



Government of South Australia

Zero Waste SA

**South Australia's Waste Strategy 2005-2010
Benefit Cost Assessment
Volume 1: Summary Report**

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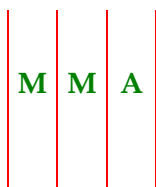
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Report to
Zero Waste South Australia

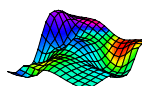
South Australia's Waste Strategy 2005-2010
Benefit Cost Assessment
Volume 1: Summary Report

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TABLE OF CONTENTS

ABBREVIATIONS	1
EXECUTIVE SUMMARY	2
1 INTRODUCTION	7
2 WASTE REDUCTION TARGETS	8
3 TRIPLE BOTTOM LINE ASSESSMENT APPROACH	10
3.1 Identifying triple bottom line impacts	10
3.2 Modelling waste management in South Australia	11
3.3 Policies investigated	12
4 TBL BENEFITS OF CURRENTLY COMMITTED POLICIES	13
5 TBL BENEFITS OF ADDITIONAL POLICIES	21
5.1 Assessment of individual policies	22
5.2 Potential contribution of individual policies to Waste Strategy	25
6 FACTORS IMPACTING WASTE STRATEGY OUTCOMES	27
6.1 Recyclate collection and sorting costs	27
6.2 Lack of local reprocessing capacity	28
6.3 Modest environmental impact values	29
6.4 South Australia incurs policy costs but exports environmental benefits	31
6.5 Uncertainty and the sensitivity of findings	31
6.6 Sustainability/intergenerational equity considerations	32
7 IMPROVING TBL OUTCOMES	34

LIST OF TABLES

Table 2-1: Waste Strategy diversion targets	9
Table 4-1: Lifecycle Emissions	17
Table 4-2: State income and employment impacts of committed policies	19
Table 4-3: TBL impacts of committed Waste Strategy policies	20
Table 5-1: Description of individual policies investigated	21
Table 6-1: Average distance to reprocessing facility for selected materials	29
Table 6-2: Sensitivity of estimated net economic benefits of committed policies (\$m)*	32

LIST OF FIGURES

Figure 2-1: Diversion of waste materials from landfill in South Australia	8
Figure 4-1: Ability of committed policies to meet the Waste Strategy targets	13
Figure 4-2: Economic impacts of committed policies over the waste management life-cycle (NPV 2004-2030)	14
Figure 4-3: Selected life-cycle emission savings from committed policies – total	15
Figure 4-4: Selected life-cycle emission savings from committed policies, within and outside South Australia (%)	16
Figure 4-5: Change in resource conservation from committed policies compared to current resource recovery volumes	16
Figure 4-6: Regional analysis of net benefits from committed policies (NPV 2004-2030)	18
Figure 5-1: Economic impacts of individual policies (NPV 2004-2030)	23
Figure 5-2: Environmental benefits of individual policies (NPV 2004-2030)	23
Figure 6-1: Marginal cost of material recovery (sorting costs)	28
Figure 6-2: Net, upstream and downstream environmental benefit by waste stream - Committed Policies (\$1)	30
Figure 6-3: Distribution of benefits and costs	Error! Bookmark not defined.

ABBREVIATIONS

C&D	Construction & demolition
C&I	Commercial & industrial
CDL	Container deposit legislation
EPA	Environment Protection Authority
EPR	Extended Producer Responsibility
HDPE	High density polyethylene
LPB	Liquid paper board
MMA	McLennan Magasanik Associates
MRF	Material recovery facility
MSW	Municipal solid waste
NPC	National Packaging Covenant
NPV	Net present value
ONP	Old newspaper
PET	Plastics
TBL	Triple bottom line
ZWSA	Zero Waste SA

EXECUTIVE SUMMARY

This report (Volume 1 of two reports) presents a summary of a benefit cost analysis of the South Australian Waste Strategy 2005-2010 using a full cost accounting approach. Further detail on the assessment framework, policies investigated and assumptions made are documented in Volume 2.

Specific targets for material recovery and recycling have been established in the Waste Strategy for the three broad waste-generating sectors of the community - municipal solid waste (MSW), commercial and industrial waste (C&I), and construction and demolition waste (C&D). A number of policies and programs have already been initiated to achieve the targeted waste reductions, including:

- tightening landfill standards;
- increasing the waste levy; and
- incentives for infrastructure, kerbside systems, and for reuse and recycling projects.

The analysis indicates that through these policies alone, the 2010 targets for C&I and C&D are likely to be met. However, based on estimated waste diversion volumes, the policies by themselves will likely fail to meet the target for MSW.

From an economic perspective, the incremental costs of source reduction, material recovery and recycling associated with the policies modelled are greater than the landfill cost savings realised. However, the value of the resources recovered and upstream emission reductions associated with displaced production based on virgin materials more than offsets the cost differential, allowing a modest net benefit to be realised. This result also takes into account the economic costs associated with a small increase in illegal dumping and increased emissions associated with increased transport and recycling of recovered materials.

The estimated triple-bottom line (TBL) impacts from the implementation of these policies, under our base assumptions, are shown in Table E1.

The economic impacts in terms of costs and benefits are presented as net present values over the study period of 2004 to 2030 estimated using a 6% social discount rate. Non-market benefits are estimated benefits from abatement of emissions. Market benefits include a value for the savings in extraction of virgin resources, valued at the price of substitutable recyclates. Greenhouse emissions are valued at \$20/t CO₂e.

The environmental impacts are also presented as a total over the study period of 2004 to 2030. However, the headline social impacts of changes in State income and employment are more meaningful when considered in terms of annual changes, and therefore we have reported these parameters as annual changes achieved by the end of the Waste Strategy, that is 2010. Annual snapshots for the years 2020 and 2030 are presented in the main section of the report.

Table E1: TBL impacts of committed Waste Strategy policies – Australia wide impacts

Economic impacts (Total \$M 2004 to 2030)	
Benefits	
Market benefits	
Recycles material value	254
Landfill cost reduction	443
Non Market benefits	
Emissions Avoided in SA	232
Emissions Avoided Outside SA	195
Total Benefits	1,124
Costs	
Individual cost items	
Illegal Dumping	42
Source Reduction	284
Material Recovery (i.e.: recycles collection, transport & sorting)	449
Material Recovery Costs (environmental)	2
Reprocessing Costs	92
Reprocessing Costs in SA (environmental)	3
Reprocessing Costs Outside SA (environmental)	12
Other Costs	64
Total Cost	948
Net economic benefit	176
Environmental impacts (Total impacts 2004 to 2030)	
Emissions abated	
Greenhouse gases (CO ₂ e, Mt)	23.1
Other air and water emissions (Mt)	0.2
Resource savings	
Minerals (Mt)	2.5
Wood (Mt)	1.0
Water (ML)	19.3
Energy (TJ)	6.0
Social impacts (Annual Impacts)	
State income (annual by 2010, \$M)	-2.8
Employment (annual by 2010, no of persons)	176

Note: Non-market benefits cover the value of reduced emissions of harmful air and water pollutants, including pollution from activities upstream from landfills, valued using recognised shadow values and derived pollution damage cost estimates. Emissions avoided in SA include those avoided at landfills and upstream of landfills. Reprocessing costs do not include costs incurred by material reprocessors outside of Australia.

The estimated benefits are a product of the assumptions and modelling approach employed. To test the sensitivity of the estimated triple-bottom line impacts, sensitivity analysis of key parameters was performed. The estimated net economic benefits of the Waste Strategy over the period 2004 to 2030 were found to increase by:

- \$30M if rural landfill compliance costs were 20% lower than our base assumptions,
- \$95M if all emission values were 10% higher than our base assumptions,
- \$346M if prices for recyclates were 20% higher than our base assumptions, and
- about \$230M for every \$10/tonne increase over base assumptions in the greenhouse gas value.

While reported economic impact values for greenhouse gases are within the range indicated above, other postulated values such as those by the Stern Report on Climate Change are as high as \$100/tonne of CO₂. If a value for greenhouse gas emissions of \$100/tonne of CO₂ was assumed, then the estimated net economic benefits of the Waste Strategy would increase by \$1,846m. Note that this benefit could be captured in isolation of the Waste Strategy if the Federal Government or the State Governments implement an emission trading scheme.

Similarly, if the parameters considered above were to move in the opposite directions, then the net economic benefits of the Waste Strategy would be less than identified under our base assumptions. Indeed given the modest overall benefits identified, sensitivity analysis within the ranges above could lead to the Waste Strategy generating a net economic cost.

From Table E1 it can be seen that much of the net economic benefit can be ascribed to the significant reduction in emissions and value of resources recovered in recyclates. However, much of the benefits will be realised outside of SA. Indeed as shown in Table E1, SA State income is estimated to fall slightly, although a net economic benefit of some \$176m over the period 2004 to 2030 is estimated from a national perspective.

In terms of the distributional incidence of costs and benefits, the Adelaide metropolitan region, the south east South Australia region and the rest of South Australia, were found to incur costs slightly greater than the estimated benefits that would accrue in these regions. A small net economic benefit was estimated for the Upper Spencer Gulf region. Most notably however, is that most benefits, net of any costs, arise outside of South Australia.

The additional contribution that a number of other policies listed in the Zero Waste Business Plan could make was also investigated. None of the policies, by themselves or in combination with others, were found likely to achieve the MSW target. The most promising combination was where education and awareness programs, a CDL deposit rate increase and trials for alternative disposal techniques were added to the already committed policies.

However, the responsiveness of waste generators to these policies and the costs associated with the new waste management practices are highly uncertain, and will be strongly influenced by policy design.

