TOTAL ENVIRONMENT CENTRE
STATE OF WASTE SERIES:
VICTORIA

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Front cover photos (from top to bottom):

- Landfill site in Victoria (Retrieved from Victorian Auditor-General's Office, http://www.audit.vic.gov.au/old/par65/ags6505.htm, February 2008.)
- Waste collection (Retrieved from Victorian Auditor-General's Office, http://www.audit.vic.gov.au/old/par65/ags6506.htm, February 2008.)
- Baled recyclables (Retrieved from Dept. of Territory and Municipal Services, http://www.tams.act.gov.au/live/Recycling_and_Waste/Residential_Waste_and_Recycling_Collection/recyclingandwaste, February 2008.)

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EXECUTIVE SUMMARY

One component of a sustainable society is the ability to maximise recycling of materials back into the productive economy. Although Australia has not reached this level of performance, many jurisdictions have signalled their intent to radically improve resource recovery and even commit to the ‘goal of zero’ – a waste free society. Achieving this goal will require many innovative interventions. Total Environment Centre, is working with support from the Pratt Foundation to develop market based approaches to sustainable resource recovery. This study into the state of waste in Victoria is one contribution to the debate and follows similar ‘state of waste’ reports on Queensland and Western Australia.

There are many challenges to overcome in order to deliver improved resource recovery and waste management outcomes in Victoria. On the basis of a national comparison, Victorians are the fifth highest generators of waste in Australia with 2.0 tonnes per capita (10.2 million tonnes in total) and the third best recyclers, recycling 60 per cent of waste generated and landfilling the remaining 0.8 tonnes per capita (4.1 million tonnes in total). However, in spite of increases in recycling rates, the amount of waste to landfill has not decreased over the past decade and performance must improve if Victoria is to reach its recovery targets by 2014.

One avenue to embrace a ‘zero waste’ future is through the creation of an ‘industrial ecology’ of infrastructure that is able to transform waste into valuable resource inputs. In a no-waste society all by-products from production and consumption need to have a beneficial use. Victoria has a number of important characteristics because of its relatively high proportion of forestry and intensive agriculture, fairly small land area and distances and its large metropolitan and regional population base. Market based instruments (MBIs) offer the flexibility to overcome these challenges and support increased resource recovery.

The range of MBIs available to support increased resource recovery includes charges, fees and taxes, market creation (such as the establishment of tradeable permits/certificates), subsidies, deposit/refunds and improving the operation of the market through non financial means such as information provision. The use of container deposits is another market intervention that will embed costs of recovery into product price and support the transition to more sustainable patterns of production and consumption. Victoria has already implemented a landfill levy as a means to internalise some landfill costs.

Other market based options for consideration include a UK style of Landfill Allowance Trading Scheme, establishing embodied energy savings as carbon abatement under a National Emissions Trading Scheme, and using a Resource Recovery Certificate in a similar fashion to Renewable Energy Certificates. Each option has strengths and weaknesses. The challenge is to articulate the case for intervention and create the political imperative for change.

In spite of the apparent progress in Victoria regarding increased resource recovery, there has been no real decrease in the amount of waste disposed of to landfill. There are several challenges that need to be addressed before any real progress is made towards ‘the goal of zero’. For example, there are no planned significant increases in the landfill levy (needed to bring Victoria up to Australian best practice), no regulatory Extended Producer Responsibility schemes, and no planned phase out of degradable organic carbon from landfill. If no further interventions are made in Victoria, then Victoria will rapidly find itself at the bottom of ‘waste school’ and will still be landfilling over $280 million in commodity value by the end of the decade. It is hoped that this ‘State of Waste in Victoria’ report, and the associated workshop for key stakeholders, will contribute some of the impetus for intervention that delivers sustainable systems of resource recovery.

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1 INTRODUCTION

The ability to recycle a maximum amount of material back into the productive economy is an important component of a sustainable society. Unfortunately this is also a feature largely missing from the Australian economy. Each year Australians generate approximately 40 million tonnes of urban waste. More than half of this waste is disposed of to landfill (22 million tonnes), which equates to more than 1000 kg of waste to landfill per person.[1] Such linear resource flows are unsustainable in the long term and generate undesirable environmental, social and economic impacts.

A multi-pronged approach is needed to address the problem of waste. Across Australia many jurisdictions have signalled their intention to improve their waste situation and engage with sustainable resource recovery. Some states have even developed inspirational visions and strategies for commitment to the 'goal of zero'. Many innovative interventions in the economy will be required if the desired change is to materialise. Market Based Instruments (MBIs) can be used to support the recycling of materials back into the economy by providing incentives for sustainable resource recovery, reprocessing and remanufacture.

As a first step to stimulate debate Total Environment Centre (TEC) published 'Market Based Instruments and Sustainable Resource Recovery' in 2004,[2] which considered the potential for MBIs to promote sustainable resource recovery in Australia. TEC, with funding from Pratt Foundation, is undertaking a national series of workshops to identify opportunities for market based interventions to help fast track the transition towards a 'waste free' society. As part of this consultation process, Warnken ISE has been retained to prepare a series of 'State of Waste' reports. This report is the third such study.

1.1 Overview of Report

Following the introduction, Section 2 presents an overview of the strategy, policy and regulatory settings as they relate to resource recovery and waste management in Victoria. Section 3 discusses the available data on waste disposed of to landfill, the amount and types of recycled materials, overall rates of waste generation and compares the performance of Victoria to the rest of Australia. Following this overview of waste generation Section 4 examines the required interventions to become a low waste society and approach zero waste including infrastructure needs, challenges from a Victorian perspective and the use of market based instruments. Finally Section 5 provides a summary, options for consideration and conclusion. The structure of the document is presented in Figure 1.

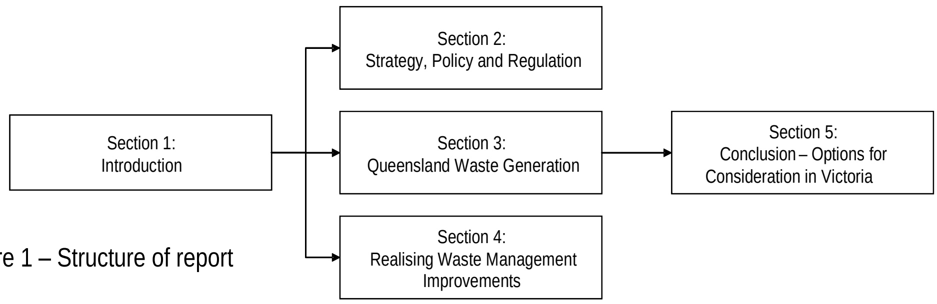

Figure 1 – Structure of report

[1] Base data from Hyder Consulting 2006, "Waste and Recycling in Australia, Department of Environment of Environment and Heritage, found at http://www.environment.gov.au/settlements/publications/waste/pubs/waste-recycling.pdf, February 2008, Population data for 2007 from ABS on population clock.

[2] See http://www.tec.org.au/dev/index.php?option=com_docman&task=doc_download&gid=109 for more information.

