	Mineral by-products	Iron Filings	Sludge	Plastic films
Sludges	Plastic drums	Wooden Pallets	Metal Printing Plates	Excess chemicals		Acids/Solvents	Oil waste	Textiles
Plastic buckets and drums	Wooden Pallets		Plastic Printing Plates	Contaminated sludges		Plastic Films	Product offcuts, by-products & scrap	Sawdust
Food contaminated paper			Sludge			Wooden Pallets		
Wooden non-reusable pallets			Plastic Drums/Buckets					
Steel drums								

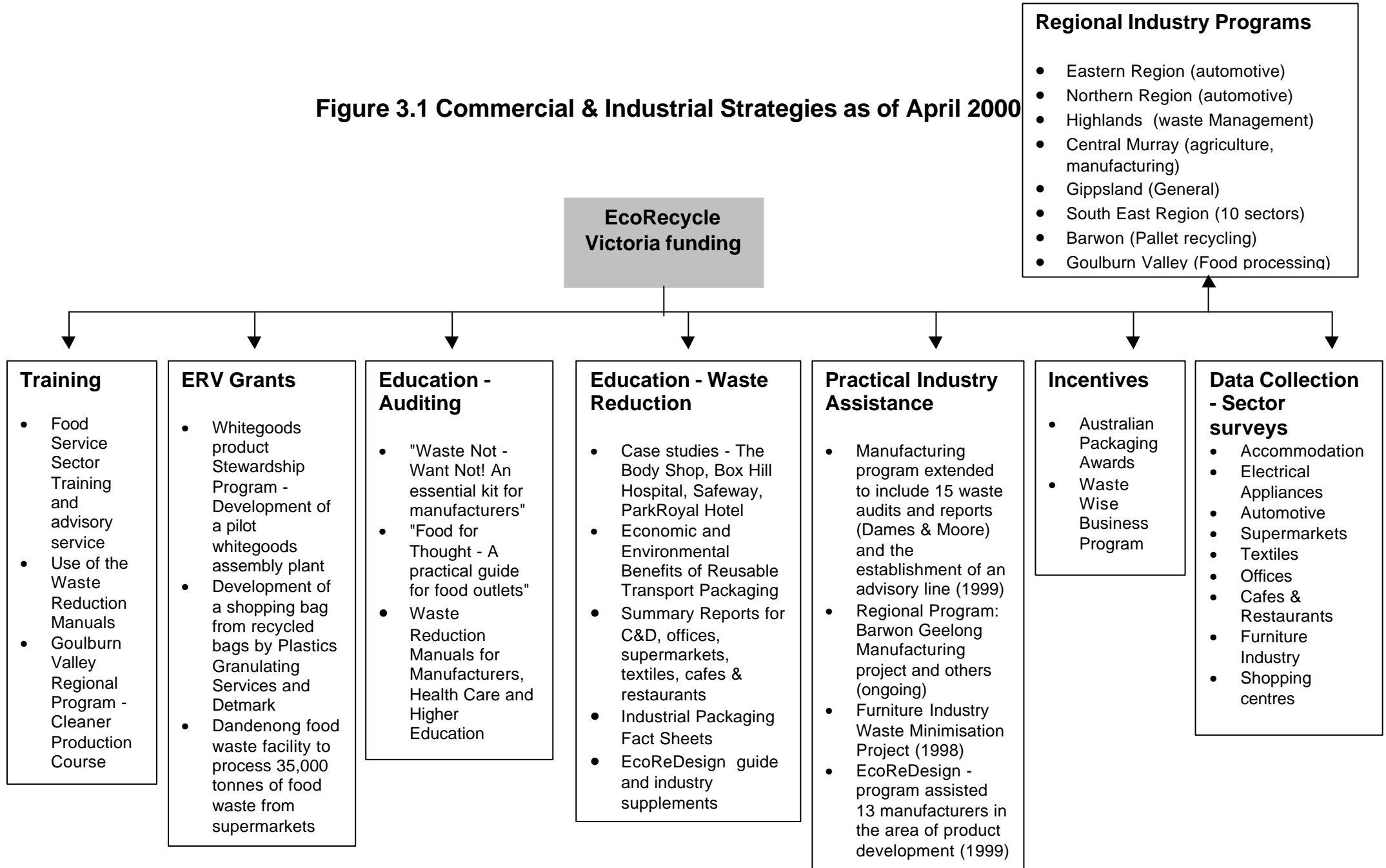
Source: Meinhardt December 1999, Commercial and Industrial and Building and Demolition sector waste: a state wide assessment of wastes and opportunities

Table 3.3: Major waste types of Commercial and Industrial sectors

Agriculture, Fishing and Forestry	Electricity, gas and water	Wholesale Trade	Transport and storage	Education	Health and community services	Cultural and Recreational services	Personal and other services
HDPE plastic "mulches"	Fly ash	Transport packaging (timber, cardboard, films)	Timber pallets	Paper/cardboard	Cardboard	Cardboard/Paper	Cardboard/Paper
Plastic/Steel Containers	Bottom ash	Food waste	Cardboard	Green waste	Paper	Beverage containers/plastic packaging	Beverage containers
Obsolete equipment		Reject produce	Plastic films	Food waste	Food waste	Food waste	Vehicle maintenance wastes
			Maintenance waste	Beverage containers/plastic packaging	Plastic packaging	Green waste	

Source: Meinhardt December 1999, Commercial and Industrial and Building and Demolition sector waste: a state wide assessment of wastes and opportunities

Figure 3.1 Commercial & Industrial Strategies as of April 2000



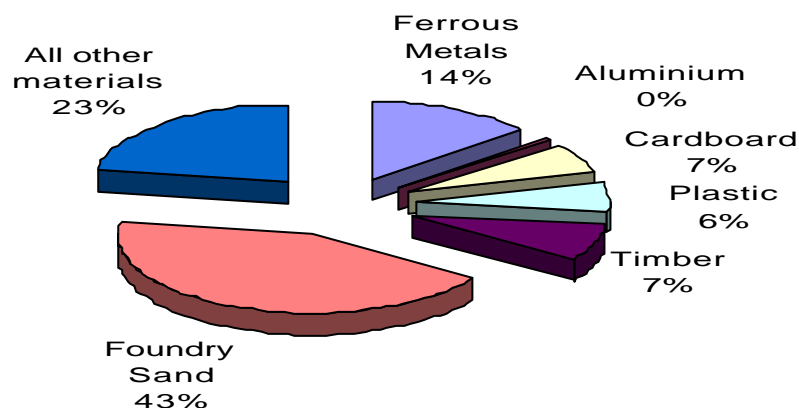
3.1.1 Motor Vehicle and Part Manufacturing

The key findings from Nolan ITU's, Motor Vehicle and part manufacturing surveys and waste reduction strategy, December 1999 are as follows.

The three largest wastes for each automotive sector are:

<p>2812 Motor Vehicle Body</p> <p>1. Ferrous metals Generated: 4574.3 Kg/week Recycled: 75.1%</p> <p>2. Timber Generated: 1783 Kg/week Recycled: 0%</p> <p>3. Plastic Generated: 627.2Kg/week Recycled: 0%</p>	<p>2813 Electrical Component</p> <p>1. Cardboard Generated: 11072.1 Kg/week Recycled: 73.7%</p> <p>2. Ferrous metals Generated: 3000.2Kg/week Recycled: 83.9%</p> <p>3. Timber Generated: 3000.2Kg/week Recycled: 36%</p>
<p>2819 Automotive Parts</p> <p>1. Ferrous Metals Generated: 195735.6Kg/week Recycled: 95%</p> <p>2. Aluminium Generated: 17893.7Kg/week Recycled: 99.8%</p> <p>3. Materials other than Ferrous, Plastic, Ferrous, Aluminium, Cardboard Generated: 12429.7Kg/week Recycled: 1.3%</p>	<p>2811 Motor Vehicle</p> <p>1. Foundry Sand Generated: 45344 t/yr Recycled: 71.2%</p> <p>2. Ferrous Metals Generated: 34732.2 t/yr Recycled: 92.4%</p> <p>3. Materials other than Ferrous, Plastic, Timber Generated: 3220.2 t/yr Recycled: 0.1%</p>

Figure 3.2: Composition of Automotive Waste to Landfill (63 businesses audited, 1999)



Source: Nolan ITU, November 1999, Motor Vehicle and Part Manufacturing surveys and waste reduction strategy

Table 3.4: Waste analysis of 63 automotive industries

Material	G (t/yr)	L (t/yr)	G (t/yr)	L (t/yr)	G (t/yr)	L (t/yr)	G (t/yr)	L (t/yr)	Total Waste generated (tonnes/yr)	Compo sition of waste genera ted	Compo sition of waste to landfill	Total Waste going to landfill (tonnes/yr)	% of this material that is sent to landfill	% of business es that recycle	Recycling Rate of waste type by those business es that do recycle
	2811		2812		2813		2819								
Ferrous Metals	34700	2630	946	235	334	55	27200	1360	63180	47%	14%	4280	7%	71%	75% - >90%
Aluminium	1750	-	150	-	255	30	6840	-	8995	66%	1%	30	0.3%	59%	87% - 99%
Cardboard	2630	1490	90	90	1360	360	2000	480	6080	4%	6%	2420	33%	31%	90%
Plastic	1000	976	110	110	264	264	413	360	1787	1%	6%	1710	96%	3%	0%
Timber	1620	760	263	263	226	147	1330	1080	3439	25%	7%	2250	66%	9%	>90%
Foundry Sand	45344	13061	-	-	-	-	-	-	45344	33%	43%	13061	29%	-	-
All other materials	3256	3283	241	241	111	95	3417	3170	7025	5%	23%	6789	28%	0%	0%
TOTAL WASTE	90300	22200	1800	1000	2550	950	41200	6450	135850	100%	100%	30540	22%	86%	-
% recycled	39.7%		44.4%		56.7%		87.5%								