The study has demonstrated that the achievement of ambitious waste diversion targets is likely to come at a net financial (market) cost. The realisation of non-market economic benefits could, however, offset this cost and provide a modest overall net economic benefit. The size of potential benefits will be driven by a number of factors including:

- Recyclates collection and sorting costs - given the high levels of diversion already in South Australia and the steeply increasing costs associated with increasing the collection and sorting of some wastes, increased diversions in the absence of technology improvements may come at a very high cost.
- Lack of local reprocessing capacity - materials, such as paper, plastics, non-ferrous metals, textiles and rubber, are largely reprocessed interstate or overseas. In addition to the high financial cost of transporting the material, there are high environmental costs associated with the transportation. A key difference between South Australia and NSW or Victoria, in terms of benefits from waste reduction strategies, is the need for exporting recyclates with large associated transport costs.
- Environmental impact values - the environmental benefits from recycling, based on identified impact values, appear to be modest. The majority of the downstream benefits arise from increased greenhouse gas capture at landfills. The majority of upstream benefits arise from reducing particulate emissions by recycling, rather than using virgin materials in production. These impacts may be more effectively dealt with through greenhouse and industrial pollution discharge incentives rather than waste diversion policies. Inclusion of the value of biodiversity impacts may also increase the benefits.
- South Australia incurs policy costs while environmental benefits are largely realised outside of the State - most, if not all of the financial costs of new policies will be incurred in South Australia, while the majority of environmental benefits will be realised by communities outside of South Australia.

In summary, the state's waste diversion targets can be realised, at a modest net economic benefit, although the targeted diversion of MSW by 2010 will present a challenge.

In analysing policies under the Waste Strategy, the study has highlighted some key issues in maximising TBL outcomes.

(1) Relying more on upstream policy interventions

The key economic benefit identified from waste diversion and recycling was primarily a reduction in air pollution externalities. Therefore the cost-effectiveness of direct industrial environmental policy interventions should be considered. For example, the South Australian government is currently introducing a suite of polluter-pays fees for air and water emissions from licensed premises, and is also investigating the feasibility of a multi-state greenhouse gas emission trading scheme. The need for upstream policies is amplified by the finding that the air pollution benefits resulting from increased recycling are largely realised outside of South

Australia. Governments in these other jurisdictions will be better placed to identify their air pollution reduction priorities and cost-effective means to achieve them.

(2) *Focussing on MSW waste materials where current diversions levels are low*

It will be difficult to realise the 2010 municipal solid waste target unless there is a focus on food waste, paper and cardboard, which make up 60% of the MSW waste currently going to landfill.

(3) *Promoting the development of local reprocessing capacity*

The estimated net economic benefits of the Waste Strategy are modest due to the need to transport a high proportion of the recycled material to interstate or overseas reprocessing plants. The results therefore suggest that developing local facilities for recycling material may be a prerequisite for further cost-effective waste diversion in South Australia.

(4) *Focussing downstream waste policies more directly on environmental impacts*

The proposed increase in the waste levy will see an increased diversion of waste from landfill, potentially mitigating some leachate pollution and greenhouse gas emissions associated with this waste. A differentiated levy could better target wastes which pose greater emission impacts, and hence amplify these benefits. However, neither levy instrument will provide an incentive for landfill operators to reduce these pollutants from the larger volumes of waste still going to landfills.

Alternatively, policies could be more closely targeted at the specific environmental impacts of concern. In the case of landfill emissions, they could as in other states be included in the polluter-pays fees for air and water emissions levied on major industrial activities. In this way, pollution fees levied at landfills would be consistent with fees faced by other industrial premises, such that overall emission reductions in the state can be achieved at lowest cost.

The study has illustrated that environmental impacts, both upstream and downstream, will vary considerably between materials. Hence, a shift in policy focus from broad tonnages to the targeting of wastes with specific and demonstrable impacts should increase overall net benefits from policy interventions – a corollary to this is that it would lessen the emphasis on overall diversion targets.

1 INTRODUCTION

Following a review of the waste industry in South Australia in January 2003, the state government announced a package of measures to more effectively coordinate and implement waste reduction targets. The measures included the development and implementation of a state Waste Strategy.

In August 2005, Zero Waste SA released South Australia's Waste Strategy 2005–2010. Policy directions were outlined in the Waste Strategy for meeting waste reduction targets and goals across the three broad waste-generating sectors of the community - municipal solid waste, commercial and industrial waste, and construction and demolition waste.

The direction for the state Waste Strategy has been constructed around five key programs:

- fostering sustainable behaviour - fostering attitudes and behaviours that encourage people to change and adopt resource efficient behaviours,
- reducing waste - modifying behaviours of households, producers and other participants in the economy,
- implementing effective systems - for recycling and re-processing, as well as infrastructure for collecting, transporting, sorting, consolidating, transferring recoverable resources,
- implementing effective policy instruments - economic, regulatory and other policy measures, and
- co-operating successfully - with a range of stakeholders.

With the release of the Waste Strategy, the South Australian government committed to a comprehensive, independent benefit cost analysis of the Strategy using a full cost accounting approach. The aim is to provide greater certainty and information about the real and total costs of implementing the Waste Strategy. While the Waste Strategy is yet to be fully implemented or completed and hence the benefit cost analysis is preliminary or ex-ante in nature, the developed model will be used by ZWSA to investigate detailed policy designs and the selection of a suite of policies to optimise economic, social and environmental outcomes.

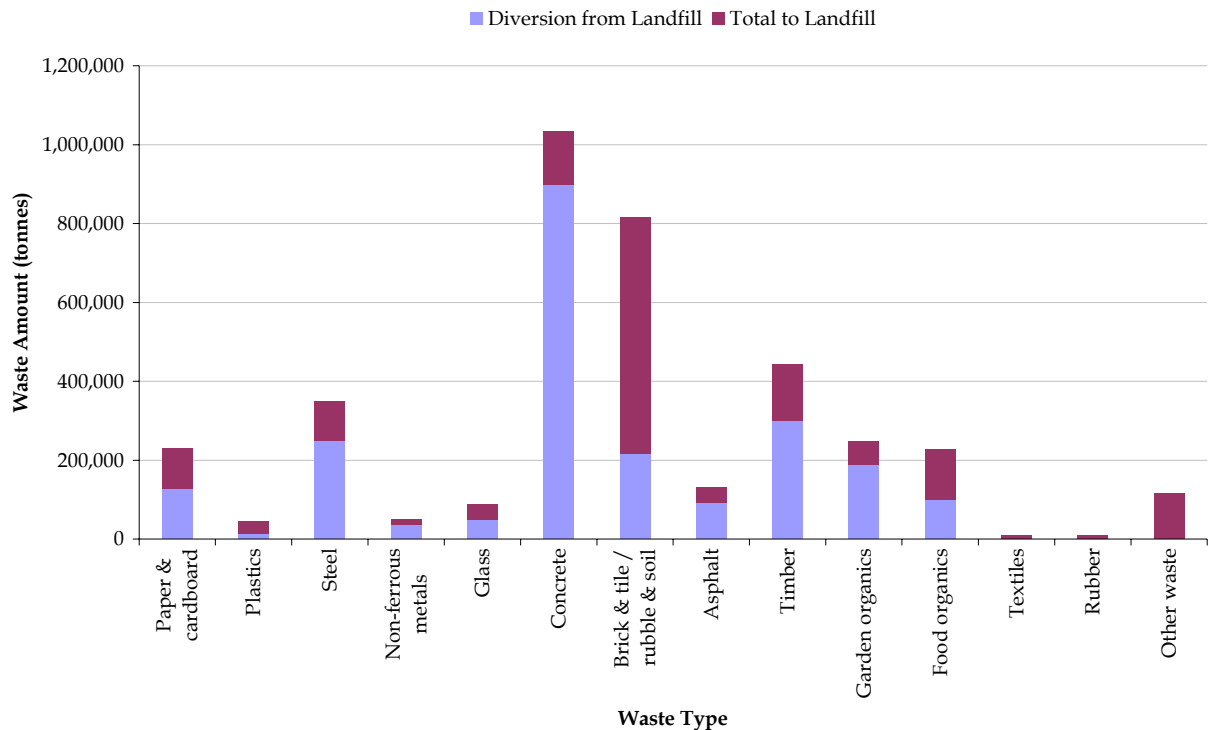
To this end, ZWSA commissioned McLennan Magasanik Associates, BDA Group and Econsearch to undertake the benefit cost assessment of the waste strategy. An overview of the assessment is provided in this volume. Descriptions of the assessment model used, data, assumptions and results of the detailed analysis are provided in Volume 2.

2 WASTE REDUCTION TARGETS

Total waste generated in South Australia in 2004/2005 is estimated at around 3.7 million tonnes. Of this total, some 63% was estimated to be diverted from landfill (compared to a national average of only 46%), to a range of reuse and recycling activities in South Australia as well as interstate or internationally.

Solid wastes are generally classified under three subcategories, namely municipal solid waste (MSW), commercial and industrial (C&I), and construction and demolition (C&D). The composition of waste disposal to landfill in South Australia is currently estimated to comprise 24% municipal solid waste, 25% C&I waste and 51% C&D waste. Within these waste classifications, the proportion of materials diverted varies significantly, with diversion rates in 2004/2005 shown in Figure 2-1.

Figure 2-1: Diversion of waste materials from landfill in South Australia



Source: Hyder. 2006: *Recycling Activity in South Australia, 2004/2005*.

Diversion of C&I and C&D wastes are estimated to be 69% and 67% respectively, whereas diversion of MSW is estimated at around 39%¹.

¹ Hyder. 2006: *Recycling Activity in South Australia 2004-2005*, prepared for ZeroWaste SA.

Specific targets for material recovery and recycling in these sectors have been established in the Waste Strategy. The end targets are:

- By 2008, 50% of municipal kerbside waste collected should be recovered, recycled or reused. This target excludes municipal food waste.
- By 2010, 75% of municipal kerbside waste collected should be recovered, recycled or reused, including food waste.
- By 2010, increase the recovery and reuse of materials from the C&I sector by 30% relative to the 2004 weights.
- By 2010, increase C&D waste recovery and reuse by 50% from the 2004 weights.

Based on current and projected waste generation, the estimated waste diversion volumes required to meet the targets in the Waste Strategy are shown in Table 2-1.

Table 2-1: Waste Strategy diversion targets

Sector	Waste recovery / recycling / reuse targets	
	2008 (tonnes)	2010 (tonnes)
MSW	399,952	748,182
C&I		865,548
C&D		1,942,650

While these targets focus on increased recycling, recovery and reuse of waste materials, the primary objective of the Waste Strategy is to reduce disposal of waste to landfill. Policies aimed at waste avoidance are generally considered a priority in waste management. However, under the current target definitions, these policies would not contribute to meeting the Waste Strategy targets as they do not directly impact on recycling or resource recovery volumes. Therefore, for this analysis, recovery, recycling or reuse are interpreted to include source reduction².