2 STRATEGY, POLICY AND REGULATION

The strategic setting for waste management in Victoria is found in the 2005 'Sustainability in Action: Towards Zero Waste Strategy' (2005). The policy settings and regulations are outlined in the Environmental Protection Act 1970, which was amended in 2002. The draft Metropolitan Waste and Resource Recovery Strategic Plan has also recently been released and covers the strategic framework for all solid waste management in Melbourne. An overview of the strategic, policy and regulatory settings is provided below.

2.1 Victoria Waste Strategy

The 'Sustainability in Action: Towards Zero Waste Strategy' was released in September 2005 by the Department of Sustainability and Environment (DSE) and is based on the following principles:

- hierarchy of waste involving avoidance, reuse, recycling, recovery of energy, treatment, containment and disposal
- product stewardship where producers, consumers and government share responsibility for the impacts of a product on the environment
- consumer education to teach people how to make more sustainable purchasing decisions
- partnerships with industry and government
- funding and support
- regulatory tools.

The 'Towards Zero Waste' aims are to have all waste streams processed for reuse and recycling where possible, with landfill only used for inert materials. By 2014 three-quarters of all waste produced should be recycled or reused.

2.2 Policy Settings and Regulation for Waste Issues

The Environmental Protection Act 1970 (the Act) outlines the central approach to environmental protection and management. The Act includes the establishment of environmental standards and criteria, regulation of emissions, discharges and wastes, pollution prevention and removal, enforcement of environmental requirements. Waste hierarchy, product stewardship and shared responsibility were introduced by amendments to the Act in 2002.

'Product stewardship' recognises the producer or importer of a product as the one that should take reasonable steps to minimise environmental harm from the production, use and disposal of the product. The waste management hierarchy, based upon the most preferred to the least preferred method, uses different terminology to cascade from waste avoidance to reuse, to recycling, to energy recovery, to treatment, to containment and lastly to disposal (SV, 2005).

The intention of the waste management hierarchy, polluter pays, user pays and the product stewardship principles is to provide a basis for waste management programs for voluntary industry waste reduction programs and for state and local government waste management strategic plans.

2.3 Landfill Levy Increases

Victoria currently has a landfill levy of $7 per tonne for municipal waste and $13 per tonne for industrial waste in rural areas, and $9 per tonne for municipal waste and $15 per tonne for industrial waste in metropolitan areas. The current prices are a result of annual increases in the levy since 2002-03. The landfill levy serves to internalise some of the external costs of landfill and to make alternatives to landfill more competitive. Levy fees are paid into the Environment Protection Fund with the funds distributed to Regional Waste Management Groups, Sustainability Victoria, EPA Victoria and the Sustainability Fund, with the objective of using the funds to establish programs, regulation and infrastructure to improve waste management and resource use efficiency. However, Victoria's current levy lags behind South Australia metro ($23 per tonne) and New South Wales metro ($46.70 per tonne).

2.4 Draft Metropolitan Waste and Resource Recovery Strategic Plan

The draft Metropolitan Waste and Resource Recovery Strategic Plan was jointly prepared by the Department of Sustainability and Environment (DSE), Sustainability Victoria (SV), the Metropolitan Waste Management Group (MWMG) and the Environment Protection Authority (EPA) Victoria. It provides a useful summary of waste generation issues for Metro-Melbourne, which accounts for approximately 70 per cent of all Victorian waste generation.[3]

One worrying aspect within the strategy is the assumption that an Australian emissions trading scheme will increase landfill costs, create greater organic waste processing and drive the recycling of high embodied energy materials (aluminium, steel, glass and plastics). The implication is that no further policy settings are required to drive additional resource recovery (for example, an increased waste levy). The danger being that a carbon price on waste could easily be incorporated into the normal cost of business with no additional impact of resource recovery. Furthermore, there is no analysis of the greenhouse liability that is being created through a continued reliance on landfill for Municipal Solid Waste.

Pressures for a continued reliance on landfill could arise from the availability of landfill in the North and West metropolitan areas. The Draft Metropolitan Landfill Schedule identifies that at current landfilling rates there could be 100 years of landfill capacity.[4] One issue is that waste from other regions will be channelled into this available space, instead of mandating change to ensure that maximum resource recovery is effected. On the positive front is the potential that Melbourne will never need new landfill space, with decreasing amounts of residual waste requiring landfill.

The challenge for Metro-Melbourne is that Victorian targets will need to be exceeded in order to make up anticipated shortfall from rural and regional activities. A mandate for all metropolitan councils to process their waste through an alternative waste recovery technology such as combination sorting and anaerobic digestion would provide an infrastructure platform to address required recovery rates. However, discussion around such a mandate is lacking from the draft plan.

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[3] Victorian Government, 2008, 'Draft Metropolitan Waste and Resource Recovery Strategic Plan', Sustainability Victoria, Melbourne, accessed at http://www.sustainability.vic.gov.au/www/html/2408-metropolitan-waste-and-resource-recovery-strategic-plan.asp, May 2008.

[4] Victorian Government, 2008, 'Part 3 - The Metropolitan Landfill Schedule', Sustainability Victoria, Melbourne, accessed at http://www.sustainability.vic.gov.au/www/html/2408-metropolitan-waste-and-resource-recovery-strategic-plan.asp, May 2008

2.5 Environment and Resource Efficiency Plan Program

The Environment and Resource Efficiency Plan (EREP) program was introduced by the Victorian EPA and came into force on 1 January 2008, making it mandatory for the largest commercial energy and water users in Victoria to implement actions that reduce energy and water use and waste production. Facilities that use more than 100 terrajoules (TJ) of energy or more than 120 megalitres (ML) of water in one year are captured under the program. Although there is no threshold on waste generation, the EREP program requires liable parties to measure resource use and baseline waste generation data, and to describe major waste generating activities. Furthermore, there is a requirement under the program for sites to develop a specific environment and resource efficiency plan that identifies and implements actions with a three year or better payback to reduce waste production (in addition to actions that reduce energy and water use).[5]

2.6 Comparison with Other States

The Australian response to the challenges presented by waste generation and resource efficiency has been varied. However they reflect an overall commitment to increasing resource recovery. Other states apart from Victoria that are publicly aspiring to move towards zero waste are South Australia, Western Australian and the Australian Capital Territory. The Victorian approach to resource recovery and waste management is fairly well defined as can be seen from Table 1 which presents an overview of policy approaches to waste management and resource recovery across Australia.

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[5] EPA Victoria, 2008, 'EREP Guidelines: Environment & Resource Efficiency Plans', EPA Victoria, Melbourne, accessed at http://www.epa.vic.gov.au/bus/erep/default.asp, July 2008.