Source: Nolan ITU, November 1999, Motor Vehicle and Part Manufacturing surveys and waste reduction strategy

KEY

G = Total waste generated, L = Total waste going to landfill

2811(ANZSIC Code) = Motor Vehicle Manufacturing

2812 = Motor Vehicle Body Manufacturing

2813 = Automotive Electrical and Instrument Manufacturing

2819 = Automotive Component Manufacturing

The total waste sent to landfill from this sector is approximately 30,000 tonnes per annum or about 3% of the total commerce and industry stream. Of the 63 separate businesses audited, 86% were reported to recycle contributing to the diversion of approximately 78% of all the wastes generated. The key wastes from the automotive sector are foundry sand (43%) and transport packaging (cardboard, plastic and timber) comprising of 19% of the total waste sent to landfill (Table 3.4). The sources of plastic are the lining of stillages and LDPE shrink wrap, whereas timber most commonly came from non-standard pallets. The most recycled materials are aluminium and ferrous metals (>90%) due to the significant cost savings involved. From this study, small businesses have been shown to recycle less than large businesses. Given that small businesses generate more waste per employee, it is recommended that there should be a greater focus on smaller businesses.

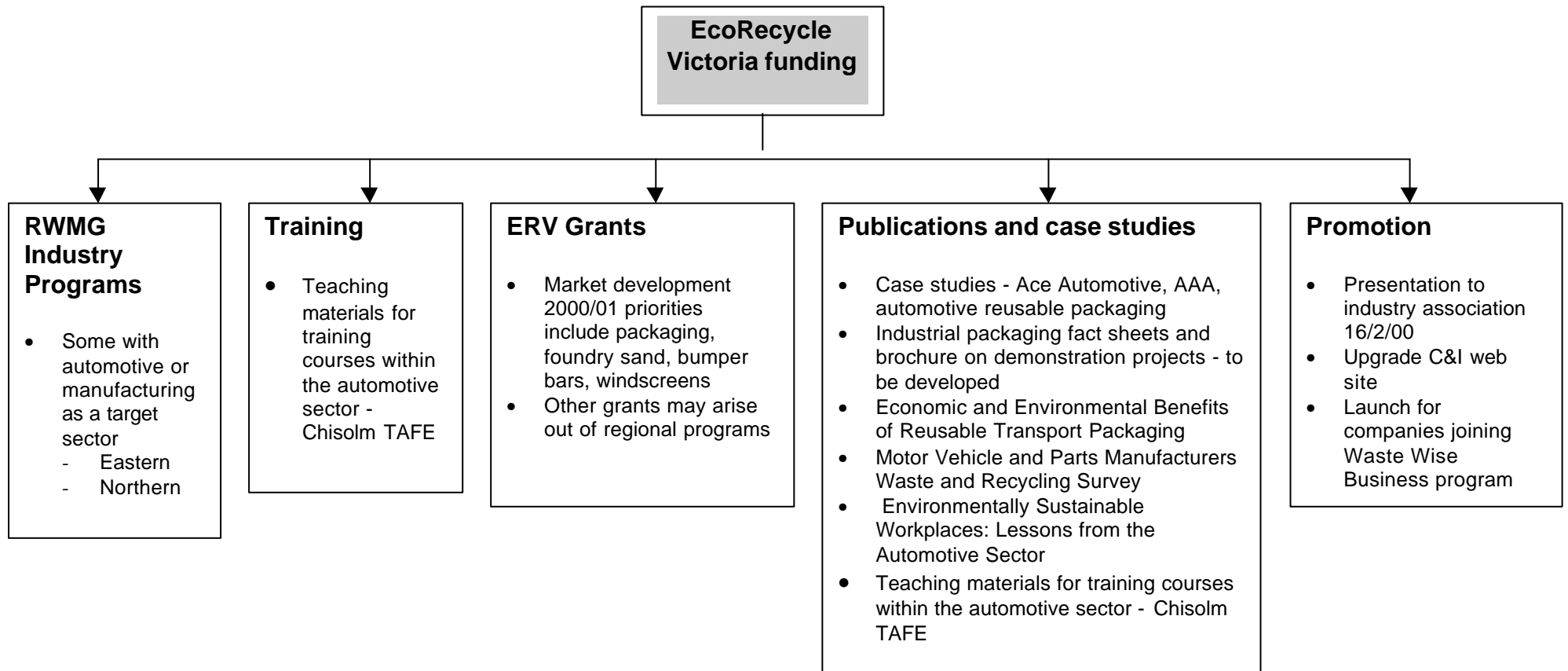
The two main barriers to recycling were the inability to obtain a collection service (23% overall) and the cost of separation (20% overall). Other barriers given were:

- small quantities
- no reliable markets
- no idea who to contact
- unsightly.

What is EcoRecycle doing in the Automotive Waste Sector?

- The Barwon Regional Waste Management Group is working with Ford to determine whether a grant project can be identified to divert foundry sand from landfill.
- The Commerce and Industry Website will be updated to promote automotive resources.
- EcoRecycle is working with Chisolm TAFE to incorporate waste management in the automotive training program

Figure 3.3 Automotive Strategies as of April 2000

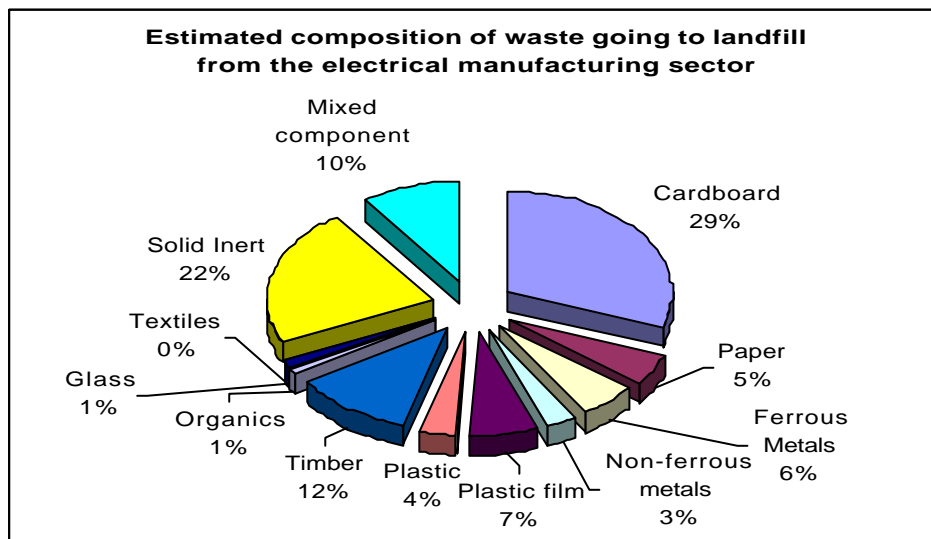


3.1.2 Electrical Appliance Manufacturing

This sector includes the following ANZSIC groups:

- 2851 - Household Appliance Manufacturing
- 2852 - Electric Cable and Wire Manufacturing
- 2853 - Battery Manufacturing
- 2859 - Electrical Equipment Manufacturing

Of the data collected from the auditing of 30 businesses and the 20 businesses surveyed, it was estimated that the entire sector generated over 9,000 tonnes of waste per year where 4,000 tonnes is landfilled. It was concluded that the electrical equipment and appliance sector is a small contributor to waste, representing only 0.4% of the C&I waste stream. Equipment manufacturers are the most significant contributors to the total waste stream in this sector. Cardboard, solid inert material, timber and mixed component items are the major waste materials going to landfill. Despite cardboard being the largest waste generated by weight, recycling of this material is not common due to an unwillingness to pay for recycling services. Ferrous and non-ferrous metals are the main waste materials produced by all sub-sectors with the exception of the lighting sector. Ferrous metals are mostly (over 90%) by weight) recycled, but continue to contribute about 6% of waste going to landfill from this sector.



Source: Meinhardt, Waste Generation and Recycling Survey in the Electrical Equipment and Appliance Manufacturing Sector, June 2000

3.1.3 Furniture Manufacturing

The furniture industry is one of Victoria's largest manufacturing industries where the majority of waste produced during the manufacturing process is disposed of to landfill. Approximately 79% of this waste is timber of various types, with other components of the waste stream being paper, cardboard, plastics, metal, glass and textiles. Industry data indicates that the furniture manufacturing industry in total produces over 434,250 m³ of waste per year in Victoria. 88% of this is produced in metro Melbourne with 35% being produced in the South Eastern region.