² Home composting is also classified as recycling/reuse for the purpose of this analysis.

3 TRIPLE BOTTOM LINE ASSESSMENT APPROACH

3.1 Identifying triple bottom line impacts

Waste reduction and diversion of waste from landfill into recycling and reuse activities may bring many benefits to the community including:

- reduction in emissions into the air and water of harmful pollutants from resource extraction, manufacturing use of virgin material and land filling of waste,
- resource conservation in mineral, water and energy resources, and
- reduction in greenhouse gas emissions.

However, recycling itself imposes costs on the community as a result of the resources expended and emissions created in recycling activities. Also, per unit recycling costs are likely to increase with higher recovery rates. This is due to the collection of smaller volumes of waste, possibly from more distant sources, or from sources with greater contamination. In addition, policies introduced to promote increased recycling may impose costs on governments, on waste generators from sorting recyclates from other wastes and on the community if higher levels of illegal dumping arise.

The challenge for the South Australian Government in developing the detailed proposals under its Waste Strategy is to ensure an appropriate balance between the economic, environmental and social benefits and costs created. That is, the government will be seeking a strategy that delivers a net economic benefit while ensuring that there is an equitable distribution in benefits and costs between stakeholder groups, current and future generations, between regional communities in South Australia and between South Australia and interstate or international beneficiaries. Identifying these trade-offs is at the core of sustainability assessments that incorporate a triple bottom line (TBL) reporting framework.

Our TBL reporting framework provides a conventional cost-benefit assessment of economic impacts that relate to environmental impacts. We also identify social impacts in terms of the distribution of costs and benefits across stakeholder groups and regions, as well as considering the implications of the Strategy for state income and employment.

It is important to note that the TBL metrics reported overlap significantly. So for example, the economic impact of increased pollutant emissions on public health and the environment is captured in the economic benefit cost analysis and bottom line estimated net economic benefit. The bottom line environmental impacts are reported in terms of physical changes in resource and materials use and emissions generated across the production – consumption – disposal life cycle, including:

- air and water emissions,
- energy use,
- water use,

- greenhouse gases,
- materials / resource use,
- waste to landfill, and
- waste illegally disposed.

So while the economic costs and benefits arising from these environmental impacts have been incorporated in our economic assessment, the environmental bottom line allows consideration of broader sustainability issues, such as intergenerational equity, and how it may be impacted through resource depletion, climate change, and so on.

3.2 Modelling waste management in South Australia

Waste streams were divided into municipal solid waste (assumed to be mainly generated by households), commercial and industrial waste, and construction and demolition waste.

In order to identify economic impacts we developed a 'bottom-up' financial model of the waste generation and disposal life-cycle linked to a material flow model. Waste management policies serve to change resource use and environmental loads associated with manufacturing, delivery and consumption processes. Through our integrated financial and material flows model, we were able to identify the geographic location and nature of the specific environmental impacts arising. We then valued those impacts in the specific context that they arose.

As alternative policy settings were applied to the model, the implications for waste generation, collection, transport, recycling and disposal were identified in physical and financial terms, including:

- changes in the volumes of waste generated and its management, and subsequent implications for raw material use (including energy and water),
- the cost of different waste management volumes and patterns to waste generators, waste handling and processing businesses and landfills,
- changes in life-cycle emissions associated with the different waste management volumes and patterns, including those from transport of materials and waste, and separated into:
 - upstream emissions - associated with resource extraction, manufacturing processes (including recycling) and in the consumption of goods and services,
 - downstream emissions - associated with the disposal of wastes to landfill or illegally,
- the value of the benefits or costs to the community resulting from changes in the life-cycle generation of emissions and resource use patterns, and
- costs to government.

Key environmental values used in the assessment included:

- Emissions to air and water – monetary valuations of emission damage costs were developed, based on a review of international valuations of health and environmental costs associated with various emissions. Relative impact values between pollutants were adjusted for South Australian circumstances through the use of pollutant weights being developed under reforms to South Australia’s pollution license fee system.
- Greenhouse gas and illegal dumping - valuations were derived based on a replacement cost approach; that is, the cost of measures, such as tradeable carbon credits and waste clean-up costs respectively, that would offset these impacts.
- Materials, energy and water savings – these savings, which may arise through the use of recyclates in favour of virgin materials, were calculated based on the observed market prices for these resources.

Details of the methodology and assumptions used are contained Volume 2.

3.3 Policies investigated

Under the Waste Strategy, a range of policies will be employed to achieve the targeted waste reductions. A number of policies have already been initiated, including:

- tightening landfill standards, including more stringent licence conditions for small rural landfills,
- increasing the waste levy, from \$11.20/tonne to \$22.40/tonne, and
- provision of financial incentives, such as for infrastructure, improving kerbside systems and for reuse and recycling projects.

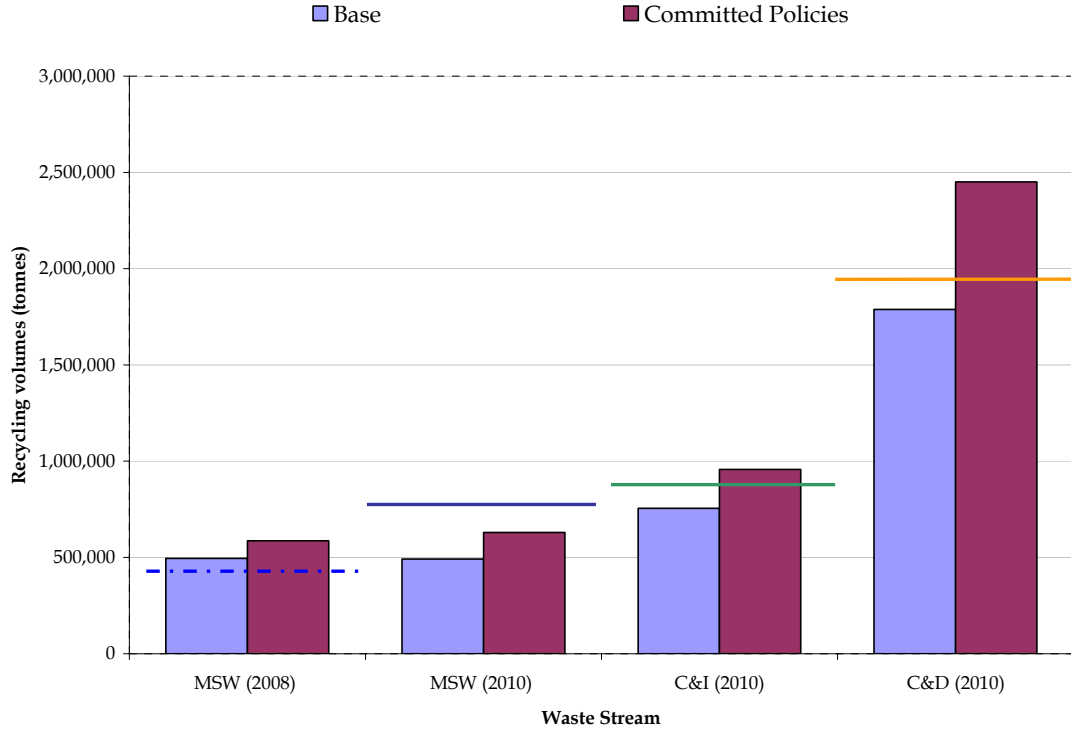
The effectiveness of these policies in achieving the targeted waste reductions is firstly identified along with their TBL impacts. A range of further policies, illustrative of those being investigated under the Waste Strategy, are then considered in order to identify the nature and extent of further policy initiatives that will be needed. These include environment protection policies (such as banning green waste to landfill), extended producer responsibility measures, government procurement incentives, trials for alternative disposal methods, education and awareness programs, differentiating the waste levy and expansion of the coverage of the container deposit legislation.

The key factors impacting identified economic, environmental and social outcomes are identified and their implications for finalising the Waste Strategy considered.

4 TBL BENEFITS OF CURRENTLY COMMITTED POLICIES

The analysis indicates that Zero Waste SA should be able to meet the 2010 recycling, recovery and reuse targets for C&I and C&D if the three committed policies are implemented. However, those policies alone will fail to meet the target for diverting MSW from landfill.

Figure 4-1: Ability of committed policies to meet the Waste Strategy targets



The modelling indicates that implementation of the three committed policies is likely to have more impact on C&D than on the other waste streams. This impact is driven by the doubling of the landfill levy and the tightening of landfill standards, both of which result in higher costs of disposal to landfill.

Facing higher landfill disposal costs, an average of 800,000 tonnes of C&D waste is estimated to be diverted annually. The majority of this waste is concrete, brick and tile, soil and rubble. Approximately 40% of the waste diversion is estimated to be achieved through source reduction (where the material is used on-site as filler, aggregate or for other purposes), with the remainder being used to replace quarry aggregate for clean fill, road applications and concreting.

The economic impacts identified with the three committed policies are shown in Figure 4-2. The net present value of economic benefits is estimated to be \$176m³.