Table 1 – Summary of policy approaches to resource recovery and waste management across Australia

Jurisdiction	*Strategy and Use of MBIs*	*Resource Recovery Targets*	*Used Waste Hierarchy*
Victoria	Sustainability in Action: Towards Zero Waste (2005) Levy increased to $15 per tonne for solid industrial waste in larger Victorian centres in July 2007. Prescribed industrial waste levies increased by between $4 - $94 per tonne depending on classification of waste.	– 1.5 million tonne reduction in the projected quantity of solid waste generated, by 2014 – 75% by weight of solid waste recovered for reuse, recycling and/or energy generation by 2014 ♦ 65% for MSW ♦ 80% for C&I ♦ 80% for C&D	Linear progression incorporating avoidance, reuse, recycling, recovery of energy, treatment, containment and disposal
Queensland	Waste Management Strategy for Queensland (1996) No levy, however note that a new strategy is under development (December 2008) which might canvass market based instruments as landfill levies, but no vision/ strategy towards zero waste.	– encourage industry associations to set targets – review of other potential targets	Linear progression of waste avoidance, waste re-use, waste recycling, energy recovery from waste to waste disposal as a last resort.
New South Wales	NSW Waste Avoidance and Resource Recovery Strategy 2007 Increasing levy to $56/tn in the Sydney Metropolitan Area and $52/tn in the Extended Regulatory Area by 2010-11 (excluding CPI adjustments)	By 2014 increase recovery and utilisation of materials from – municipal sector from 26% to 66% – commercial & industrial sector from 28% to 63% – construction & demolition sector from the current 65% to 76%.	Modified – reuse, reprocessing, recycling and energy recovery all grouped on the same level as resource recovery, between avoidance of unnecessary consumption and disposal
Western Australia	Statement of Strategic Direction for Waste Management In Western Australia (2004) Levy increased from $3 to $6 for putrescible and from $1to $3 per tonne for inert Considering container deposits	– changing focus from waste management to waste prevention by 2008 – half of effort spent of waste management and the other half on waste prevention by 2012 – majority of effort spent on prevention by 2015 – little or no waste created that cannot be recovered by 2020	Linear progression of prevention (avoid the creation of waste), recovery (efficient recovery, re-treatment and re-use all wastes) and disposal (responsibly manage waste into the environment). (However note cross over between prevention and recovery).

Table 1 (contd…) – Summary of policy approaches to resource recovery and waste management across Australia

Jurisdiction	*Strategy and Use of MBIs*	*Resource Recovery Targets*	*Used Waste Hierarchy*
South Australia	South Australia's Waste Strategy 2005-2010 (2005) Levy for waste disposed of in metropolitan areas of $23.00 per tonne, non–metro is $11.50. Increases occur each year based on CPI movements and current discussion is taking place on increasing the levy. Long established use of container deposits	– 25% reduction of waste to landfill by 2014 – Interim ramping up targets so that by 2010: ♦ 75% of all materials presenting at kerbside recycle ♦ 30% increase in recovery and use of C&I materials ♦ 50% increase in recovery and use of C&D materials	Linear progression of avoid, reduce, reuse, recycle, recover, treat and dispose
Tasmania	Draft Waste Management Strategy for Tasmania (2007) Planning to provide enough financial incentive to waste generators to reuse or recycle their waste. This will result in a reduction of landfill facilities.	Under review	Linear progression of avoidance, reuse, recycling, energy recovery, repository storage, treatment and disposal/permanent containment
Australian Capital Territory	The Next Step in the No Waste Strategy (2000) No levy but ACT Government sets price of landfill aimed at full cost recovery	Waste free society by 2010 including interim progressive targets driving to zero by 2010 for domestic collected, private delivery, commercial & industrial, and building & demolition	Linear progression of avoidance, reduction, reuse, recycling, recovery, and disposal.
Northern Territory	NT Waste Management and Pollution Control Strategy (1995) and Re-thinking Waste –Disposal Behaviour and Resource Efficiency Interim Action Plan (2007)	Initial step in developing waste management strategies by raising awareness of environmental responsibilities, improving waste reporting, identifying opportunities for resource recovery and encouraging appropriate disposal behaviour	Linear progression of avoidance, reduction, reuse, recycling, and disposal

The above table raises some questions for Victorian policy settings, especially in light of aspirations towards zero waste. For example, the landfill levy is set at a level reminiscent of NSW in the 1990s, no regulatory Extended Producer Responsibility schemes under consideration (such as container deposits) and an apparent lack of incentives for investment into alternative waste technology suggest that resource recovery is no longer an issue for Victorian Policy setters. The data on waste generation performance is presented in the following section.

3 VICTORIA WASTE GENERATION

Waste generation is measured as the amount of materials disposed of to landfill plus the amount of recycling that occurs within a given region. Waste materials are commonly broken down into three waste 'streams' of Municipal Solid Waste, Commercial and Industrial, and Construction and Demolition.

Municipal Solid Waste (MSW) comprises materials that are generated from the domestic sector and are collected in household garbage, recycling, garden organics and Council and/ or private sector clean-up collections, in addition to waste materials collected by Councils and/ or private sector as part of street sweeping, litter bins and park cleanups.

Commercial and Industrial (C&I) waste includes materials generated from fixed point sources within the manufacturing, wholesale, retail, professional services and administration sectors. Construction and Demolition (C&D) covers materials generated from construction and demolition activities, both on a large scale (high rise) and small scale (residential housing), in addition to materials from landscaping and other urban based construction activities.

Victorian waste data was incomplete regarding landfill material compositions and waste streams. There were no representative waste stream percentages available for landfilled waste in 2003-04. Limitations were also present in the determination of the composition of waste disposed to landfill by material type as there were no Victorian state figures recorded. Local governments are required to report on certain information as waste and recycling data, but private industries provide waste data on a voluntary basis. For example, in 2005-06 this resulted in only a 57 per cent response rate from reprocessing industries surveyed. However, it is noted that the industries that did respond are thought to represent over 90 per cent of the industry (SV, 2007). The quality of data has increased in recent years due to increasing industry reporting rates and broader data collection in regional centres.

3.1 Disposal to Landfill

In 2005-06 approximately 4,080,00 tonnes of waste was landfilled in Victoria. This translates to a per capita landfill disposal rate of 0.8 tonnes. No information is available on the material composition of waste disposed of to landfill in Victoria. National averages have been used to approximate the material breakdown of waste to landfill. Indicative commodity values have also been used to provide an estimate of the financial lost opportunity of landfill and are presented in Table 2 below.

Table 2 – Estimated composition of material disposed of to landfill in Victoria and indicative financial value for 2005-06[6]

Material Type[7]	*Tonnes*	*Indicative Value per tonne*	*Commodity Value*
Food and other organics	734,000	$20	$14,688,000
Paper & Cardboard	612,000	$70	$42,840,000
Garden Organics	530,000	$20	$10,608,000
Wood/Timber	408,000	$20	$8,160,000
Glass	122,000	$72	$8,813,000
Non-ferrous	41,000	$1,500	$61,200,000
Ferrous	163,000	$75	$12,240,000
Plastic	367,000	$300	$110,160,000
Soil/Rubble and Other Clean Excavated Material	571,000	$15	$8,568,000
Concrete, bricks and asphalt	408,000	$15	$6,120,000
Other Recyclables (inc Textiles and Rubber)	41,000	$10	$408,000
Other (waste)	82,000	-	$0
Total	4,080,000		$283,805,000

Table 2 shows a lost commodity value of over $280 million worth of materials to landfill in Victoria during 2005-06. While it is true that high transport prices and a lack of local markets can erode the value of recycled materials, the assumed commodity values used by the WMAA (NSW Branch) were conservative. Movements in market value are more likely to be the major determining factor of financial value for materials such as aluminium, plastics and to a lesser extent, paper and cardboard.[8]

Historical data on the amount of waste disposed of to landfill in Victoria can be determined for each financial year from 2000-01 to 2005-06 except for 2003-04 figures which have been estimated from the available data. Figure 2 on the next page shows the breakdown of disposal tonnages by source. (The corresponding data is presented in Appendix 1 Table 6.)