The 1998 furniture industry report surveyed 64 businesses, accounting for over 48,000 m³ of the annual waste stream derived from the furniture industry. Over 71% of respondents did not use any recycled material at all, while those that did, typically re-used stationery and cardboard packaging. There was very minimal re-use of timber or the other major waste products identified in their manufacturing process. Approximately 30% of respondents recycled timber offcuts, shavings or sawdust for use as firewood, mulch, animal bedding or in craft ware; these were mainly private arrangements with individuals known to or employed by the manufacturers.

Reasons behind low rates of recycling and the re-use of materials were lack of awareness of waste issues, logistic problems and negative perception of using recycled materials.

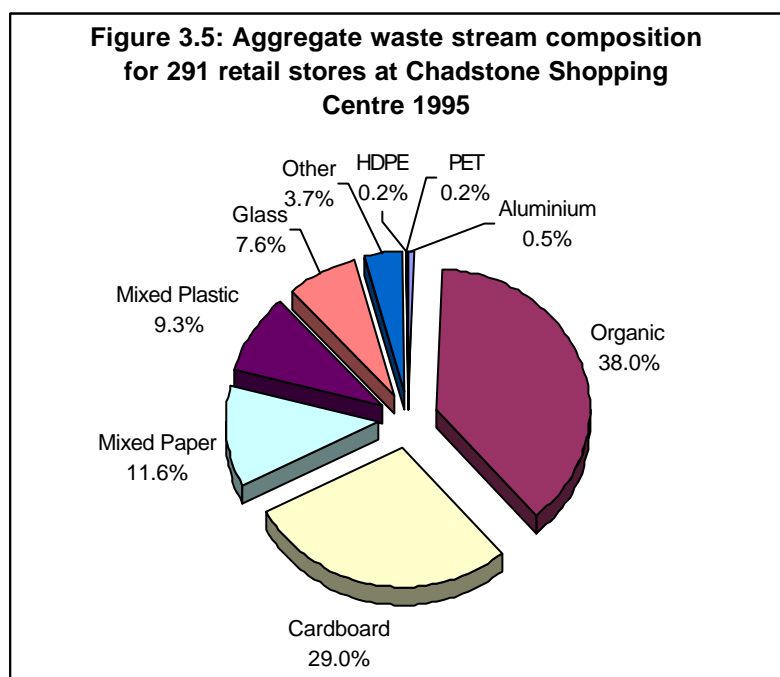
Table 3.5: Waste Volumes from the Furniture Industry (m³/year)

RWMG	Industry types				TOTAL (m ³ /yr)
	Wooden Furniture	Sheet Metal Furniture	Mattress Manufacturing	Furniture Other	
LeastWaste	68,023	997	2,503	4,206	75,729
Northern	66,932	1,440	11,888	4,751	85,011
South Eastern	118,950,	2,658	6,882	6,465	134,955
Western	81,118	1,440	1,877	3,193	87,629
TOTAL - Melbourne	335,023	6,535	23,150	18,615	383,323
TOTAL - Rural Vic	382,055	6,895	25,050	20,250	434,250

Meinhardt (Vic) Pty Ltd, Furniture Industry Waste Minimisation, July 1998

3.1.4 Retail Trade

In 1995, 291 retail stores at Chadstone Shopping Centre were surveyed with the aim of identifying the most significant sources and components of waste generated by shopping centres. The tenancies surveyed were typical of small retail stores (112 being fashion stores) where supermarkets and department stores such as Coles and Myer were not surveyed. Most of the waste generated at shopping centres were food preparation wastes and surplus food and wholesale packaging materials (cartons, pallets, film wraps, packing tapes, shock insulation, hangers, etc).

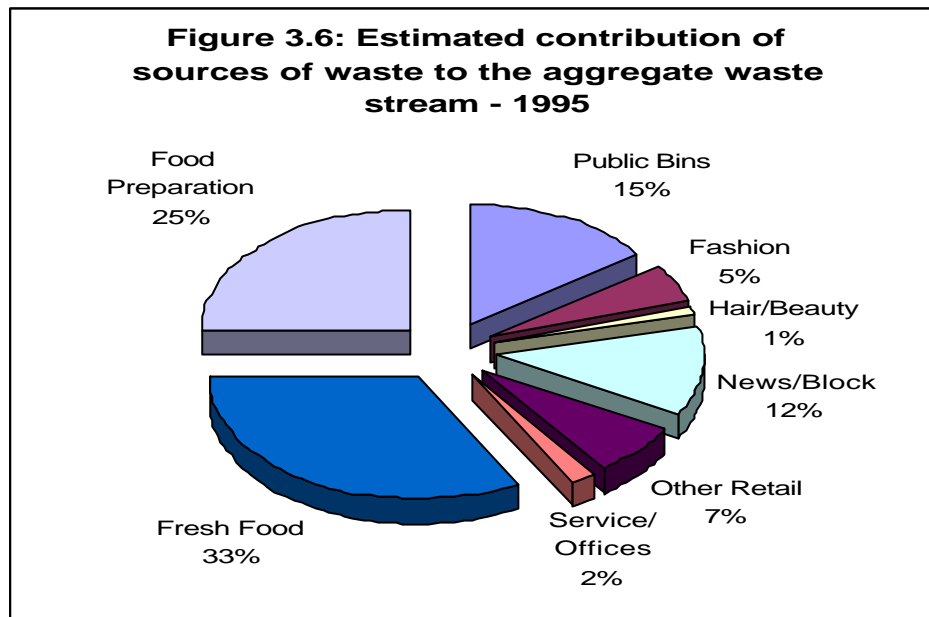


Source: Centre for Innovation & Waste Management Monash University of Australia, **Waste Minimisation in Shopping Centres**, March 1996

Table 3.6: Estimated average generation rates for different businesses typically found within shopping centres

Retail Store	Average generation rate (tonne/tenancy/year)
Fashion	2.5
Hair/Beauty	0.7
Newsagency/Book	6.1
Other Retail	3.6
Service/Office	1.2
Fresh Food	17.3
Food preparation	12.9

Fresh food tenancies generate the greatest amount of waste. They generate the greatest amount of organic and cardboard waste, and are the second highest generators of plastic after fashion stores.



Source: Centre for Innovation & Waste Management Monash University of Australia, **Waste Minimisation in Shopping Centres**, March 1996

Although Newsagencies and Bookstores generate only about 12% of the aggregate retail waste stream, they produced more waste per store than other non-food retail stores, with over 95% of this waste being made up of paper and cardboard from obsolete publications and packaging.

A majority of respondents (over 50%) indicated that they were not willing to adopt waste minimisation practices. Those that were willing to participate wanted the implementation of cardboard recycling (44.9%), paper recycling (36.7%), bottle and can recycling (34.7%) and the re-use of cardboard boxes (34.7%).

Cardboard and paper are the most feasible items to be recycled based on the factors of practicality, implementation costs, markets and avoided costs. At the time of this study, Chadstone Shopping Centre had no formalised minimisation or recycling systems in place. It has since adopted a cardboard and paper recycling system. Since the introduction of the recycling system, stores have been provided with re-useable cartons or MGB's for the separation of cardboard and paper.

Reviewing other shopping centres:

- Northland features paper and cardboard recycling;
- Eastland has public places recycling for source separated glass and aluminium beverage containers and paper;
- Highpoint West have secured one contractor to take a variety of waste to be sorted; and
- Myer (City) recycle cardboard and paper via a chute system.

3.1.5 Accommodation sector

The accommodation sector includes hotels, motels, serviced apartments, caravan parks and bed and breakfast establishments. The survey sampled only 43 businesses from the 3,138 available. Thus the survey represents 1% of the accommodation sector. The estimated waste generated for the entire accommodation sector is 430,000 cubic metres/year which is approximately 65,000 tonnes. This represents 2% of the total waste to landfill.

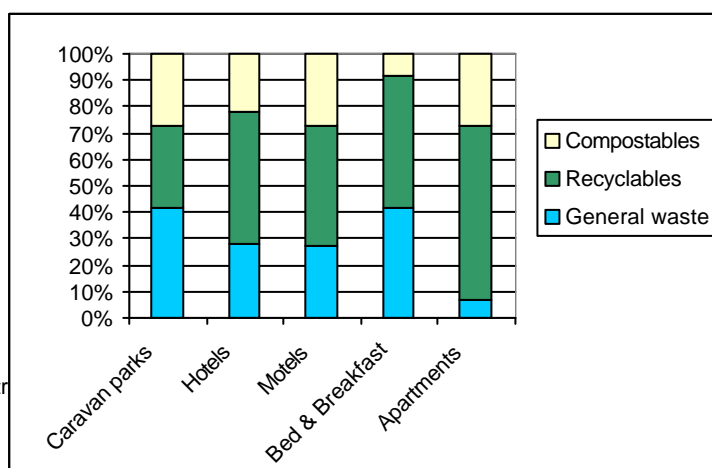
Table 3.7: Average waste generated in the accommodation sector

Sector	Estimated volume m ³ /year
Caravan parks	156,078
Motels (all data)	110,085
Serviced Apartments	34,747
Hotels	112,264
Bed & Breakfasts	16,963
TOTAL	430,137

Of the 43 businesses surveyed, 60% of them had recycling systems. All of the Bed & Breakfast businesses surveyed, half of the caravan parks, 70% of hotels and 83% of motels participated in recycling. The majority of serviced apartments surveyed do not recycle (71%), nor do they undertake waste minimisation strategies in their day to day operation of their business operations.