Figure 4-2: Economic impacts of committed policies over the waste management life-cycle (NPV 2004-2030)

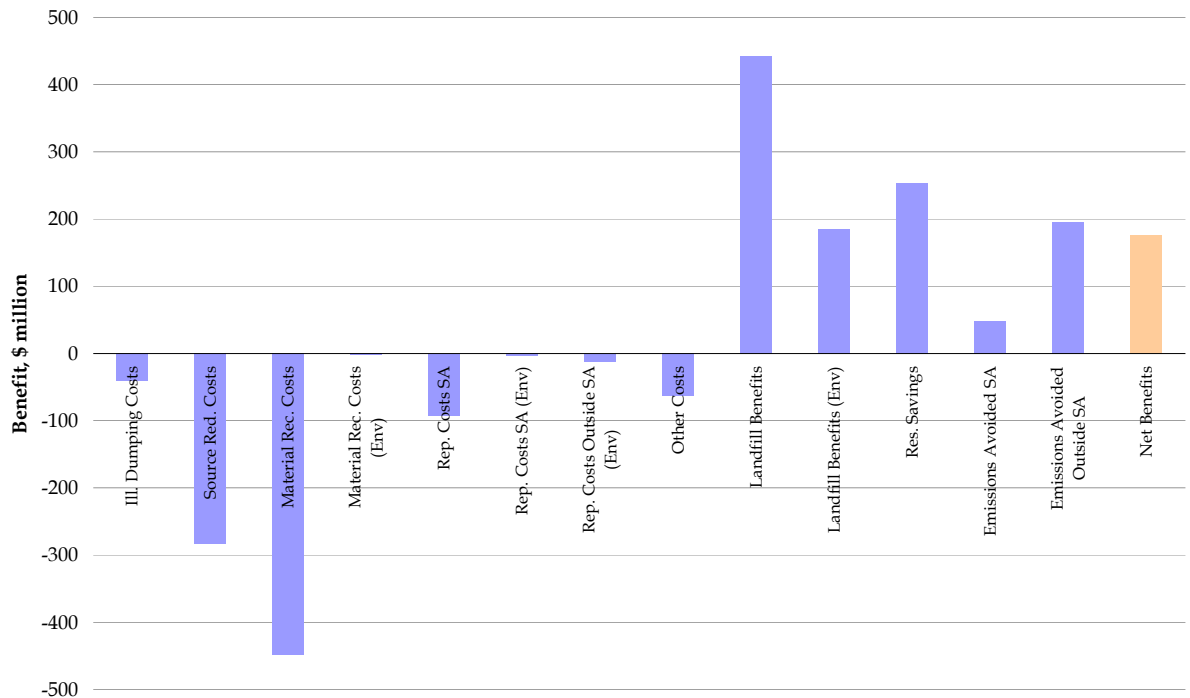


Figure 4-2 shows that the incremental costs of source reduction, material recovery and recycling are greater than the landfill cost savings. However, the value of the resources recovered and upstream emission reductions associated with displaced production based on virgin materials more than offsets the cost differential, allowing a net benefit to be realised. This result also takes into account the economic costs associated with a small increase in illegal dumping and increased emissions associated with increased transport and recycling of recovered materials.

For the C&I and C&D waste streams, any changes in waste collection costs have been included under material recovery costs. However, in the case of MSW kerbside collection costs, no change in collection costs as a result of the policies was included. While householders may still put their bins out for collection just as frequently (although they may not be as full), some collection cost savings would still be realised as trucks filled more slowly,

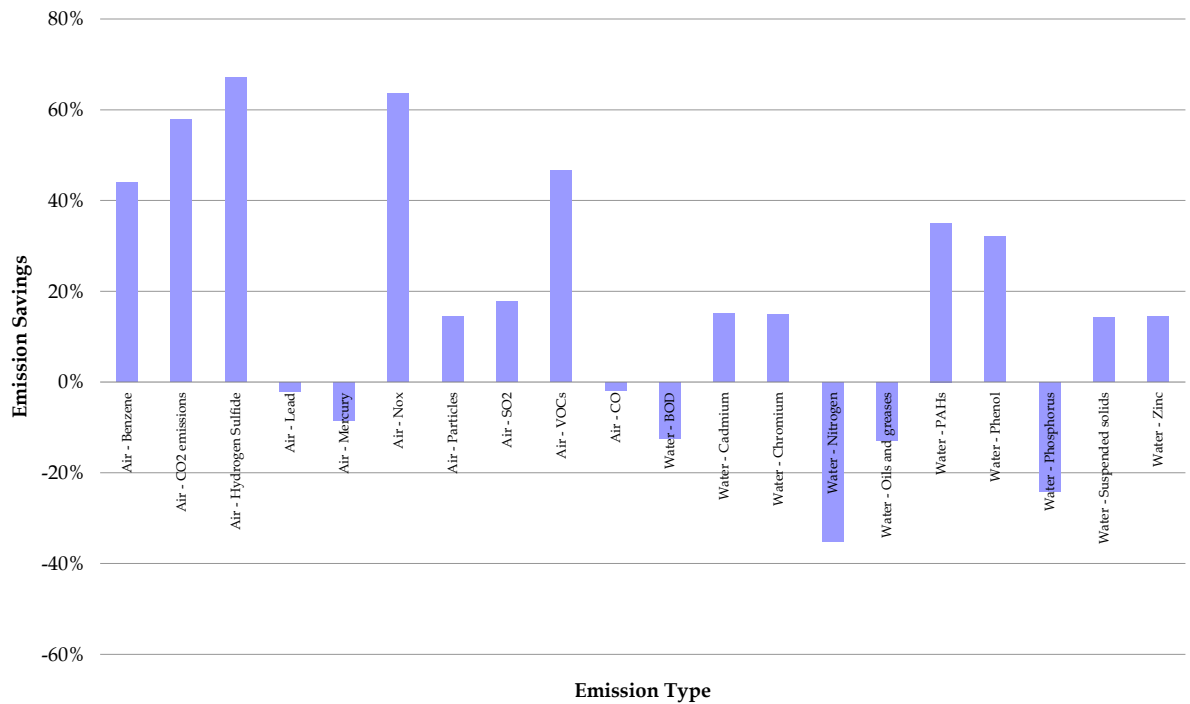
³ Using a 6% social discount rate.

required less trips to landfill, and so on. To the extent that these cost savings have been omitted, overall net benefits from the committed policies will be understated⁴.

The environmental impacts resulting from with the three committed policies are shown in Figure 4-3 and Figure 4-4 in terms of life-cycle emissions. Figure 4-5 in contrast, shows the environmental impacts in terms of resource savings, expressed as the percentage change in resource savings from reuse/recycling of South Australia waste before and after the policies.

The impact of the policies on illegal dumping was shown in Figure 4-2 in monetary terms. This was based on an estimated 300,500 tonnes increase in dumped volumes from 2004 to 2030. The majority of this increase comes from illegal dumping of MSW green waste.

Figure 4-3: Selected life-cycle emission savings from committed policies – total



⁴ It should also be noted that increased recycle processing costs arising from any increase in contamination and/or the impact of contamination on recycled material quality (and hence sale price), have also been included under material recovery costs.

Figure 4-4: Selected life-cycle emission savings from committed policies, within and outside South Australia (%)

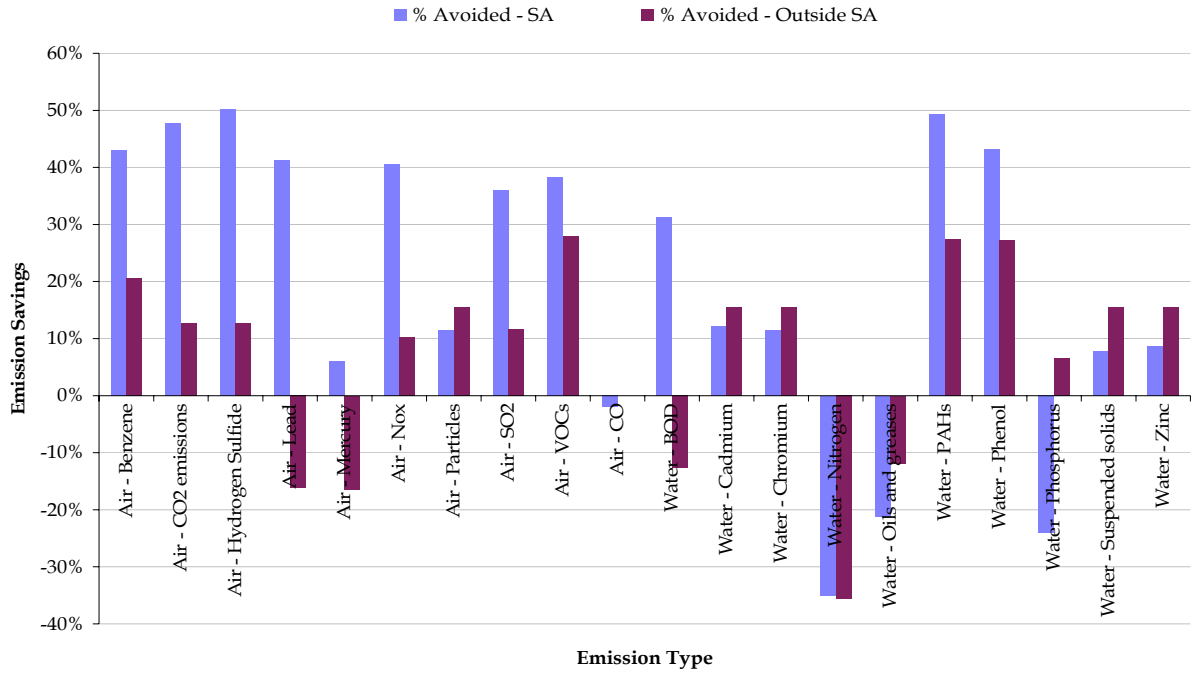


Figure 4-5: Change in resource conservation from committed policies compared to current resource recovery volumes