[6] Average commodity values from WMAA (NSW Branch) 2006 and proportions derived from Hyder Consulting 2006 – totals may not add due to rounding). Also note that these values are a conservative underestimate – especially given the current resources boom.

[7] Bio solids have been left out this overview because they are not considered part of the waste stream.

[8] For example, there are industry reports of trade for recycled Aluminium, recycled Plastic and recycled Office Paper at nearly double the estimates given here.

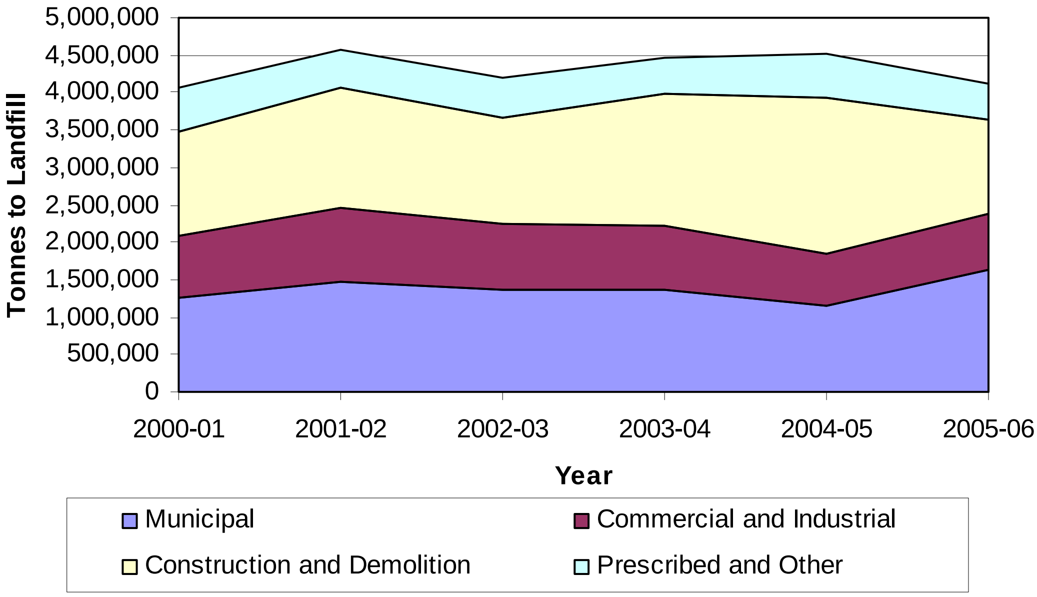

Figure 2 – Waste to landfill in Victoria 2000-01 to 2005-06

Figure 2 above was difficult to compile based on existing data because waste figures are incomplete and have different inclusions each year. Methods of data collection are likely to have varied between the different data sources. In particular, the breakdown of waste into streams can be ambiguous and data analysts may categorise waste streams in many different ways.

The landfill waste disposal figures since 2000-01 show some fluctuation, however the amount of waste disposed of to landfill has remained constant over the recent past. This means that there has been no real reduction in the amount of waste disposed of to landfill in Victoria. Gross State Product shows an average increase of 3 per cent between 2000-01 and 2005-06 and the Victorian population has increased from 4.8 million in 2000-01 to 5.1 million in 2005-06.[9] This suggests that increases in resource recovery have offset increases in waste generation owing to economic and population growth.

3.2 Recycling

In 2005-06 approximately 6,130,000 tonnes of waste was recycled in Victoria translating into 1.2 tonnes per capita. The material composition of recycled materials is presented in Table 3.[10]

In 2005-06, there were 920,000 tonnes recovered from the Municipal stream, 1,594,000 tonnes from Commercial and Industrial, 2,913,000 tonnes from Construction and Demolition sources, and 490,000 from Regulated Waste and Other (SV, 2007). (See Appendix 2 an overview including the years 2002, 2003 and 2004). Figure 3 on the next page shows the breakdown of recycling tonnages by material type.

[9]GSP in "Australian National Accounts: State Accounts 2001-02 to 2005-06" and population count in "Australian Demographic Statistics July 2001to Jul 2006", published by ABS

[10] Note that data presented on recycling is 'as reported'. No analysis on the amount of materials exported from Victoria and claimed as recycling as been undertaken as part of this study. Large amounts of material with high levels of contamination that were exported and claimed as 'recycling' would inflate recycling performance.

Table 3 – Materials recycled in Victoria in 2005-06 (SV, 2007) – totals may not add due to rounding

Material Type	*Tonnes*
Food and other organics	35,000
Paper & Cardboard	1,090,000
Garden Organics	215,000
Wood/Timber	121,000
Glass	168,000
Non-ferrous	137,000
Ferrous	1,313,000
Plastic	110,000
Soil/Rubble and Other Clean Excavated Material	611,000
Concrete, bricks and asphalt	2,270,000
Other Recyclables (inc Textiles and Rubber)	58,000
Total	6,123,000

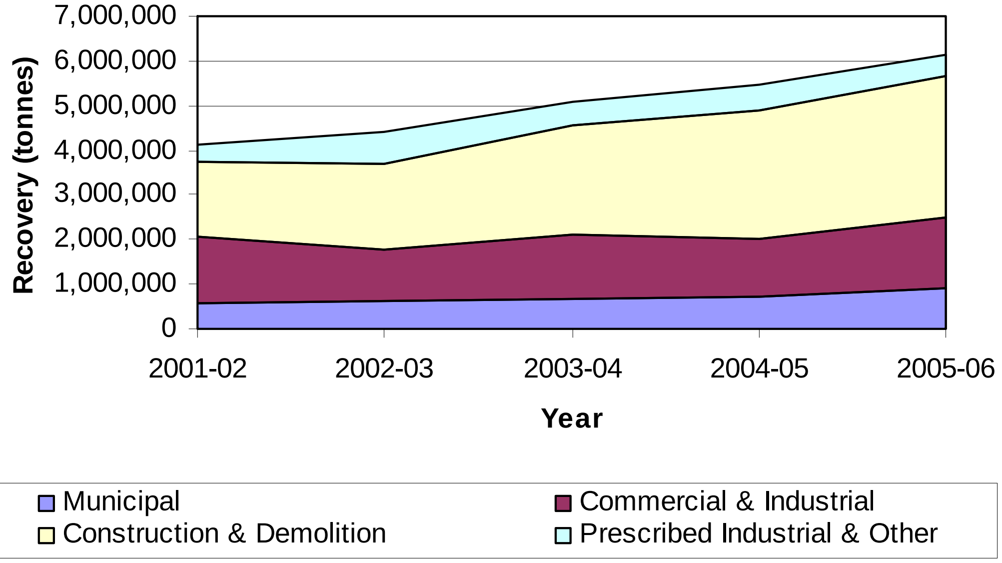

Figure 3 – Materials recycled in Victoria 2001-2006

3.3 Waste Generated

Based on the preceding analysis, the estimated amount of waste generation in Victoria for 2005-06 is approximately 10,210,000 tonnes. A breakdown of this amount by waste stream is presented in Table 4 below and a breakdown by material type is presented in Appendix 3. Based on data supplied by Sustainability Victoria, it is estimated that Victoria recycles 60 per cent of its waste, with the remaining 40 per cent disposed of to landfill.