Caravan parks are significant generators of food waste (25% by volume of their waste) and packaging (14% by volume of their waste). Hotels mainly recycle glass. There is insufficient space to store a number of different recycling bins. Only two of the regional hotels surveyed said that they recycled more than one type of material. Amongst the Bed & Breakfast establishments surveyed, 83% recycle co-mingled material, paper and cardboard, 33% regularly take shopping bags back to the supermarkets for recycling and 67% utilised on-site compost as a means of reducing their organic waste.

Figure 3.7 Percentage composition of general waste by category - accommodation



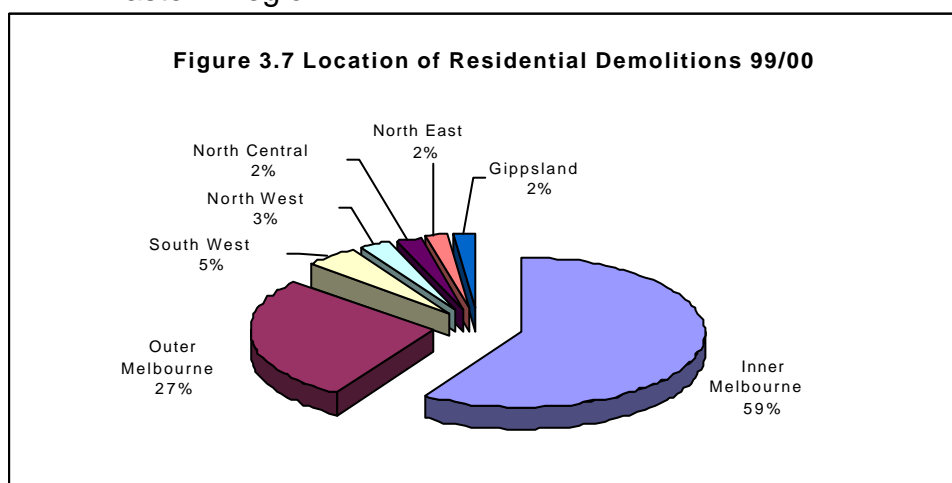
3.2 Construction and Demolition

One of EcoRecycle's objectives over the next three years is to reduce C&D waste going to landfill by 10% from 1996/97 levels (1,200,000 tonnes). 72% of the total C&D waste or 864,000 tonnes/year derives from the demolition sector with 39% from residential demolition and 33% from commercial demolition. 15% of the total C&D waste or 180,000 tonnes/year derives from the residential and commercial construction sector. The remaining C&D waste derives from the construction and demolition of roads and other civil structures.

86% of demolition activity across Victoria occurred in Metropolitan Melbourne (Figure 3.7).

C&D waste is the most significant waste type across all the sixteen waste management regions. The hierarchy of C&D waste coming from metropolitan sources are:-

1. South-east Region - *due to the high level of residential and commercial activity within the region, and the higher percentage of the metropolitan population compared to other regions*
2. Northern Region
3. Western Region
4. Eastern Region



Source: Nolan ITU, Waste Generation and Recycling in the Residential Demolition Sector, November 1999

The 1999 Residential Demolition survey (15 housing demolitions sampled) showed that 133 tonnes of waste, on average is generated from demolitions, including driveways, fences, paths and gardens. Diversion from landfill varied from 17% to 63% depending on location, range of materials and condition of the houses.

Table 3.8: Material types that are recovered or not recovered

Rarely Recovered	Nearly Always Recovered	Always Recovered
Water & gas piping	Terra cotta roof tiles	Solid Bricks
Garden Waste	Panel Doors	Tongue and groove flooring
Plasterboard	Slate roofing	Leadlight windows
Vanity Units	Timber windows	Oregon Rafters
Carpet	Weatherboards	
Cupboards		

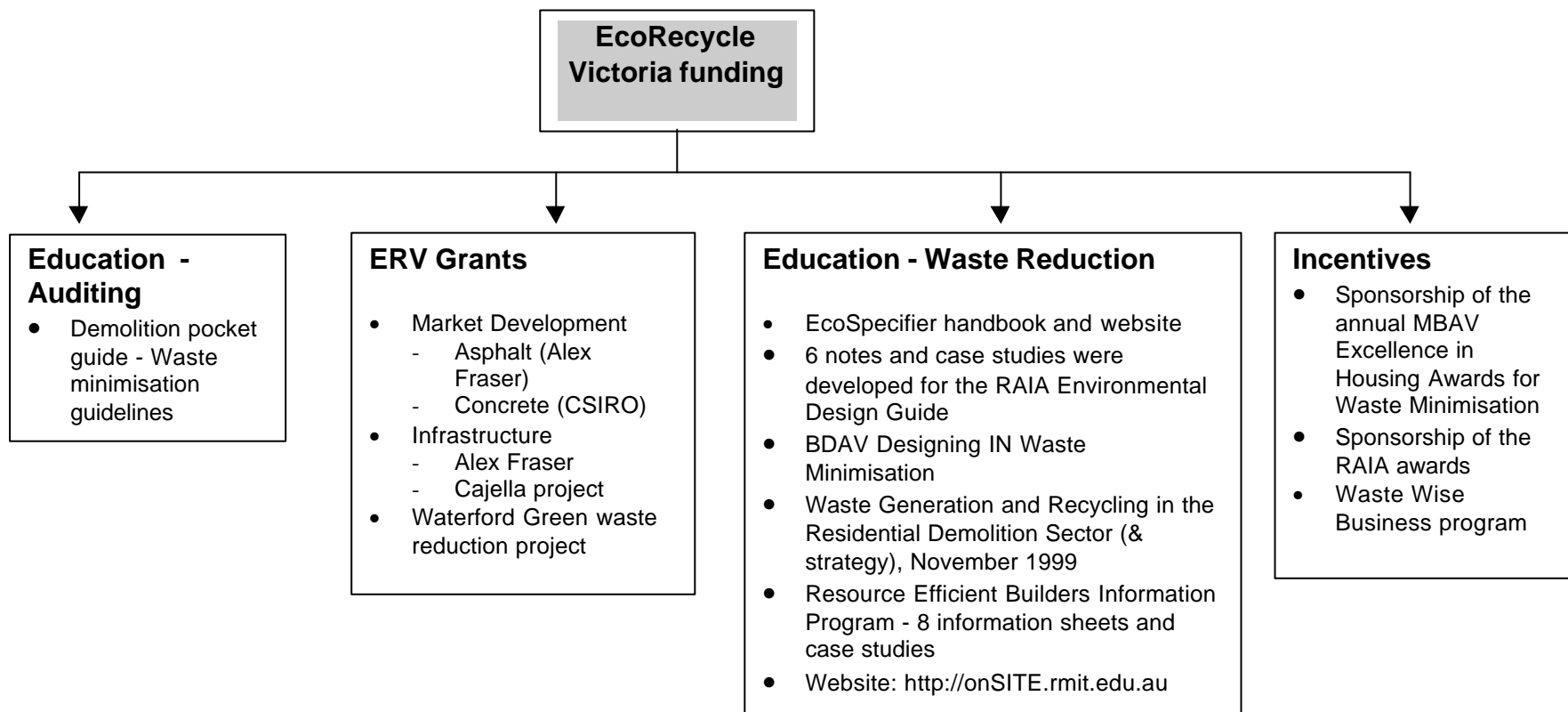
Significant quantities of plaster waste are generated from demolition activities in Victoria. No markets exist for this material and thus plaster and plasterboard are rarely recovered from demolition sites. Large amounts of 'recyclable' material are being sent to landfill (concrete, brick rubble, timber, metals, trees) because on-site sorting and separate transport is not viable. Most of the materials that are recovered are re-used, with the exception of concrete. Recovered materials include windows, doors, bricks, tiles, framing timber and floorboards, and the majority of these are offered for re-sale without any reprocessing.

What is EcoRecycle doing in the C&D sector?

- Ecospecifier project with RMIT
 - The EcoSpecifier handbook and website (www.EcoSpecifier.rmit.edu.au) provides a practical tool that allows architects, designers and builders to select appropriate materials that take into account environmental implications.
- Sponsorship of the annual MBAV Excellence in Housing Award for Waste Minimisation.
- Sponsorship of the Royal Australian Institute of Architects (RAIA) - 1999 Award for Ecologically Sustainable Development.
- Waterford Green - trial of separation & collection system for a cul-de-sac housing development.
- Building Designers Association of Victoria (BDAV) - Designing 'IN' Waste Minimisation publication for education and promotion.
- Environmental Design Guide - a guide consisting of six notes and one case study focusing on waste minimisation in the building industry.
- Resource Efficient Builders Information Program in conjunction with the Master Builders Association of Victoria (MBAV)
 - 8 information sheets and case studies highlighting current approaches that contractors and building-related organisations are taking to eliminate or reduce waste.
- The demolition pocket guide provides a "how to" guide in assessing current waste practices and suggests ideas to save money and better utilise existing resources.