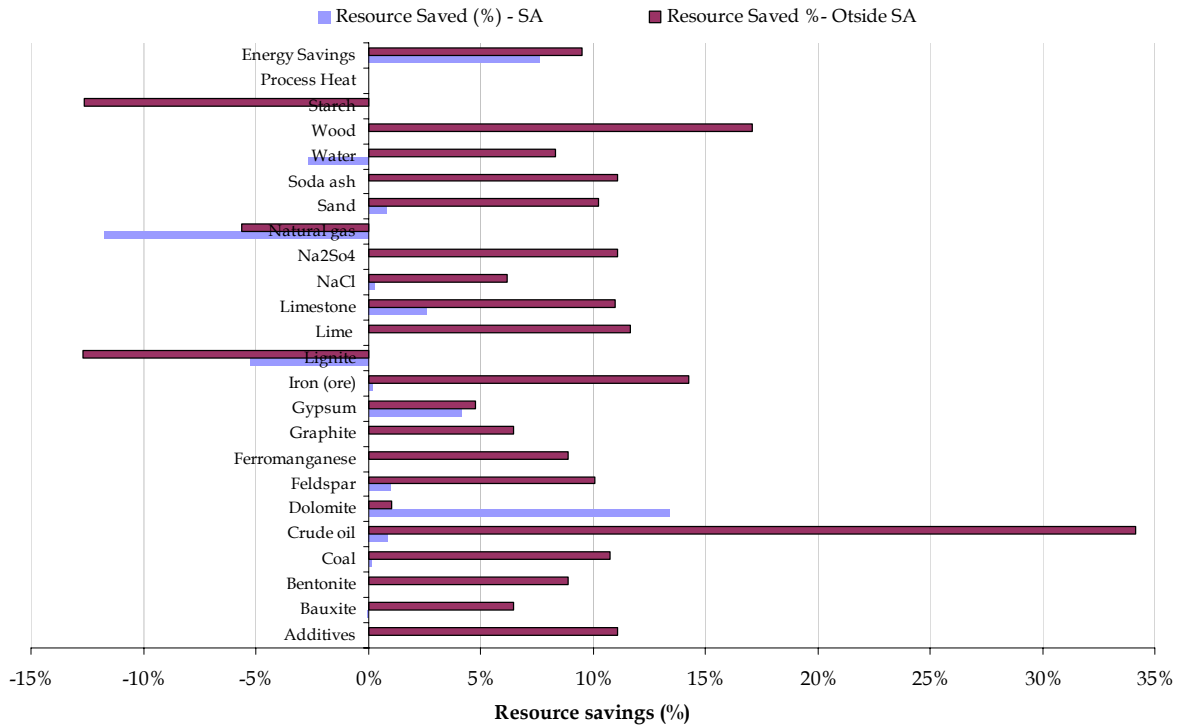


Table 4-1: Lifecycle Emissions, tonnes, 2004 to 2030

	Emissions - Base - SA	Emissions - Base - Outside SA	Emissions - Total base	Emissions avoided - SA	Emissions avoided - outside SA
<i>Air emissions</i>					
Benzene	37.42	-0.50	36.91	16.12	0.10
CO ₂ emissions	46,575,975	-6,697,950	39,878,026	22,222,352	847,792
Hydrogen Sulfide	205.57	-43.67	161.90	103.04	5.53
Lead	-0.04	0.12	0.08	0.02	-0.02
Mercury	0.03	0.06	0.09	0.00	-0.01
NO _x	3,953.35	-7,717.02	-3,763.67	1,601.81	792.85
Particles	-245,866.87	-683,312.03	-929,178.90	28,304.68	105,851.73
SO ₂	-2,835.63	-8,721.01	-11,556.65	1,023.61	1,020.67
VOCs	11,682.07	-1,291.40	10,390.67	4,481.34	359.91
CO	34,304.38	0.00	34,304.38	-679.84	0.00
<i>Water emissions</i>					
BOD	-502.01	37,995.69	37,493.68	157.30	-4,809.08
Cadmium	-0.66	-4.12	-4.78	0.08	0.64
Chromium	-2.34	-14.46	-16.80	0.27	2.24
Nitrogen	8.84	5.99	14.84	-3.10	-2.14
Oils and greases	1.68	13.87	15.56	-0.36	-1.65
Phenol	-36.18	-78.76	-114.94	15.61	21.37
Phosphorus	1.69	0.00	1.69	-0.41	0.00
Suspended solids	-11,940.31	-69,313.03	-81,253.34	923.97	10,722.79
Zinc	-281.85	-1,663.15	-1,945.01	24.68	257.81
Benzene	37.80	0.00	37.80	16.01	0.00
Copper	0.06	0.00	0.06	0.03	0.00
Lead	0.19	0.00	0.19	0.09	0.00
Arsenic	0.04	0.00	0.04	0.02	0.00

Figure 4-5 shows changes in resource savings due to the committed policies as a percentage of current resource savings associated with resource recovery. There is an increase use of natural gas, starch, and lignite as recycling increases. Other resources are conserved as the recycled material displaces production from virgin resources.

Resource savings are relatively higher outside South Australia, reflecting the location of resource extraction and of major industrial and manufacturing plants producing goods from virgin materials.

Emission savings from the implementation of the committed policies are relatively higher within South Australia, reflecting fewer landfill emissions due to increased diversion rates, and fewer transport emissions due to source reduction. This contrasts with Figure 4-2 which indicated the value of emission reductions were higher outside of South Australia than within South Australia. This arises partly due to the mix of emissions reduced within and outside of South Australia, and as the assumed impact value of pollutants reduced outside of South

Australia are generally higher (with CO₂ and PM₁₀ being notable exceptions and having the same values within and outside of South Australia).

The social impacts of the three committed policies, in terms of the distribution of net economic benefits between South Australian regions and outside of South Australia are shown in Figure 4-6, while the impact of the policies on employment and state income are shown in Table 4-2.

As shown in Figure 4-6, the total costs outweigh the total benefits in the Adelaide metropolitan region, the south east South Australia region and the rest of South Australia. A small total net benefit was estimated for the Iron Triangle region. Most notably however, is that most benefits, net of any costs, arise outside of South Australia. This is firstly because recyclers outside of South Australia enjoy a modest net financial benefit through the increased use of recyclates over virgin materials, without incurring the higher waste management costs involved in collecting and sorting the material in South Australia. Secondly, significant upstream emission savings accrue, while no costs associated with illegal dumping are incurred in these regions.

Figure 4-6: Regional analysis of net benefits from committed policies (NPV 2004-2030)

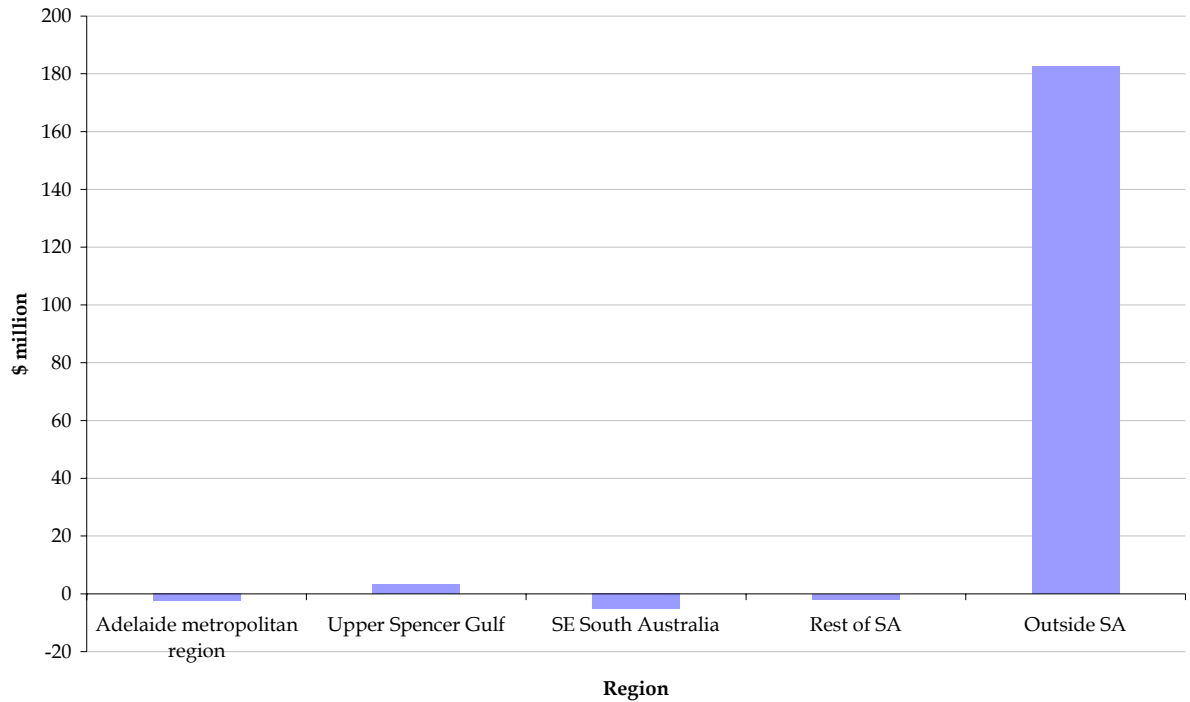


Table 4-2 : State income and employment impacts of committed policies

	2010		2020		2030	
	GSP (\$m)	Employment (fte)	GSP (\$m)	Employment (fte)	GSP (\$m)	Employment (fte)
Direct effect	-19.9	0	-39	0	-75.4	0
Indirect effect						
Waste management services	5.8	55	11.3	91	21.9	148
Manufacturing	4.1	50	7.5	83	14.1	141
Finance & business services	4.1	24	8.1	42	15.8	73
Trade	1.7	30	3.2	54	6.2	94
Transport	-1.5	-12	-1.7	-13	-2.5	-17
Other	3	29	5.8	52	11.3	91
Total indirect effect	17.1	176	34	309	67	530
Total direct + indirect	-2.8	176	-4.7	309	-8.7	530

A summary of the identified TBL impacts of the three committed policies is provided in Table 4-3.

The net economic benefit over the period 2005 to 2030 of achieving the landfill diversion targets under the currently committed policies is \$176 million. The benefit is modest due to the need to transport a high proportion of the recycled material to interstate or overseas reprocessing plants. Other factors contributing to the modest return are discussed in Section 6.

Table 4-3: TBL impacts of committed Waste Strategy policies

Economic impacts (Total \$M 2004 to 2030)	
Benefits	
Market	
Recyclates material value	254
Landfill	443
Non Market	
Emissions Avoided in SA	232
Emissions Avoided Outside SA	195
Total Benefits	1,124
Costs	
Illegal Dumping	42
Source Reduction	284
Material Recovery (i.e.: recyclates collection, transport & sorting)	449
Material Recovery Costs (Environmental)	2
Reprocessing Costs	92
Reprocessing Costs in SA (Environmental)	3
Reprocessing Costs Outside SA (Environmental)	12
Other Costs	64
Total Cost	948
Net benefit	176
Environmental impacts (Total impacts 2004 to 2030)	
Emissions abated	
Greenhouse gases (CO ₂ e, Mt)	23.1
Other air and water emissions (Mt)	0.2
Resource savings	
Minerals (Mt)	2.5
Wood (Mt)	1.0
Water (ML)	19.3
Energy (TJ)	6
Social impacts (Annual Impacts)	
State Gross Product (annual by 2010, \$M)	-2.8
Employment (annual by 2010, no of persons)	176

Note: Economic benefits and costs are the net present values of benefits and costs over the study period 2004 to 2030 estimated using a 6% social discount rate. Non-market benefits are estimated benefits from abatement of emissions. Market benefits include a value for the savings in extraction of virgin resources, valued at the price of substitutable recyclates. Greenhouse emissions are valued at \$20/t CO₂e.