Table 4 – Estimated amounts of waste generated in Victoria in 2005-06 – totals may not add due to rounding

Waste Stream	*Disposed of to Landfill*	*Recycled*	*Total Waste Generated*	*% Disposal*	*% Recycling*
Municipal	1,635,000	920,000	2,555,000	64%	36%
Commercial and Industrial	750,000	1,594,000	2,344,000	32%	68%
Construction and Demolition	1,248,000	3,126,000	4,374,000	29%	71%
Prescribed Industrial Waste and Other	494,000	490,000	984,000	50%	50%
Total	4,080,000	6,130,000	10,210,000	40%	60%

Figure 4 below shows the trendline of 2000-01 to 2005-06 of the total tonnes of waste generated, comprising tonnes disposed to landfill and tonnes of resources recovered. This figure shows a steady growth of total waste generation, which is caused by a combination of better data collection, population growth and GSP growth. The increase in recycling is attributable to additional efforts in recycling, which has been enough to offset the increase in waste generation. However, this has meat that there has been no real decrease in the amount of waste being disposed to landfill.

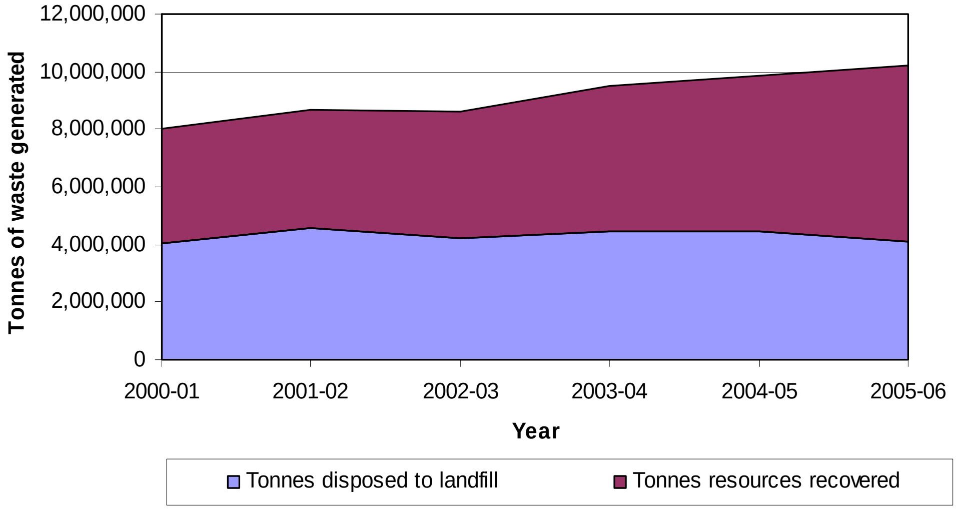

Figure 4 – Total waste generated in Victoria 2001-2006 composed of landfill disposal and resource recovery

3.4 Comparative Performance

A comparison of Australian per capita disposal, recycling and waste generation rates provides an opportunity to benchmark waste performance in Victoria. As shown in Table 7 below, national averages are: 1.0 tonnes of waste disposed of to landfill, 0.9 tonnes recycled, and a per capita waste generation rate of 1.9 tonnes (total tonnages are provided in Appendix 5).

The per capita rates on a state and territory basis highlight the inaccuracies of waste data in Australia. For example, there is no evidence to suggest that Tasmania has a waste generation rate that is nearly 50 percent lower than the national average, as was also the case with previous studies that reported Queensland waste generation as also 1 tonne per person (Hyder 2006).[11]

The figures used in this study show Victoria to be the fifth highest waste generator and also the fifth highest landfiller of waste in Australia. The Victoria per capita total comprises 1.2 tonnes recycled (6.1 million tonnes) and 0.8 tonnes disposed to landfill (4.1 million tonnes).[12] The level of waste generation presents a number of future challenges if Victoria is to achieve their strategy goals by 2014.

Table 5 – Per Capita comparison of Victorian Resource Recovery Performance in tonnes[13] (Derived from Hyder 2006 using ABS population figures)

Category	Vic	NSW	Qld	WA[14]	SA	TAS	ACT	NT	AU Average
Disposed	0.8	0.9	1.5	1.9	0.8	1.0	0.6	0.4	1.0
Recycled	1.2	0.9	0.6	0.4	1.4	0.1	1.5	0.1	0.9
Generated	2.0	1.8	2.1	2.3	2.2	1.1	2.1	0.5	1.9

3.5 Forecast Waste Generation Rates in Victoria

The gap each year between actual waste disposed and resource recovery will grow unless innovative market based solutions are used to stimulate a more robust resource recovery industry in Victoria that is able to reduce the amount of waste disposed of to landfill. Figure 5 on the next page shows that waste generation in Victoria could rise to over seventeen million tonnes per annum by 2025, with over nine million tonnes of materials wasted to landfill. This ‘worst case’ scenario would occur where waste avoidance activities do not counter economic growth Australia (no decoupling between waste generation and economic growth).[15]

[11] Notice that recent data revised the Queensland waste generation rate upwards to 2.1 tonnes per person, up from 1.0 tonnes. See http://www.tec.org.au/dev/index.php?option=com_docman&task=doc_download&gid=109 for more information.

[12] Total waste landfilled of 4.1 Mt divided by ABS population of Victoria for 2005-06 of 5,091,700 gives 0.8 tonnes disposal per person.

[13] Derived from Hyder Consulting 2006 using ABS population estimates for all states except Qld. Current Qld estimates are used to provide a more accurate picture of performance (2002/2003 data showed waste generation at around 1 tonne per capita). Note that this table is an update of the previous WA State of Waste report published by Total Environment Centre see *http://www.tec.org.au/dev/index.php?option=com_docman&task=doc_download&gid=18*.

[14] Estimates for Perth per capita disposal were used for all of WA

[15] An average of the Gross State Product growth rates from 2000-2001 to 2005-2006 (2.9%) were used for years 2008 – 2025 (Source: ABS 2006), Waste generation rates were calculated as an estimate of waste generation per $million of GSP using 2000-01 to 2005-06 waste data against the corresponding financial years.