- EcoRecycle website - case studies and examples on waste minimisation in the C&D sector.
- Market Development
 - Alex Fraser/CSIRO/City of Wyndham/City of Hobsons Bay - Concrete
- Infrastructure Projects
 - Alex Fraser - commissioning their new windsifter
 - Cajella Project - construction of a mixed waste recovery facility in Altona
- Barwon Regional Program Feasibility Study
 - To assess the feasibility and develop a business plan for a timber and pallet recycling business

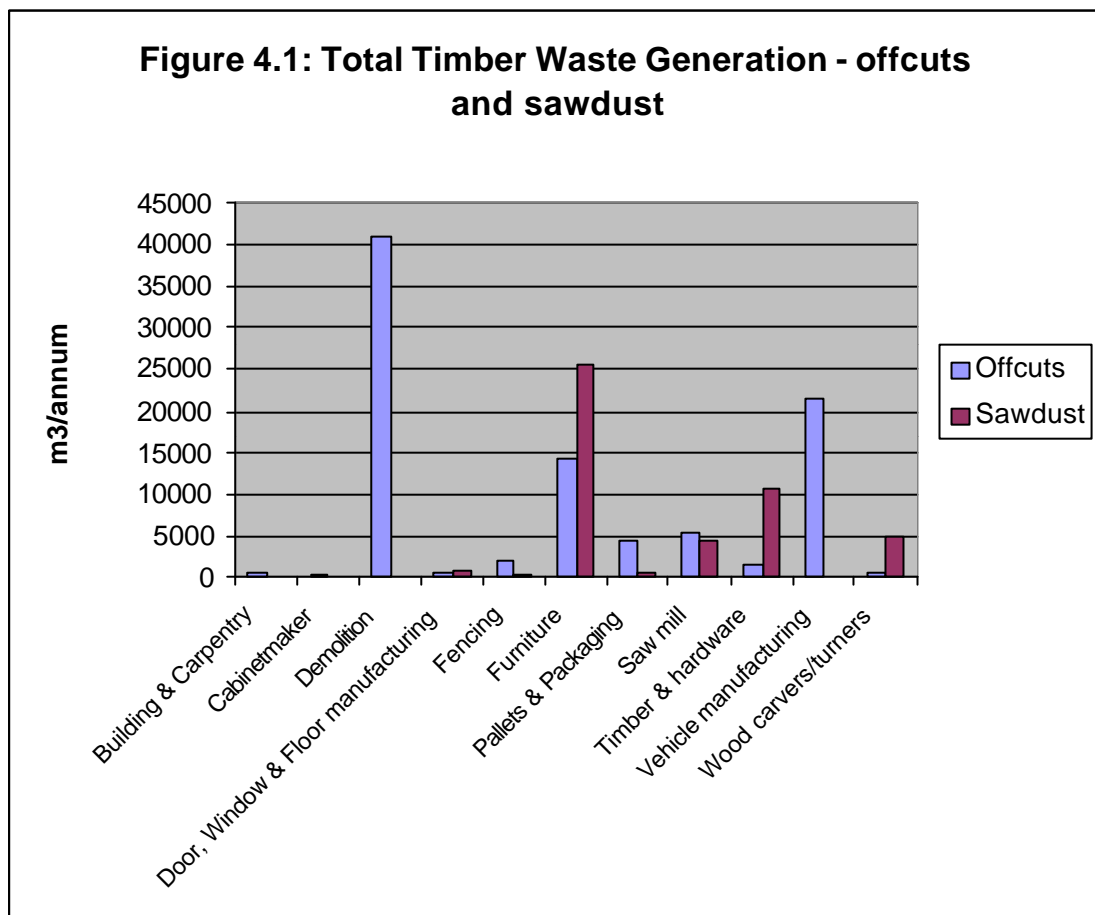
Figure 3.9 Construction and Demolition Strategies as of April 2000



4.0 MATERIALS

4.1 TIMBER

Timber is a major waste material in the C&I and C&D sectors. A 1998 survey showed that a total of 92,300 m³ of timber offcuts, including waste pallets, and 47,300 m³ of sawdust is generated across Melbourne by the 126 industries that participated in the survey (this includes the timber that is recycled). 93% of all waste timber generated in metro Melbourne is hardwood (72,500m³), softwood (43,700m³) and waste timber pallets (11,300 m³). 23% or 32,600 m³/annum of waste timber is currently recycled by 44% of the 126 businesses surveyed.



Source: Meinhardt, Collection of Waste Timber from Melbourne Businesses, August 1998

It can be concluded from figure 4.1 that demolition, furniture, saw mill, timber and hardware, and vehicle manufacturing industries should be targeted for collection of waste timber from Melbourne businesses.

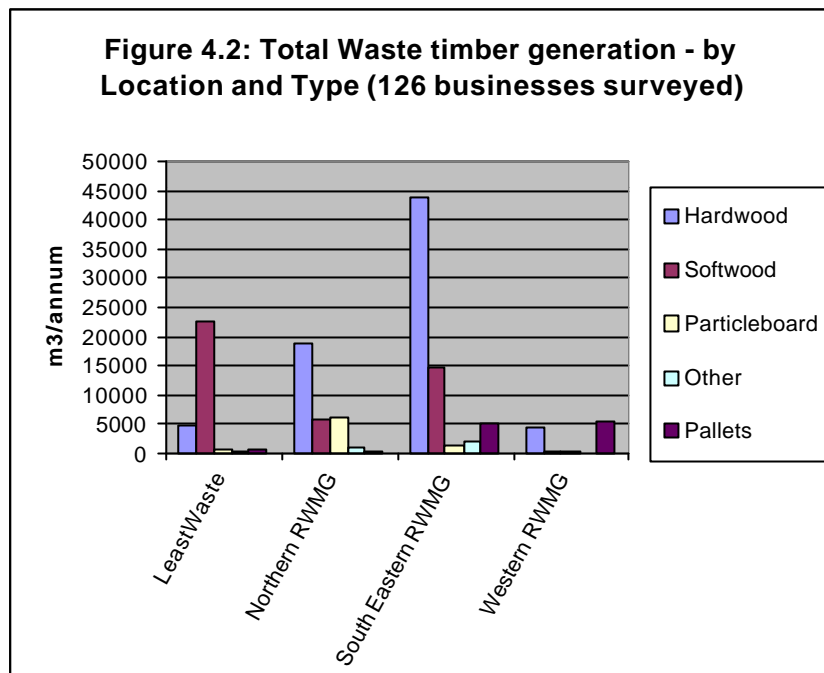
Table 4.1: Waste timber generation and recycling of Melbourne businesses

Industry	Businesses Surveyed	Businesses that recycle waste timber	Businesses that recycle	Concentrated Regions	Volume of waste timber generated (m ³)	Volume of waste timber recycled (m ³)	Percentage of waste timber that is recycled
Demolition	4	2	50%		41,000	5430	13%
Furniture	62	24	39%	Least Waste & Northern	39,996	952	2%
Vehicle Manufacturers	2	2	100%		21,484	11029	51%
Timber and Hardware	13	7	54%	South Eastern	12,286	587	5%
Saw Mill	1	1	100%	South Eastern	9,900	9658	98%
Wood Turners and Carvers	5	4	80%	Least Waste & South Eastern	5,581	122	2%
Pallets & Packaging Manufacturing	4	2	50%	South Eastern	4,889	3516	72%
Fencing	9	5	55%	Least Waste	2227	1005	45%
Door, window and floor manufacturer	4	2	50%	Northern	1350	215	16%
Building and Carpentry	15	6	40%	South Eastern	620	41	7%
Cabinetmaker	5	2	40%		173	8	5%
Miscellaneous	4	0	%		173	4	2%
TOTAL	126	56	44%		139,678	32,568	23%

Source: Meinhardt, Collection of Waste Timber from Melbourne Businesses, August 1998

The lowest recycling rates of timber and sawdust are amongst the sectors of cabinetmakers, builders & carpenters, furniture manufacturing, timber & hardware, woodturners and carvers. Such low rates can be attributed to:-

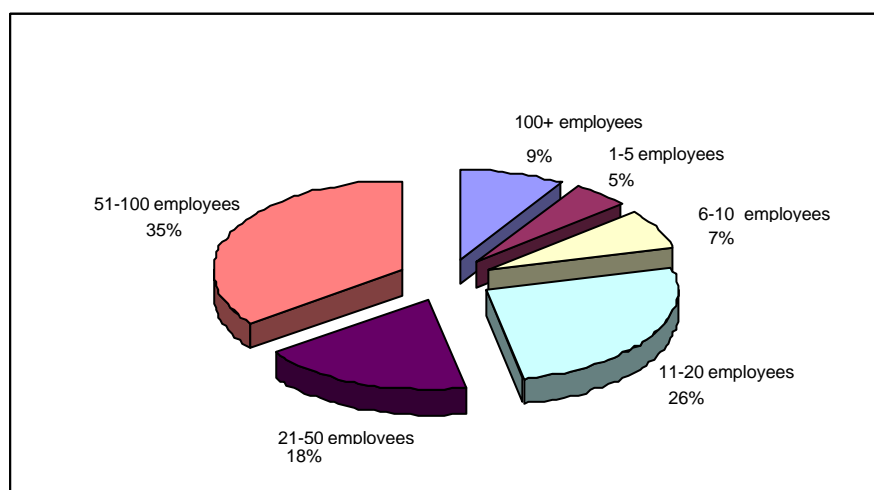
- lack of knowledge about existing waste timber recycling drop-off facilities;
- only small volumes of waste timber are being produced; or
- many other types of waste are generated by each business



Source: Meinhardt, Collection of Waste Timber from Melbourne Businesses, August 1998

Operations in the Northern Region (Moss Rock at Epping) and South Eastern Region (WM Waste Management in Dandenong) recycle timber to make mulch. Other facilities exist in the Western Region (Twiggs and Calleja in the Brooklyn area) and South Eastern Region (John Benedict on Grange Road). The South Eastern Region is the largest source of total waste timber, producing almost 50% of the total generated across the 126 businesses surveyed.