5 TBL BENEFITS OF ADDITIONAL POLICIES

Of the strategies and policies listed in the Zero Waste Business Plan, it was agreed with ZWSA that the assessment of individual policies, over and above those already committed to, should focus on those shown in Table 5-1. Details of the specific design and associated modelling assumptions are described in Volume 2.

Table 5-1: Description of individual policies investigated

Policy name	Description	Key design parameters
Bans on materials to landfill	Prevent landfills from accepting garden organics waste from any waste stream.	<ul style="list-style-type: none"> Metropolitan councils enhance garden waste collection and centralised processing infrastructure 20% of households take up home composting
Differential waste levy	Differentiate the waste levy to reflect the externality costs of land filling key waste types, and according to the design parameters shown.	<ul style="list-style-type: none"> Total levy revenue set equivalent to that under recent levy increase Different levy rates according to waste type (including a separate levy rate for organics) and for landfills without gas capture
Container deposit legislation	Increase the recycling deposit to encourage greater material returns to CDL depots.	<ul style="list-style-type: none"> Examines benefits if leads to increased recovery rates of 100% for glass containers, aluminium cans and PET bottles
Extended producer responsibility	Considers additional measures as part of a National Packaging Covenant to reduce plastics packaging.	<ul style="list-style-type: none"> Examines benefits if leads to a 1% reduction in plastics packaging to landfill through source reduction
Government procurement programs	New requirements for purchase of products with recycled content by public agencies, focusing on increasing paper recycling and use of recycled aggregate for road base.	<ul style="list-style-type: none"> Examines benefits if leads to a 30% increase in municipal paper recycling, development of a local reprocessing facility and tripling of brick and rubble recycling.
Education and awareness	Education programs to promote waste reduction and avoidance across all waste streams.	<ul style="list-style-type: none"> Examines benefits of a \$0.55m program assumed to achieve a 0.1% reduction across all waste streams (based on financial break-even)
Trials for alternative disposal methods	Trial new processing/disposal systems for food organics.	<ul style="list-style-type: none"> Examines benefits if leads to 36% of food waste being diverted from landfill to centralised composting facility.

The behavioural response likely to be achieved under many of these policies is highly uncertain and will be strongly influenced by policy design. Accordingly we have only sought to investigate, in broad terms, the contribution of postulated policy outcomes to reducing waste disposal volumes and implications for waste management costs and environmental benefits. In some cases, the behavioural response may be more or less than assumed in this study. For example, banning organic material to landfill may not lead to a significant increase in home composting. Similarly, extended producer responsibility may lead to a greater level of reduction in use of material than assumed especially if a broader range of materials are targeted, although the impact on material use will depend on how this policy is structured and the interaction with other product stewardship programs such as the National Packaging covenant.

For some policies, such as extended producer responsibility, education and awareness, and alternative disposal methods for food organics, only government program or trial costs have been included. As the costs associated with changing waste management practices to achieve the postulated policy outcomes in these instances have not been included, estimated net benefits will be overstated. On the other hand, to the extent that green waste collections were already in place before the strategy was implemented, then these costs may have been overestimated.

5.1 Assessment of individual policies

The estimated economic impacts of the individual policies are shown in Figure 5-1. A net benefit was estimated in the case of a differentiated waste levy, CDL, education and awareness programs and trials for alternative disposal methods for food organics. However, as discussed below, caution is needed in interpreting these findings.

The environmental impacts identified with individual policies are shown in Figure 5-2 in terms of aggregate upstream and downstream (including illegal dumping) impacts.

The majority of upstream benefits are associated with life-cycle emissions avoided by recycling materials, rather than producing products using virgin materials. The greatest upstream benefit is the environmental benefit from reducing the tonnage of particles (including PM₁₀) emitted by increasing glass recycling and steel recycling. The majority of downstream benefits are associated with CO₂e avoidance.

Figure 5-1: Economic impacts of individual policies (NPV 2004-2030)

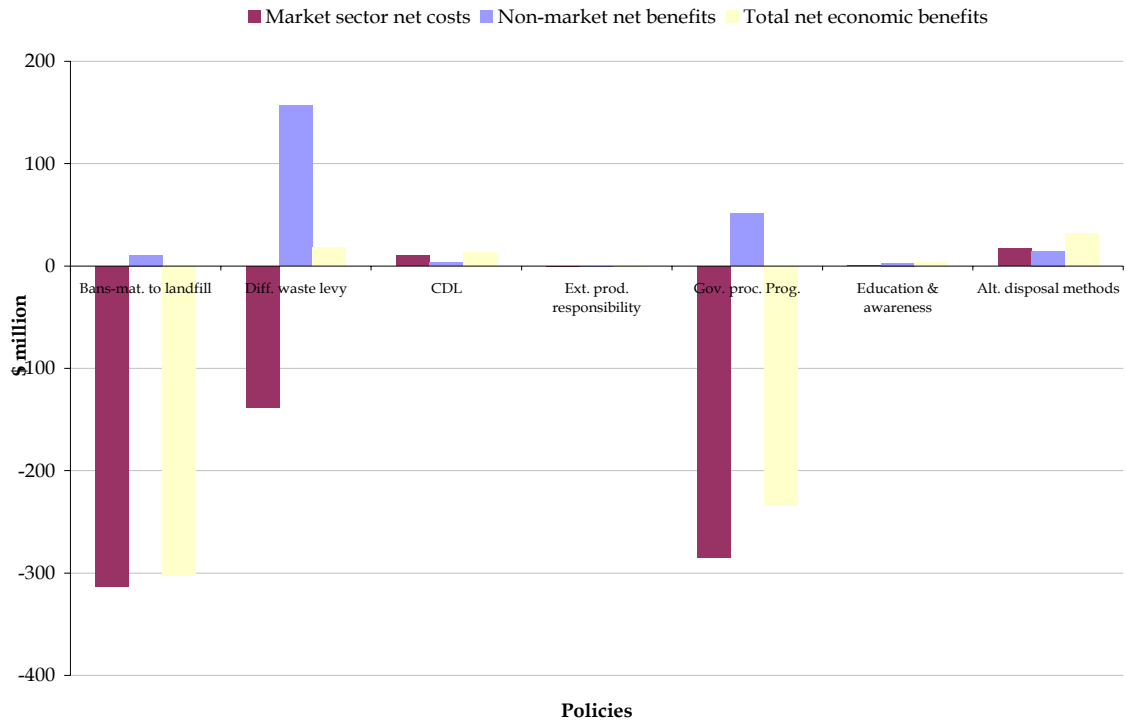
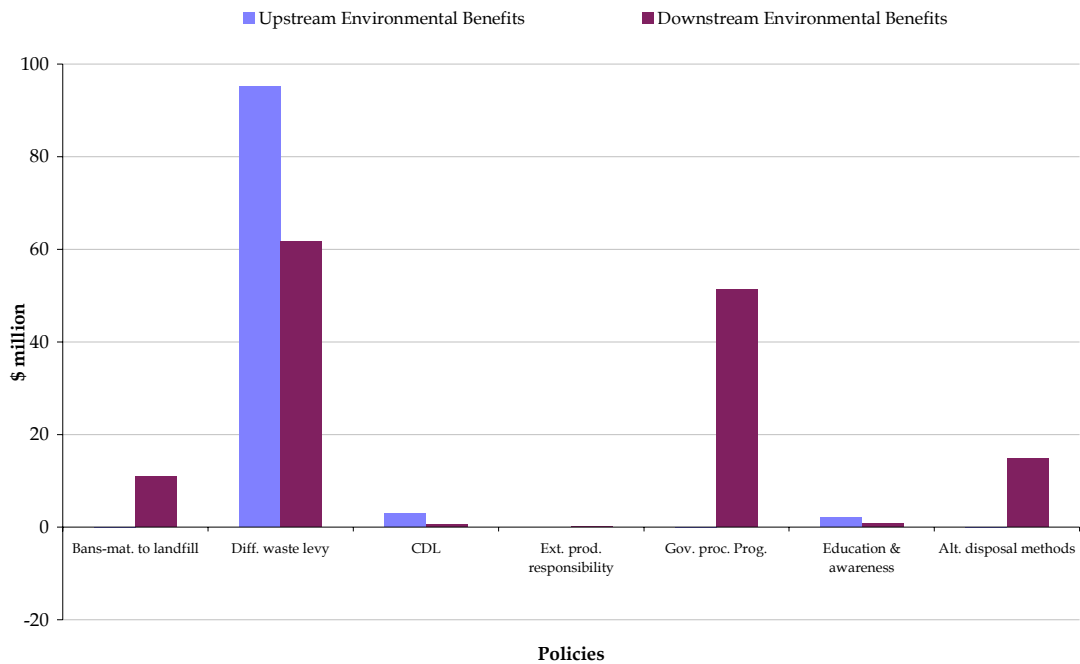


Figure 5-2: Environmental benefits of individual policies (NPV 2004-2030)



The ban on garden organics to landfill imposes new waste management costs on waste generators (including householders' time), with only small offsetting benefits in terms of landfill cost savings and resource savings.

The differentiated landfill levy between waste types results in a lower diversion of C&D and a higher diversion of C&I and MSW compared to the uniform levy (which is part of the committed policies). As the environmental benefits associated with diverting C&I and MSW are greater than for C&D, the differential levy facilitates a significant increase in environmental benefits. However, it is also estimated to lead to an additional 8,150 tonnes of illegally dumped waste each year. Overall, the policy was estimated to deliver a marginal net benefit.

The CDL policy serves to increase the proportion of waste that arrives at material recovery facilities that is pre-sorted, reducing material recovery costs. In addition, resource and emission savings are associated with reduced production of glass, aluminium and plastics from virgin materials. Overall, a net benefit is estimated from this policy. However, caution is needed with this conclusion, as a recovery rate as high as 100% is unlikely, and not all costs have been included (such as the costs to individuals in separating containers from general waste and impacts on the viability of kerbside waste collection systems).