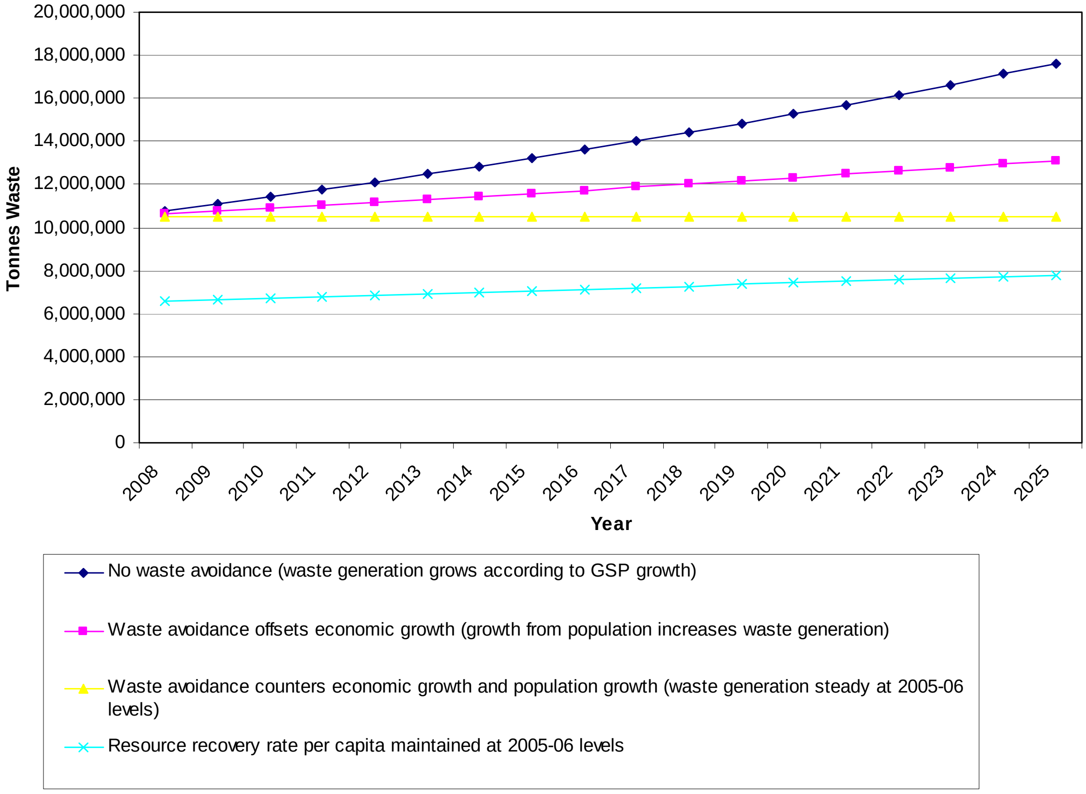

Figure 5 –Forecast waste generation rates for Victoria

Even if waste avoidance is successful in countering an increase in waste generation from economic growth, the anticipated population increases in Victoria to 2025 will add over two million tonnes of waste generation that would need to be recycled in order to prevent an increase in the amount of waste disposed of to landfill. If waste disposal to landfill is to be reduced, an increase in recovery rates over and above growth in population is required, in addition to waste avoidance efforts.

The challenge is compounded by technical barriers to increased recycling rates, such as inherent contamination in mixed kerbside recycling systems and stringent quality requirements for feedstock materials. For example, the quality specifications for amber glass bottles are at odds with the current system of collection and sorting used to transform glass bottles into a furnace ready product. As some recollection systems compact the recycled material the amount of glass fines is increased due to breakage. The difficulties associated with separating the fine material is causing a decrease in the amount of glass being recycled into new glass bottle products. System-wide improvements are required to increase the volume of glass recovered and the quality of recycled material produced (APC 2006).

The scale of the challenge facing Victoria is highlighted by the potential increases in waste generation and emphasises the need for innovative solutions to increase the recovery of resources and reduce waste generation.

4 REALISING RESOURCE RECOVERY IMPROVEMENTS

Although Victoria is implementing the 'Towards Zero Waste' strategy, continued progress must be made to achieve the waste reduction and recovery targets by 2014. The hidden elephant in the room is that current progress in recycling rates has only offset increases in waste generation from economic and population growth. The real risk is that progress to date has been as a result of record high commodity prices and that all accessible resources have been recovered. This suggests that additional changes are required to underpin and accelerate resource recovery. Furthermore, there is no action explicitly addressing the issue of degradable organic carbon (food, paper, wood and garden materials) disposal to landfill. This is of paramount importance because every tonne of waste with degradable organic carbon landfilled represents a greenhouse gas liability in 2050, a time when Victoria could least afford greenhouse emissions that add no value to society or the economy.[16]

Some of the changes required to deliver sustainable outcomes include redesigning current infrastructure for waste management as an industrial ecosystem that delivers resources back into the productive economy at their highest resource value. Victoria does have the advantage of a high population density with relatively small land area and distances, making the state well placed for the establishment of high volume, low cost resource recovery markets. While there have been a number of innovative pilot projects such as Byteback (for used computers), Batteryback (for used batteries) and Paintback (for used paint), they are limited in scope and rely on voluntary funding for their continued operation.

The tasks of providing an ongoing revenue stream for the service of resource recovery, transforming current infrastructure and overcoming barriers to increased resource recovery can be overcome through innovative use of Market Based Instruments (MBIs). This section explores how MBIs can assist Victoria in improving resource recovery performance.

4.1 Achieving the Zero Waste Vision

The goal of 'zero waste' is one key element in transitioning to a sustainable economy where patterns of production and consumption are based on the principles of nature – the 'biomimetic economy'. For example, Janine Benyus (1997) in her book 'Biomimicry' puts forward nature as a model, measure and mentor, citing nine key lessons regarding the operation of natural systems, including 'nature recycles everything'.

In addition to having a sound philosophical basis, the recovery of resources for recycling is, in and of itself, a value adding activity. The value proposition of recycling to society is (ACOR 2006):

- less energy requirements for the same unit of material resource - savings in associated greenhouse gas emissions arising from energy generation through conserving embodied energy
- avoided depletion of primary resources - extends the life of given stocks
- replacement of fossil fuels - where the calorific value of materials are recovered for energy generation

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[16] Warnken ISE. 2007, 'The Potential Greenhouse Gas Liability from Landfill in Australia: An Examination of the Climate Change Risk from Landfill Emissions to 2050', Total Environment Centre, Sydney, accessed at http://www.tec.org.au/index.php?option=com_docman&task=doc_download&gid=245, May 2008.

– nutrient cycling - through the composting and anaerobic digestion of organic materials for application to land)

– provision of waste management services as a by-product - society still has a need to handle the bulk flows of materials that are discarded. Recycling provides this service as a by-product of recovering resource value for the economy.

The creation of an 'industrial ecology' of infrastructure that can transform waste into valuable resource inputs will be required to achieve zero waste. One version of an industrial ecology has been developed by the Strategic Planning and Infrastructure Group (SPIG) which resides under the umbrella of the Waste Management Association of Australia. Figure 2 below identifies the key characteristics of an infrastructure able to deliver zero waste.

Materials at their end-of-life can generally fit into one of three categories: dry recyclables (#4 on Figure 6); organics (#5); and residuals (#3). For both dry recyclables and organics there is existing infrastructure and technology that can process and beneficiate collected materials.