Figure 4.3: Total timber waste by employment size

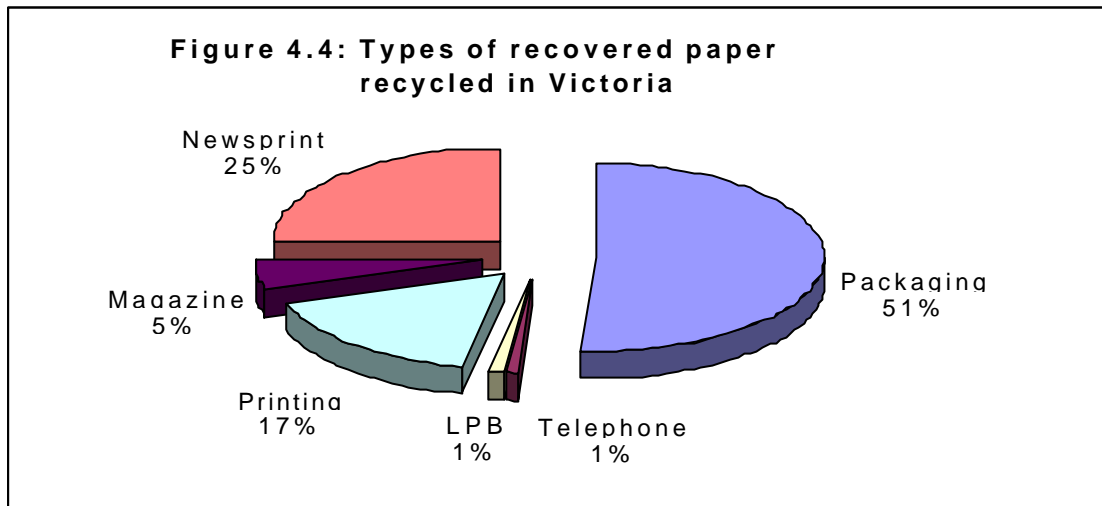


Source: Meinhardt, Collection of Waste Timber from Melbourne Businesses, August 1998

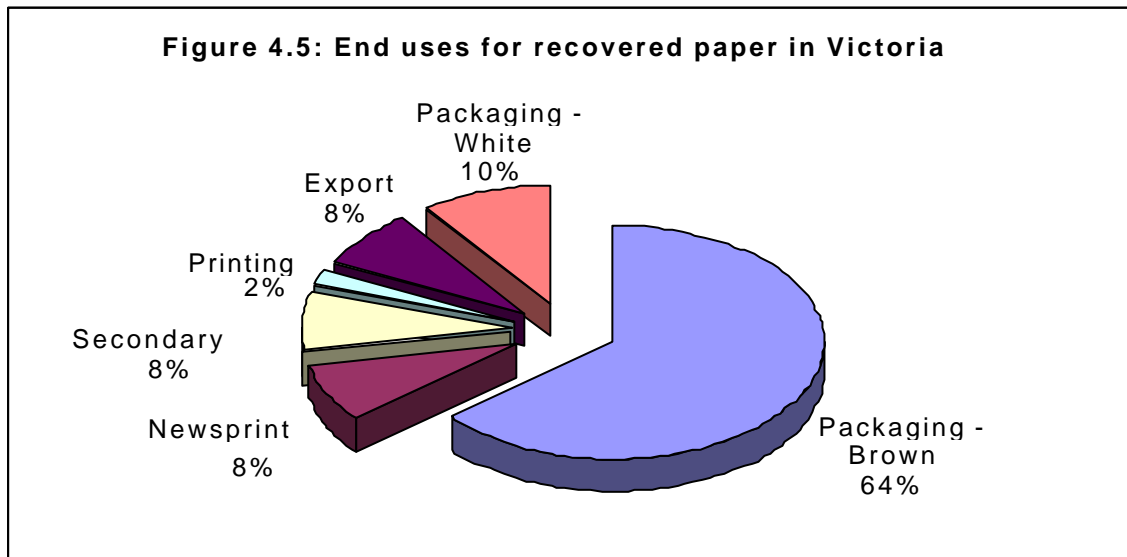
It can be observed that the larger businesses (51-100 employees) and the medium sized enterprises (11-20 employees) need to be targeted in adopting waste minimisation practices (Figure 4.3).

4.2 Paper

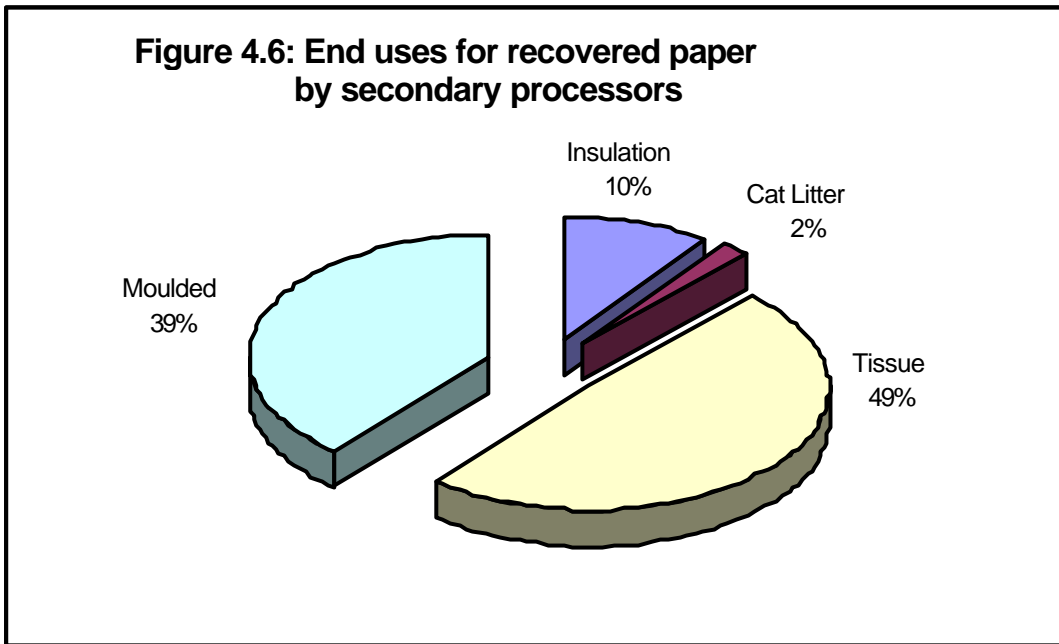
Of the 828,000 tonnes of paper and paper products consumed in Victoria in 1997/98, over 530,000 tonnes is recycled. This represents a recycling rate of 64%. 490,000 tonnes per annum of recovered Victorian paper are utilised by primary markets in Victoria. 42,000 tonnes per annum are utilised by secondary markets in Victoria, representing 8% of the total market.



Source: C4ES Pty Ltd, Material Strategy, Secondary Markets for Recovered Paper in Victoria, December 1999
Total: 530,000 tonnes



C4ES Pty Ltd, Material Strategy, Secondary Markets for Recovered Paper in Victoria, December 1999
Total: 490,000 tonnes



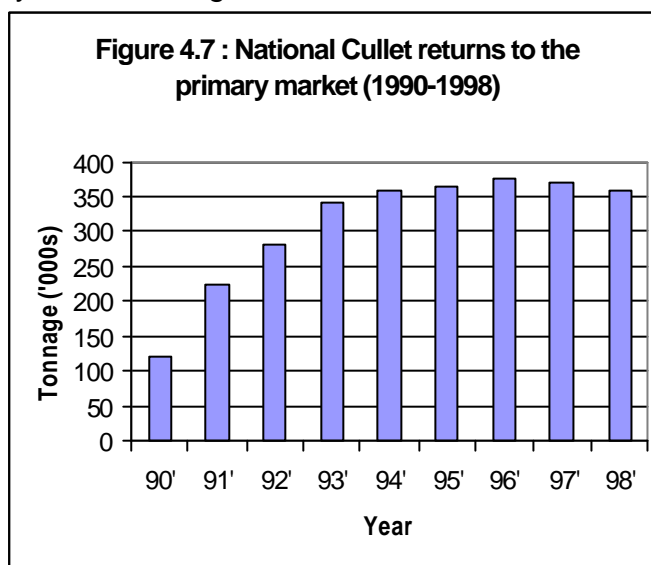
C4ES Pty Ltd, Material Strategy, Secondary Markets for Recovered Paper in Victoria, December 1999

Total: 42,000 tonnes

4.3 Glass

In 1998, approximately 108,000 tonnes of amber, clear and green container glass was beneficiated (sorted and crushed) for the primary market in Victoria. 95,000 tonnes of this came from Victorian kerbside and commercial collections, with the remainder coming from Tasmania, South Australia and New South Wales.