The EPR policy, assumed to be implemented through the NPC and via source reduction by waste generators, was found to have limited impact. This was largely due to the modest target investigated, which was estimated to result in a reduction of waste to landfill of only 414 tonnes of MSW, 190 tonnes of C&I and 20 tonnes C&D. Targeting this program to a broader range of material may lead to different outcomes.

The government procurement programs are postulated to result in a significant reduction in waste disposal volumes, of some 8,700 tonnes of municipal paper and 475,000 tonnes of brick, tile and rubble. As shown in Figure 5-2 this is estimated to result in significant downstream environmental benefits, largely through the reduction of landfill emissions. However, this result is overstated because the use of average emission factors by landfill type that does not distinguish between differing compositions of delivered waste. As much of the assumed diversions are of inert material, emission savings are likely to be small. In addition, the savings of these commonly available resources are small in monetary terms. Moreover, the identified costs involved in recovering and reprocessing these materials result in a significant overall net cost. On the other hand, if increased demand brought about by this program increases prices for recyclates, then the benefits will have been understated.

The education and awareness policy, like the EPR policy, was found to have limited impact due to the modest target investigated. The purpose of the analysis for this policy was to demonstrate the reduction in waste generation required for the policy to breakeven. The ability of such programs to deliver significantly greater changes in waste management behaviours would need to be confirmed. The promotion of increased source reduction and recycle pre-sorting could, relative to other behavioural changes, lead to significant benefits.

Finally, the trials of alternative disposal methods for food organics were postulated to achieve a 36% diversion of food waste from landfill to a centralised composting facility. This was found to deliver both market and environmental benefits, and a net benefit overall. However, while the costs of the trials have been considered, the cost of widespread implementation of the new methods (assumed to result from the trials) has not been identified and thus not included. To the extent that implementation costs exceed revenues that could be generated for the compost product, then the identified net benefits will be overstated.

5.2 Potential contribution of individual policies to Waste Strategy

For the C&I and C&D waste streams, the analysis in Section 4 indicates that South Australia should be able to meet the 2010 recycling, recovery and reuse targets if the three currently committed policies are implemented.

Nonetheless, the currently committed policies may not be the most cost-effective way of reaching the desired targets. The addition of education and awareness programs along with the currently committed policies could increase overall net economic benefits. The addition of an increase in the CDL recycling deposit and/or funding of trials for new processing/disposal systems for food organics could also further improve environmental outcomes and potentially enhance overall net benefits to the Waste Strategy. However, as described in Section 5.1 above, there are significant caveats on the potential of these policies to deliver the postulated waste management outcomes.

Further, the policy to increase the waste levy, when investigated by itself was found to lead to significant costs (by way of higher waste management costs and through illegal dumping). These were only marginally outweighed by the associated environmental benefits. Therefore, the suite of policies that would optimise overall benefits in meeting the Waste Strategy targets may involve some refinements to current policies, as well as initiating new policies.

None of the additional policies, as specified, by themselves or in combination with others, were found likely to achieve the MSW 2010 target. The most promising combination was where education and awareness programs, a CDL deposit rate increase and trials for alternative disposal techniques were added to the already committed policies. Alternatively, a differentiated levy could be adopted which provided even greater disincentives for MSW disposal to landfill. However, in the absence of viable processing alternatives, this would impose large costs on councils and households and lead to greater volumes of illegally disposed waste.

Currently, no municipal food organics are recycled. Municipal food organics account for approximately 17% of the total MSW generated. With a target of only 25% of municipal waste going to landfill by 2010, clearly this landfill waste will primarily consist of food organics if viable alternative disposal methods cannot be found. For this reason, trials of new processing/disposal systems may be critical to develop recycling systems for food organics and the achievement of the municipal waste target.

6 FACTORS IMPACTING WASTE STRATEGY OUTCOMES

The preceding analysis has demonstrated that the achievement of ambitious waste diversion targets is likely to come at a net cost in terms of market costs and benefits. The realisation of non-market environmental benefits could, however, offset this cost and provide a modest overall net benefit. Recent investigations of waste management targets in Victoria and NSW have come to a similar conclusion, despite significant differences in assessment methodologies and underlying benefit valuations.

The identified Waste Strategy outcomes are driven by a number of factors specific to the South Australian situation, and are sensitive to a number of broader factors. Consideration of these factors, discussed in this section of the report, will be important in framing outstanding waste management policies and the realisation of net community benefits.

6.1 Recyclates collection and sorting costs

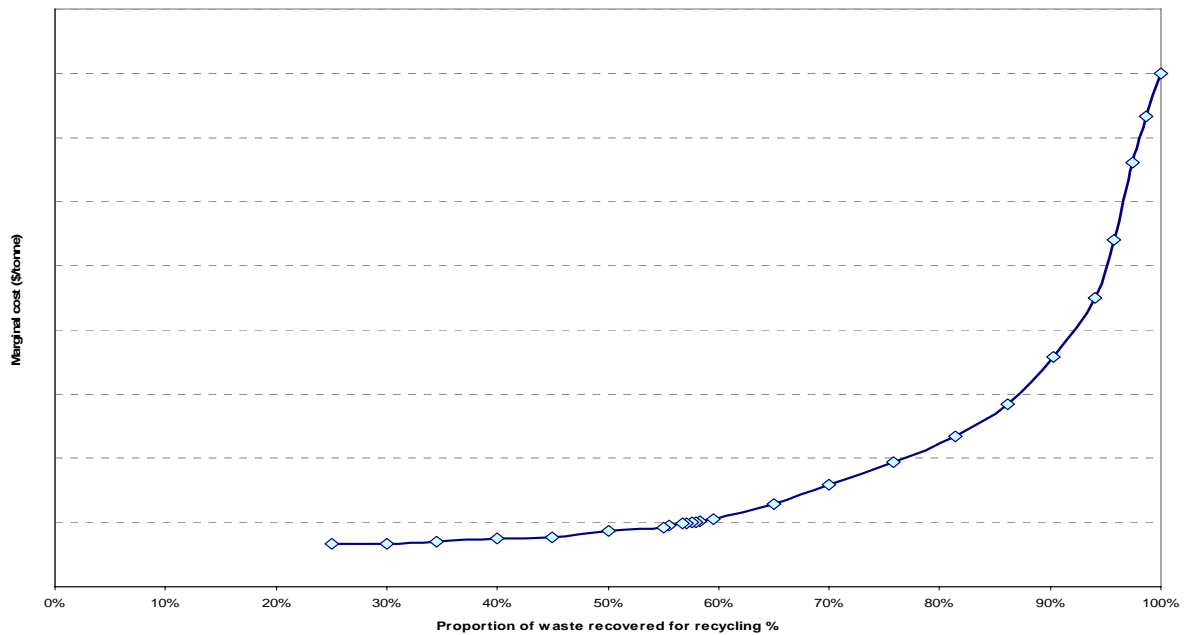
As the proportion of waste diversions increases, the cost of collecting and sorting increases per tonne of recyclates collected. This is because more and more material is sourced from low quality recyclates, the remaining material is often mixed with other waste material with little economic use or the material is located at more distance sources (such as in remote areas).

The collection and sorting cost curve varies depending on the type of waste and the current recovery rate, but typically follows a shape similar to the curve depicted in Figure 6-1.

For many waste streams in South Australia there is already a high level of diversion (relative to other Australian states), so that further diversions under the Waste Strategy will be progressively more expensive (as shown by the increasing steepness of the sorting cost curve). The steeper the sorting cost curve for a particular waste, the smaller the tonnage of waste that will be diverted.

Due to these costs, a policy incentive such as increased landfill charges, will lead to the largest diversion of waste coming from the C&D sector. The cost of sorting and transporting this waste is lower than for the other sectors, as sorting and reprocessing often occurs at the same sites. Most of the additional C&D material diverted will be concrete, brick and tile, soil and rubble recycling. By weight, timber, food organics and steel represent the majority of waste diverted from C&I, and over one third of the municipal waste diverted is garden organics.

Given the high levels of diversion already in South Australia and the steeply increasing costs associated with further increasing the collection and sorting of some wastes, increased diversions in the absence of technology improvements may come at a very high cost. For this reason, policies that force diversions (such as landfill bans) risk imposing high costs on the community.

Figure 6-1: Marginal cost of material recovery (sorting costs)

Source: MMA derivation based on Australian Council of Recyclers. 200: *Rewarding Recycling: Eco-services from the Resource Recovery Industry – A Market Based Approach, Discussion paper*, page 14 and discussion with key stakeholders.

6.2 Lack of local reprocessing capacity

A range of recovered materials are reprocessed or recycled in South Australia, including glass, concrete, bricks, soil and rubble, asphalt, timber and food and garden organics. Due to the bulkiness of many of these materials and low value of the recycled commodities by weight, export of them out of South Australia is generally not viable. Hence, recycling volumes and local reprocessing capacity will be dictated by local market factors.

Other recovered materials, such as paper, plastics, steel, non-ferrous metals, textiles and rubber, are largely reprocessed interstate or overseas. This largely reflects the location of industrial plants that can incorporate the recycled material, along with virgin materials into manufacturing processes.

Due to the location of these plants, transport distances are considerable. This in turn leads to high financial costs in transporting the material, as well as high environmental costs associated with its transportation. Average transport distances in South Australia between MRF and reprocessing site are shown in Table 6-1. Transportation costs account for 30% to 60% of the material recovery costs for most waste types.

Table 6-1: Average distance to reprocessing facility for selected materials

Waste type	Average km per trip between MRF and reprocessing site
Mixed paper	431
ONP (old newspaper)	206
LPB (liquid paper board)	982
PET (plastics)	573
HDPE (high density polyethylene)	32
Steel	140
Non-ferrous metals	498
Glass	15
Food organics	125
Textiles	144
Rubber	688

In the absence of developing facilities or enhanced capacity for recycling these materials in South Australia, the viability of diverting them from landfill will be less than that faced in states such as NSW and Victoria.