There is, however, a requirement for ongoing development to improve recycling participation amongst business and individuals, in addition to improving output quality. It is in the recovery of value from 'residual' materials that the bulk of innovation and development is required.

Under a zero waste model, all by-products from production and consumption need to have a beneficial use. Technology and infrastructure will be required to transform residual waste (3) into its generic material types including metals (6), inert materials (7), organics / lignocellulosics (woody materials – 8) and high calorific (energy content) hydrocarbon based fractions (9). These generic recovered resources can then be recycled for new metal manufacture, used for civil works, converted into soil improvement products, and used as coal or gas replacement fuels respectively. In order to optimise this system of residuals processing it will be necessary to use Extended Producer Responsibility (Product Stewardship – EPR/PS) schemes to remove products or items with special value recovery potential, or with toxic characteristics that could disrupt residual processing (Glover and Wainberg unpublished). EPR/PS can also be used to improve recovery rates, such as through the use of container deposits.

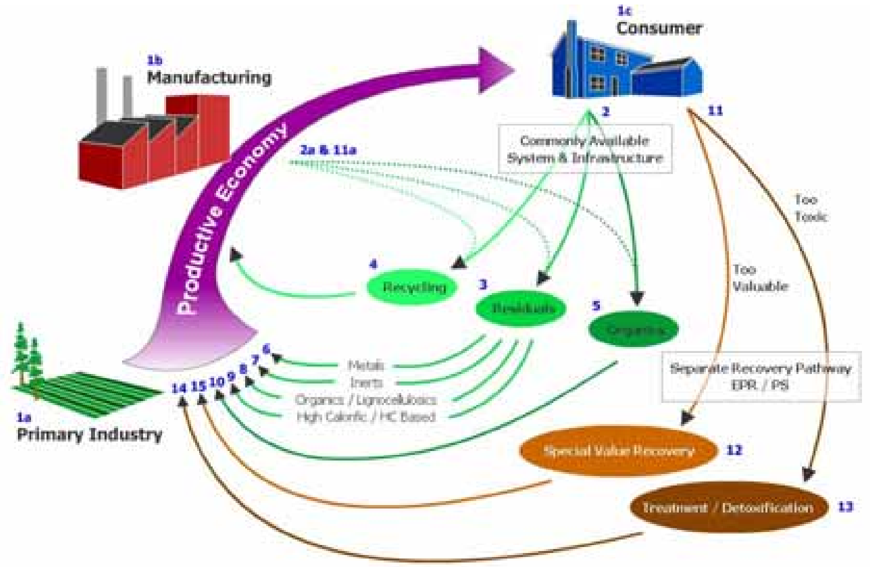

Figure 6 – Conceptualisation of infrastructure requirements for zero waste (Glover and Wainberg unpublished)

The design of such a zero waste industrial ecology in the Victorian context would also need to address some important system characteristics.

4.2 Important Characteristics of Victoria

Victoria has a number of characteristics arising from its high proportion of intensive farming and forestry, large metropolitan and regional population and comparatively small land area. The relatively high population density and short travel distances have the advantage of making the establishment of recycling and reuse activities more viable.

A further challenge is in the management of rural and regional landfills to improve beyond a basic level of environmental performance, let alone influencing onsite resource recovery activities.

Market based instruments offer a number of opportunities to overcome these challenges and support increased resource recovery.

4.3 Using Market Based Instruments to Achieve Sustainable Resource Recovery

Market based instruments (MBIs) can be used to harness market forces in meeting a desired sustainability goal, for example, the increased recovery of resources. The range of MBIs includes charges, fees and taxes, market creation (such as the establishment of tradeable permits/certificates), subsidies, deposit/refunds and improving the operation of the market through non financial means such as information provision.

- Charges, Fees and Taxes - attempt to change the actions of companies and individuals to achieve a desired outcome. In general, environmentally related taxes are based on the ‘polluter pays principle’ where pollution costs are factored into manufacture and production costs. One issue to resolve is whether to charge the consumer (consumption price signal) or the producer (targets pollution abatement at source – UNEP 2004)
- Market Creation - Tradeable Permits and Certificates – a tradable ‘property right’ is assigned to items that previously had no direct financial value. This action can be used to create markets in tradeable permits or certificates for damage control/reversal of environmental pollution, stewardship of natural resources and restoration of ecosystem services (Hyder Consulting 2005). Australian examples include Renewable Energy Certificates (RECs) and NSW Greenhouse Gas Abatement Certificates (NGACs). An international example directly related to resource recovery is the UK Landfill Allowance Trading Scheme (LATS) that will dramatically reduce Biodegradable Municipal Waste disposed of to landfill
- Subsidies - include tax concessions, low or no interest loans and exemptions from fees and charges to improve the financial viability of organisations undertaking desired actions intended to bring about an environmental improvement. Also involved is the elimination of perverse subsidies, those mechanisms that actively accelerate environmental deterioration; for example, any subsidies that promote the use of fossil fuels like coal, or provide an incentive for increased primary production (OECD 2001)

- Deposit/Refund Schemes - apply the principle of Extended Producer Responsibility to products and packaging by including a deposit in the purchase price of the product such as beverage containers, but can also be applied to chemical drums, paint tins or mobile phones and computers. The deposit is redeemable when the container is returned either to collection depots. A well known example is container deposit legislation (CDL) such as the 5 ¢ deposit on beverage containers in South Australia, in addition to the streamlined Californian model
- Market Friction Reduction - addresses forms of market distortion through non-financial means such as reducing transaction costs and improving information flows. Examples include ecolabelling, information and technology transfer and research programmes to facilitate market exchanges (Whitten et al 2003)

The benefits highlighted with a market based approach include (OECD 2001 and UNEP 2004):

- static efficiency – the achievement of environmental pollution abatement at the minimum cost and the equalisation of marginal abatement costs across companies
- dynamic efficiency - ongoing incentives to reduce the costs of pollution abatement, over and above meeting an arbitrary performance level
- double dividend - the realisation of both an improved environmental outcome and a reduction in other taxes such as labour taxes
- self enforcement and transparency - trading mechanisms are by necessity transparent and information on trades is more accessible than reports generated under 'command and control' regulations

These benefits are contrasted with potential limitations that need to be addressed in the design phase including (OECD 2001, Murtough et al. 2002, Whitten et al. 2003):

- institutional weaknesses - the free rider problem caused by companies not participating in an MBI programme
- legal gaps - there needs to be a legal authority that assigns the necessary property rights and enforces contracts
- strong opposing political factions - well organised and funded special interest groups may disrupt the process of establishing an MBI if it is perceived to disadvantage their financial interests
- community perception – there is the potential for MBIs to be perceived as representing the ability to pay to pollute, especially with cap and trade programmes.

For an MBI to be effective within the Australia context it would need to create a price signal that includes the post consumer management of products and packaging; reward those companies adding value through additional recovery of resources over and above baseline performance; provide an incentive to invest in reverse distribution and reprocessing infrastructure; and influence the design of products and packaging so that they fit into a planned beneficiation option at their end-of-life.