An estimated 20,000 tonnes of container glass collected from kerbside systems went to landfill because it was either broken or contaminated. In 1998, implementation of Visy's Binder Optical Sorting plant provides an opportunity to divert a high proportion of this glass from landfill. 25% of kerbside glass is presently directed towards the Visy Recycling MRF's at Laverton and Banyule for sorting.



Source: C4ES Pty Ltd, Glass Market Development Strategy for Victoria, 1999

Table 4.2: Existing and potential secondary markets for glass

Existing Secondary Markets	Potential Secondary Markets
Coopers Minerals Pty Ltd - Abrasives	Abrasives
Glass Bead manufacturing	Fibreglass Insulation
	Filtration Systems
	Aggregate Substitute
	Termite Barrier
	Traction control media
	Industrial Mineral Fillers
	Pavers and Tiles
	Absorbents

Source: C4ES Pty Ltd, Glass Market Development Strategy for Victoria, 1999

Secondary markets provide the opportunity to utilise glass that is unsuitable for container manufacture or not cost effective to transport to a beneficiation plant.

4.5 HDPE

Table 4.3 : Tonnage of HDPE packaging and blow moulded containers (Australia)

HDPE	'000 tonnes				
	1994	1995	1996	1997	1998
HDPE Packaging	95.7	90.5	97.0	99.0	105.5
Total plastics packaging	339.1	350.4	354.0	365.7	387.9
Percentage of total	28.2	25.8	27.4	27.1	27.2
Blow moulded HDPE	67.0	70.3	70.6	73.0	83.5
Total HDPE all processes	179.0	194.5	200.5	210.4	223.5
Percentage of total	37.4	36.1	35.2	34.7	37.4

Source: Delynda Pty Ltd, Strategies to Increase Post-consumer HDPE Recycling, February 2000

Table 4.4 : HDPE materials collected in Victoria from post consumer and post industrial sources

HDPE materials collected (VIC)	1995/6	1996/7	1997/8	1998/9
Bottle Dairy	3,610	3,800	5,900	7,800
Bottle Other	510	602	1,305	1,600
Film	635	520	380	650
Bags Shopping	2,360	3,020	3,610	3,600
Bags Other	250	380	400	400
Moulded Packaging	87	87	1,117	300
Not Identified	143	113	1,663	1,150
Total Collected	7,595	8,522	14,375	15,500

Markets for HDPE recyclate from post consumer milk and juice bottles are generally limited to blow moulded or extruded products or heavy-walled injection, intrusion or injection-compression moulded parts.

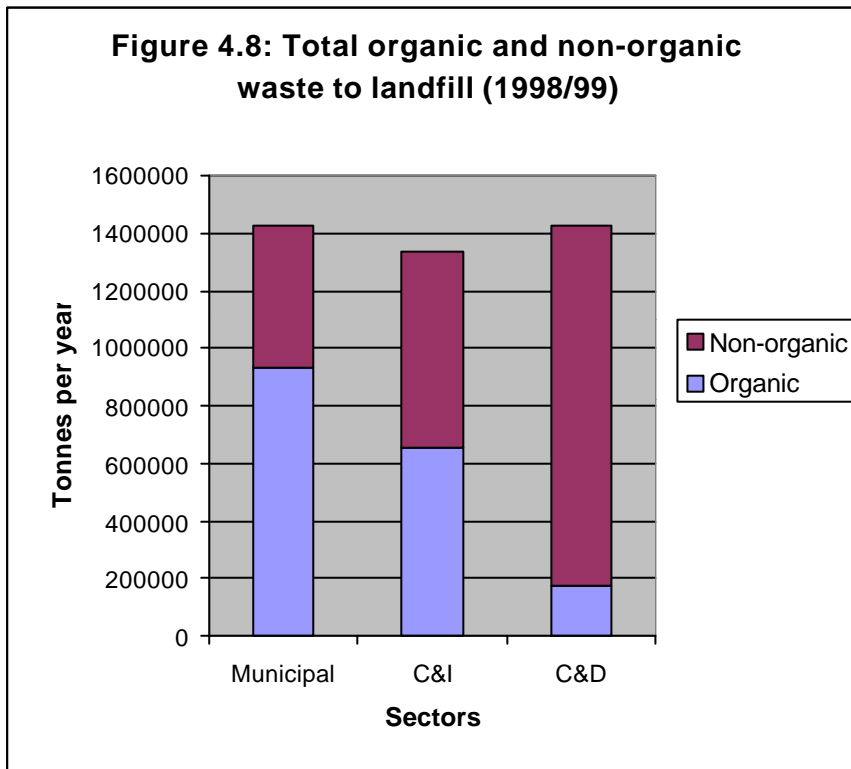
Markets for recycled HDPE include:

- Plastic Lumber
- Fibre reinforced rubber and thermoplastic composites
- Flood and drainage pipe

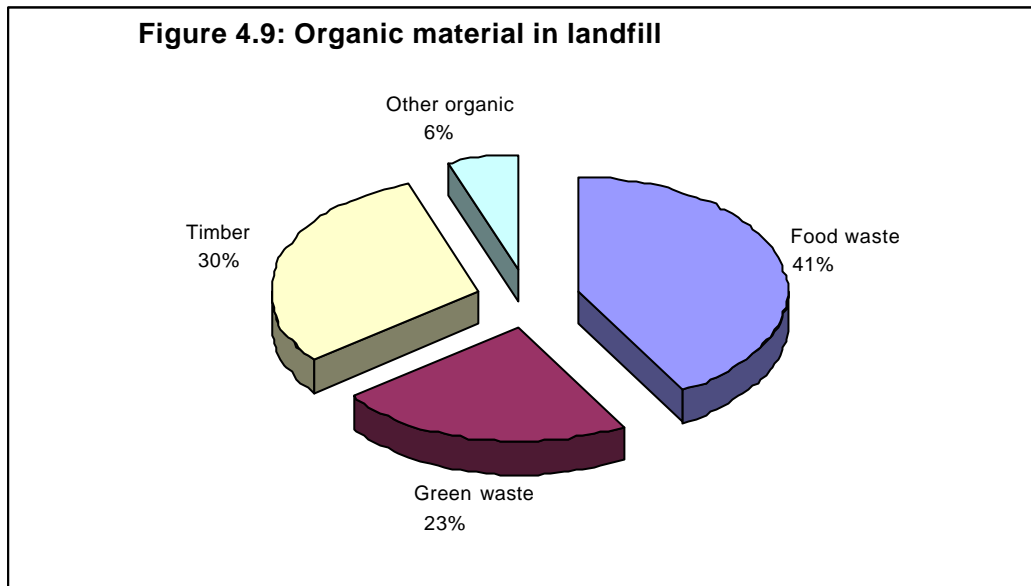
- Rotational cast pipes
- Large capacity moulded containers
- Limited food contact packaging
- Mobile Garage Bins and kerbside recycling boxes
- Amphibious products - boats, kayaks, pontoons
- Pallets and large (materials handling) injection mouldings.

4.6 Organics

Organic materials (food waste, green waste, timber and other organics) are a significant proportion of Victorian's waste stream going to landfill. Approximately 1.7 million tonnes of organic material or 40% of the total waste was disposed to landfill in 1998/99.



Source: EcoRecycle interpolation of EPA *Waste Profile Study of Victorian Landfills*, Golder Associates, 1999



Source: EcoRecycle interpolation of the EPA *Waste Profile Study of Victorian Landfills*, Golder Associates, 1999

Total: 1,734,359 tonnes

Markets for recycled green organics include:

- Mulches
- Organic fertilisers
- Soil enhancers
- Growing media
- Blended soils
- Animal feed
- Biogas