5 CONCLUSION - OPTIONS FOR CONSIDERATION IN VICTORIA

Victoria is already using a landfill levy as a means to internalise some of the external costs of landfill, however this needs to be dramatically increased to support additional resource recovery. Other actions for Victoria to consider in the transition to a waste free society include:

- a UK style of Landfill Allowance Trading Scheme (LATS) – with the obligation on local government to reduce the amount of putrescible waste sent to landfill. A series of allowances is allocated in line with the reduction timeline. Those Councils able to exceed their diversion targets would have surplus allowances that could be traded to Councils unable to meet their obligations. The ceiling price of the allowances would be set by the price of the penalty for not having enough allowances to cover the amount of putrescible waste sent to landfill
- establishing embodied energy as a form of carbon abatement under the proposed National Emissions Trading Scheme – it is well known that recycling saves energy, especially for materials like aluminium and plastic. Recycled materials are said to have a lower embodied energy than their primary resource counterparts. Because a lower energy profile produces less greenhouse gas emissions, savings in embodied energy are a form of carbon abatement. One way to drive greenhouse gas friendly recycling would be to establish embodied energy under an emissions trading scheme, such as the proposed Australian Emissions Trading Scheme (AETS)
- resource recovery certificates – RRCs would seek to support a sustainable resource recovery sector, similar in purpose to renewable energy certificates (RECs). There are three general areas where an RRC could be applied. Firstly upstream, creating a market pull for material inputs with recycled content; secondly downstream, creating a supply push of recovered resources; and finally a midstream approach, aiming for balance by combining supply push and market pull. Of the three options, a simplified downstream MBI applied to landfill owners/operators and requiring them to divert increasing amounts of material away from landfill toward beneficial use, has the greatest potential due to (relative) administrative simplicity
- container deposits as an improved financial basis for regional hubs support drive-through recycling of a range of products, including e-waste.

Other potential approaches include targeting elements within the packaging supply chain and establishing a recovery liability based on the amount of packaging they handle,[17] application of a levy benefit scheme for products similar in operation to the national Used Oil Product Stewardship scheme, or a mechanism to reward the eco-system services of recycling, as advocated by the Australian Council of Recyclers.

Each potential instrument has its own set of strengths and weaknesses, with varying impacts and benefits on participants within the recycling value chain.

It is hoped that this 'State of Waste in Victoria' report, and the associated workshop for key stakeholders, will provide impetus to deliver sustainable systems of resource recovery towards a waste free Australian society.

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[17] For example Packaging Recovery Notes in the UK – see 'Packaging and Packaging Waste' at http://www.defra.gov.uk/environment/waste/topics/packaging.

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7 APPENDICES

7.1 Appendix 1 – Waste to Landfill 2000-01 to 2005-06

Table 6 – Waste disposed of to landfill in Victoria (Nolan -ITU, 2002; Hyder, 2006; SV, 2007a) – totals may not add due to rounding

Waste Stream	2000-01	2001-02	2002-03	2003-04[18]	2004-05	2005-06
Municipal	1,248,000	1,465,000	1,359,000	1,354,000	1,151,000	1,635,000
Commercial and Industrial	832,000	992,000	882,000	874,000	701,000	750,000
Construction and Demolition	1,387,000	1,611,000	1,432,000	1,748,000	2,083,000	1,248,000
Prescribed Waste and Other	588,000	516,000	536,000	485,000	586,000	494,000
Total	4,055,000	4,565,000	4,209,000	4,459,000	4,426,000	4,080,000

7.2 Appendix 2 – Resources Recovered 2000-01 to 2005-06

Table 7 – Resource Recovery in Victoria (SV, 2002, 2003, 2004, 2005, 2006, 2007)– totals may not add due to rounding

Waste Stream	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Municipal	465,000[19]	577,000	620,000	659,000	706,000	920,000
Commercial and Industrial	1,400,000[20]	1,483,000	1,152,000	1,470,000	1,303,000	1,594,000
Construction and Demolition	1,318,000	1,689,000	1,905,000	2,434,000	2,877,000	3,126,000
Prescribed Waste and Other	803,000	371,000	753,000	507,000	597,000	490,000
Total	3,986,000	4,119,000	4,430,000	5,070,000	5,428,000	6,130,000

[18] Estimated as average of proportions of 2001-02, 2002-03 and 2004-05 data

[19] Estimated from trend of 2001-02 to 2005-06 data.

[20] Estimated as average of 2001-02 to 2005-06 data

7.3 Appendix 3 – Summary material composition of Victorian waste generation

Table 8 – Summary material breakdown of waste generation in Victoria during 2005-06 (SV, 2007; averages for disposal from WMAA 2006, – totals may not add because of rounding)

Material Type[21]	Tonnes Wasted to Landfill	Tonnes Recycled	Total Waste Generation
Food and other organics	734,000	35,000	769,000
Paper & Cardboard	612,000	1,087,000	1,699,000
Garden Organics	530,000	215,000	745,000
Wood/Timber	408,000	121,000	529,000
Glass	122,000	168,000	290,000
Adjusted non-ferrous	41,000	137,000	178,000
Ferrous	163,000	1,313,000	1,476,000
Plastic	367,000	109,000	390,000
Soil/Rubble and Other Clean Excavated Material	571,000	2,270,000	680,000
Concrete, bricks and asphalt	408,000	611,000	2,678,000
Other Recyclables & waste (inc Textiles and Rubber)	616,000	58,000	180,000
Total	4,080,000	6,130,000	10,210,000

[21] Biosolids have been left out this overview because they are not considered part of the urban solid waste stream.

7.4 Appendix 4 – Total Waste Generated in Victoria

Table 9 –Total waste generated in Victoria – totals may not add due to rounding

Waste Stream	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Municipal	1,713,000	2,042,000	1,979,000	2,014,000	1,857,000	2,555,000
Commercial and Industrial	2,232,000	2,475,000	2,033,000	2,344,000	2,004,000	2,344,000
Construction and Demolition	2,705,000	3,299,000	3,337,000	4,182,000	4,960,000	4,374,000
Prescribed Waste and Other	1,391,000	887,000	1,289,000	992,000	1,183,000	984,000
Total	8,041,000	8,684,000	8,639,000	9,529,000	9,854,000	10,210,000

7.5 Appendix 5 – Comparison of Victorian waste generation against other Australian jurisdictions

Table 10 – Tonnage comparison of Victorian Resource Recovery Performance (derived from Hyder, 2006[22])

Category	QLD	NSW	Vic	WA	SA	TAS	ACT	NT	AU Totals
Disposed	6,026,000	6,341,000	4,080,000	3,706,000	1,277,000	497,000	207,000	83,000	22,217,000
Recycled	2,273,000	5,830,000	6,130,000	826,000	2,156,000	38,000	467,000	10,000	17,730,000
Generated	8,299,000	12,171,000	10,210,000	4,532,000	3,433,000	535,000	674,000	93,000	39,947,000

[22] Estimates for Queensland derived from the current analysis and are used to overcome under reporting in 2002/2003. Most recent data pairs used for other states and territories.