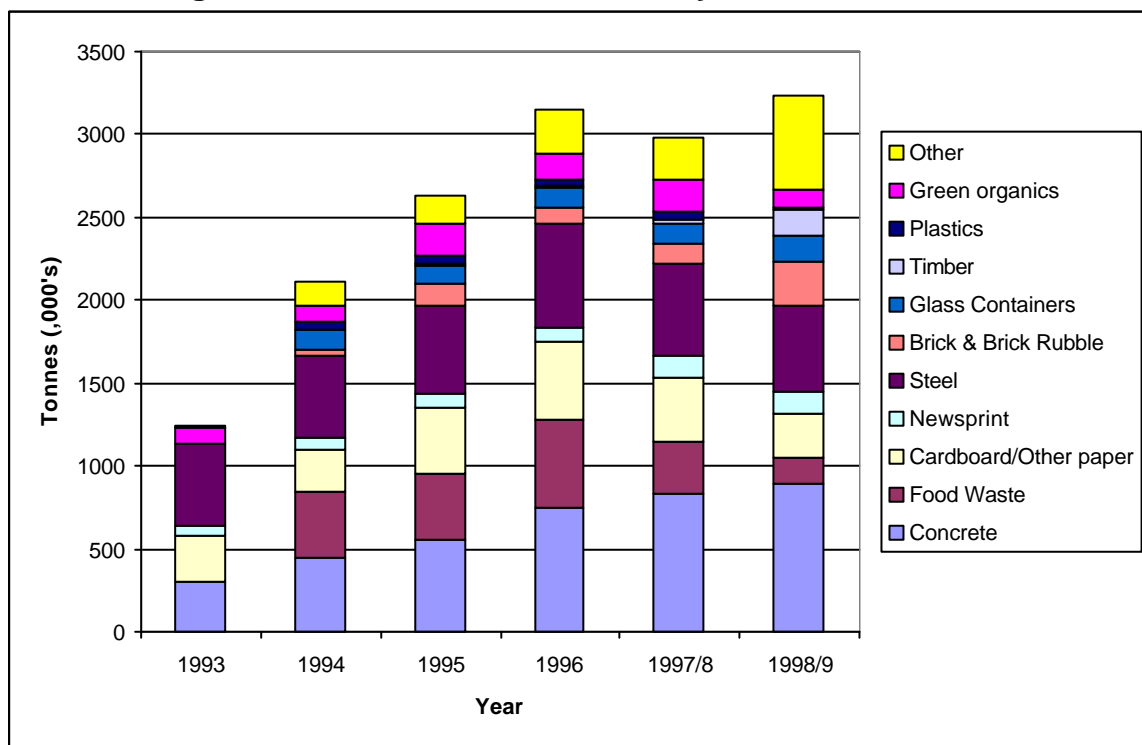
5.0 RECYCLING INDUSTRIES

The Annual Survey of Recycling Industries for 1997/98 found that for companies providing data (47 companies):

- 1200 people were employed in recycling activities
- gross annual turnover was \$250 million
- investment in infrastructure was \$700 million.

Given that several large companies declined to give financial figures, the contribution of the recycling sector is more likely to be around \$400 million in turnover and \$1 billion in investment. The total quantity of materials collected for recycling in Victoria has increased from 2,634,000 tonnes in 1995, to 3,242,000 tonnes in 1998/99 (an increase of 23%).

Figure 5.1: Amount of materials recycled in Victoria



Source: Annual Survey of Victorian Recycling Industries 1997-1998, Salmon Consulting Pty Ltd, 1999

Note: The methodology changed in 1997/98, so data may not be directly comparable.

Table 5.1 : Materials recycled in Victoria ('000 tonnes)

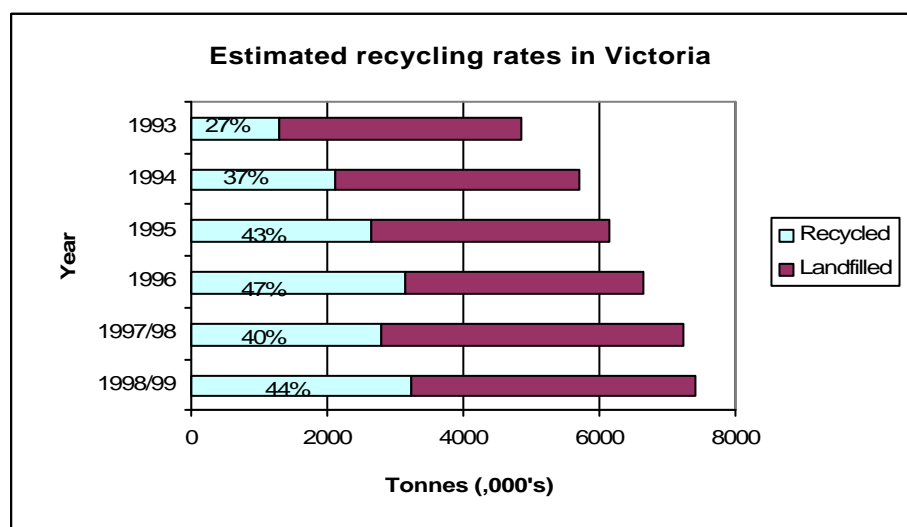
Recyclable Material	1993	1994	1995	1996	1997 /98	1998 /99
Aluminium		40	38	45	9	12
Asphalt			10	19	125	371
Brick & Brick Rubble		45	130	102	126	271
Cardboard/Other paper	277	245	397	469	382	271
Newsprint ¹	63	75	85	84	139	137
Concrete	300	450	550	748	834	899
Food Waste		400	400	531	316	146
Garden/Green Waste	95	95	199	152	183	120
Glass Containers		111	110	111	110	158
Non-Ferrous Metals		60	57	120	20	21
Packaging Steel					10	10
Plasterboard			6	10	20	27
Plastic ²	36	42	43	44	53	10
Rubber	20	20	16	15	25	77
Sawdust						8
Seaweed		16	18	11	23	33
Sheet Glass		12	12	15	14	10
Steel	492	492	540	630	540	503
Textiles & Clothing			13	30	19	10
Timber		10	10	12	30	148
Totals	1,283	2,113	2,634	3,148	2,978	3,242

¹ Newsprint figures are from News Limited Recycling Database - ONP Market Report

² Plastic figures from 1994 -1998/99 are from the PACIA Australian Plastics Materials survey, 1999

In 1998/99, Victoria had a diversion rate of approximately 44%.

(Total waste stream = 7,421,000 tonnes, recycling waste stream = 3,236,000 tonnes)



Source: Diversion rates calculated by EcoRecycle, based on data from 1998/99 *Annual Survey of Recycling Industries* and EPA landfill levy

Materials collected at kerbside for recycling are primarily paper (51%) and glass (41%) (Table 5.2).

Table 5.2: Summary of Domestic Recycling by Material Type in Victorian Suburban Regions, 1997

Material Type	Tonnes/annum	Percentage of Total
Paper/Cardboard	123 850	51%
Glass	99 670	41%
PET	6 050	2.5%
HDPE (coloured)	950	0.4%
HDPE (clear)	3 510	1.5%
Steel	4 230	1.8%
Aluminium	1 590	0.7%
Liquidpaperboard	1 210	0.5%
PVC	200	0.1%
Other Plastic	40	0%
Total	241 300	100%

Source: Kerbside Recycling in Victoria - Assessment of markets and costs, By Nolan ITU, October 1998

6.0 List of EcoRecycle Victoria Publications

Construction and Demolition

- Meinhardt (Vic) Pty Ltd, **Collection of waste timber from Melbourne Businesses** - Part 1, August 1998
- Meinhardt (Vic) Pty Ltd, **Collection of waste timber from Melbourne Businesses** - Part 2 Infrastructure requirements, July 1999
- Nolan-Itu Pty Ltd, **Waste Generation and Recycling In the Residential Demolition Sector**, November 1999
- Meinhardt (Vic) Pty Ltd, **Commercial and Industrial and building and demolition sector waste: a state wide assessment of wastes and opportunities**, December 1999
- Nolan ITU, **Construction and Demolition Waste Landfill Traffic and Compositional Surveys**, July 1998
- Fletcher Construction (Australia) Pty Ltd & Deakin University, **Minimising Construction Waste**, January 1996
- Bruce McDonald Fletcher Construction (Australia) Pty Ltd, **Building Construction Waste Minimisation and Recycling Project**, September 1994

Automotive

- VIATB Environmentally Sustainable Workplaces: **Lessons from the automotive sector**, November 1995
- Nolan ITU, **Motor Vehicle and part manufacturing surveys and waste reduction strategy**, December 1999

Commercial and Industrial

- Maunsell Pty Ltd, **Commercial & Industrial Sector Waste Generation And Recycling Surveys : Offices, Supermarkets, Clothing Manufacturers, Cafes and Restaurants**, July 1998
- Monash Centre for Environmental Management, **Economic and environmental benefits of reusable transport packaging: Case Studies and implementation guidelines**, April 1999
- Nolan ITU, **Food for Thought - Waste Reduction for Food Outlets**, 1999

Landfill composition

- Golder Associates, **Waste Profile Study of Victorian Landfills**, September 1999
- Maunsell Pty Ltd, **Design of a recycling and waste data collection program**, August 1997
- Nolan ITU, **Estimates of Waste Quantities and Composition in Victoria**, September 1995
- GHD and The Waste Management Council, **Waste Minimisation Strategy for Metropolitan Melbourne**, June 1995
- Maunsell Pty Ltd, **RRRC Waste Traffic and Composition Surveys for Melbourne Metropolitan area**, December 1993
- Maunsell Pty Ltd, **RRRC Additional waste surveys for Melbourne Metropolitan Area**, July 1994
- **BIEC recycling and garbage bin audit**, 1998

Electrical Appliances

- Centre for Design at RMIT University, **Appliance reuse and recycling**, November 1999
- Meinhardt (Vic) Pty Ltd, **Waste Generation and Recycling survey in the electrical equipment and appliance manufacturing sector**, March 2000 (Draft)

Furniture Manufacturing

- Meinhardt (Vic) Pty Ltd, **Furniture Industry Waste Minimisation**, July 1998

Materials

- C4ES Pty Ltd, **Glass market development strategy**, 1999
- Delynda Pty Ltd, **Strategies to Increase Post-consumer HDPE recycling**, February 2000
- C4ES Pty Ltd, **Secondary Markets for recovered paper in Victoria**, December 1999
- Salmon Consulting Pty Ltd, **Annual Survey of Victorian Recycling Industries 1997-1998**, October 1999

Nolan ITU, **Kerbside Recycling in Victoria - Assessment of markets and costs**, October 1998