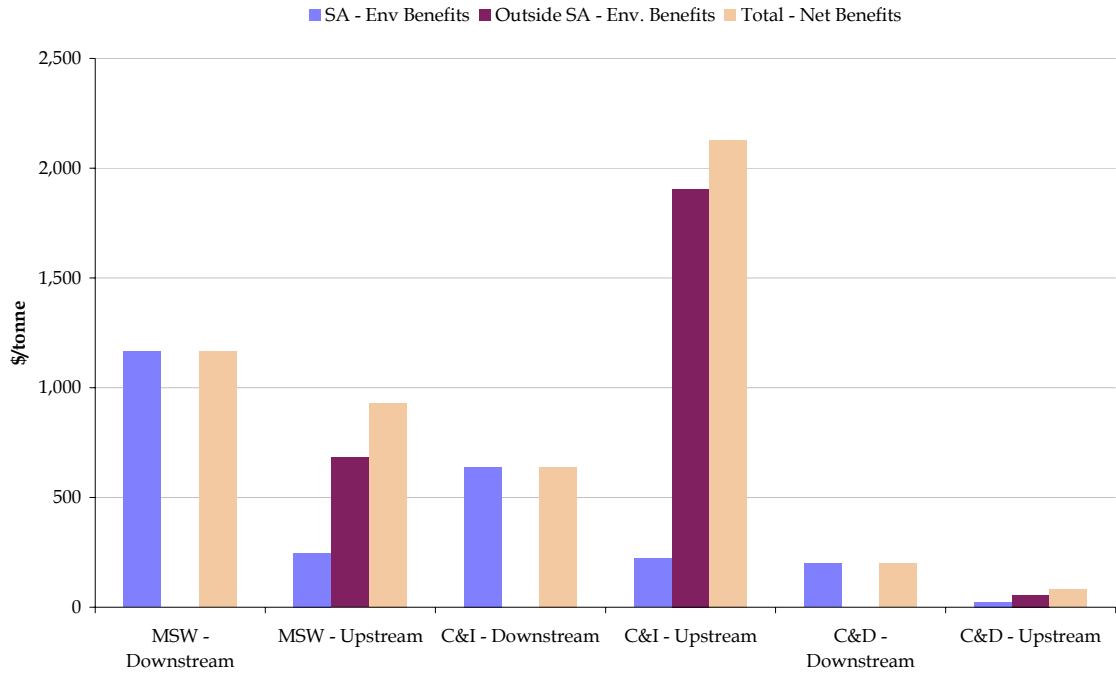
6.3 Modest environmental impact values

The upstream and downstream economic value of the environmental benefits from recycling appears to be modest.

In the case of downstream benefits, the bulk of the metropolitan landfills already adopt best practice methods for leachate and methane management. Upstream environmental benefits are also modest, as some of the recycled material does not actually replace virgin product but is instead used to replace other material. For example, recycled concrete is used as a road base and green waste is used as mulch on parks and gardens and horticultural enterprises.

Estimated upstream and downstream environmental benefits by waste stream associated with increased diversion from landfill under the three committed Waste Strategy policies are shown in Figure 6-2.

Figure 6-2: Net, upstream and downstream environmental benefit by waste stream - Committed Policies (CP)



The majority of the downstream benefits arise from increased greenhouse gas capture at landfills.

The majority of upstream benefits arise from reducing particulate emissions by recycling, rather than using virgin materials in production. However, not all emissions are estimated to fall. For example, the additional electricity consumption required for reprocessing is estimated to lead to an increase in BOD, oils and greases and mercury emissions outside of South Australia. All other air, water and leachate emissions decrease through policy implementation (Figure 4-4).

6.4 South Australia incurs policy costs while environmental benefits are realised world wide

As illustrated in Figure 4-2 on page 14, most, if not all, of the market costs of new policies under the Waste Strategy will be incurred in South Australia, whether these are the costs to the South Australian government of funding incentives or technology trials, or increased waste management expenses incurred by local households and industry through source reduction, sorting, recyclates transport and reprocessing. Some savings in local landfill management costs are realised.

Downstream environmental benefits are dominated by greenhouse gas reductions (which provide a global benefit) and costs associated with increased recyclates transport emissions and illegal dumping (both incurred by the South Australian community).

Upstream benefits associated with reduced emissions from manufacturing processes are split between South Australia and interstate/overseas, with the majority of the benefits realised by communities outside of South Australia⁵.

The equity implications of the distribution of costs and benefits attributable to the Waste Strategy are a matter for the people of South Australia and their elected representatives. However, policies directed at different waste streams will lead to differing distributions of costs and benefits across regions. For example, the overall net benefits of increased diversions of C&D are small, but are almost entirely realised in South Australia as recovered material is reprocessed within the state.

6.5 Uncertainty and the sensitivity of findings

Given the breadth of policies investigated and range of uncertainties inherent in such a large modelling exercise, the findings need to be tested under a range of alternative assumptions relating to recycling cost structures, environmental impact values, recyclates market prices, energy prices, and so on.

Sensitivity analysis was performed in relation to the following parameters identified by ZWSA:

- the price of greenhouse gas emissions was raised from \$20 to \$30, \$60 and \$100 per tonne of CO₂, a figure similar to likely preventative costs suggested in the recently released Stern Review on the economics of climate change (2006),
- the price of diesel was raised from \$1.38 to \$2.00 per litre, a price that could be seen over the coming years considering recent fluctuations and constraints of the world oil market

⁵ To the extent that greenhouse gas emissions are abated outside of South Australia, this will also benefit the South Australian community due to the global impacts of climate change arising from greenhouse emissions.

- the cost of disposing waste to rural landfill was reduced from \$40 to \$32 per tonne, which is halfway between the best practice large landfill cost of \$25 per tonne and the previously assumed average cost of \$40 per tonne for rural landfills,
- the market price of recyclables was increased by 20%, reflective of either potentially increased demand for raw materials (for example, to meet the rapid economic growth in China), or to illustrate the benefit of reducing recyclates collection, sorting or transport costs through technological change or development of domestic processing,
- all environmental emission factors for land, water and air emissions (g/kg) were increased by 10%, reflecting the level of uncertainty surrounding life-cycle assessments.

Table 6-2 shows the net economic benefits of the committed policies under the base case assumptions and for each of the scenarios identified above.

Table 6-2: Sensitivity of estimated net economic benefits of committed policies (\$m)*

Economic Benefits	Units	Committed Policies (CP)
Base Case	\$ million	176
Lowering rural landfill costs by \$8 to \$32	\$ million	206
Increasing diesel prices form \$1.38 to \$2.0	\$ million	66
Increasing all emission values by 10%	\$ million	271
Increasing market prices for recycle by 20%	\$ million	522
Carbon price - 30 \$/tonne	\$ million	407
Carbon price - 60 \$/tonne	\$ million	1,099
Carbon price - 100 \$/tonne	\$ million	2,022

* NPV 2004 - 2030

6.6 Sustainability/intergenerational equity considerations

The economic analysis and reported net benefits takes into account the market value of recovered materials, as well as monetary valuations of environmental impacts, including the health and environmental damages associated with pollutant emissions and preventative expenditures and clean-up costs associated with greenhouse gas emissions and illegal dumping respectively.

These are costs that directly impact the current generation. Broader sustainability questions are concerned with the impacts of current consumption levels on future generations. Therefore, levels of resource use and contributions to climate change reported under the environmental results may be of further interest to the South Australian government when considering the merits of the Waste Strategy.

The committed policies under the Strategy are estimated to result in a reduction in greenhouse gas emissions of 23 Mt of CO₂e over the period to 2030. As indicated in Section 6.5, the shadow price of greenhouse gas emissions adopted in this study was \$20/t CO₂e, based on the price of offset measures in Australia. In 2006, the Stern Review on *The Economics*

of Climate Change released by the UK government put damage costs at some US\$95 per tonne CO_{2e}. While this estimate was not based on standard economic valuation principles and cannot be viewed as an economic cost, it highlights the potential severity of climate change on future generations.

Resource savings under the three committed policies were estimated at around 2.5 Mt. In the economic analysis this resource saving has only a modest value because of the abundant reserves of most minerals in Australia and hence modest market value for recovered resources. Nevertheless, some members of the community have expressed concerns over resource depletion and the need for greater resource efficiencies to minimise resource use.

The relative importance of these intergenerational considerations is a matter for the South Australian community. It is salient to note the comments by the Productivity Commission that to the extent there is any case for policy interventions to manage greenhouse gas emissions or resource conservation, waste policy interventions are likely to be less efficient and less effective relative to direct upstream policies.

7 IMPROVING TBL OUTCOMES

South Australia already has high rates of diversion of waste from landfill, which makes further diversion increasingly costly. Nevertheless, key policies already committed to by the state in pursuit of the Waste Strategy landfill reductions targets were found to offer modest economic benefits. Those policies are:

- tightening landfill standards,
- increasing the waste levy,
- incentives for infrastructure, kerbside systems, and for reuse and recycling projects.

The results from this study also indicate that with the exception of the 2010 MSW target, these policies alone will enable the Waste Strategy targets to be met.

Adopting the Strategy is also anticipated to have positive employment impacts in South Australia. The additional employment occurs mainly in waste management industries, although there is a small increase in downstream economic activities. Gross State Product is anticipated to fall slightly (by less than 1%) due to the higher waste management costs.

In finalising policies under the Waste Strategy, the study has highlighted some key issues in maximising TBL outcomes.

(1) Relying more on upstream policy interventions

The key benefits identified from waste diversion and recycling were ‘upstream’ impacts associated with recycled material replacing virgin material use. Of these benefits, the most significant was in relation to a reduction in air pollution externalities.

Many commentators have argued that policies that directly impact on upstream externalities are more effective at reducing the externalities. Accordingly, the cost-effectiveness of direct industrial environmental policy interventions should be considered. For example, the South Australian EPA is currently introducing a suite of polluter-pays fees for air and water emissions from licensed premises in South Australia. Similarly, the South Australian government is also investigating the feasibility of a multi-state greenhouse gas emission trading scheme and other measures to increase the proportion of renewable energy in the state. These direct policy interventions may prove a more cost-effective means of securing further air quality benefits in South Australia rather than waste management interventions at the end of long production – consumption supply chains.

In the context of waste management in South Australia, policy selection should also be influenced by the finding that, as much of the material or goods displaced by recycled products are produced interstate or overseas, the air pollution benefits associated with increased recycling are realised significantly outside of South Australia. Apart from the equity issues associated with South Australia incurring higher waste management costs to realise air

pollution benefits outside of the state, governments in these other jurisdictions will be better placed to identify air pollution reduction priorities and cost-effective means to achieve them.

(2) A focus on MSW waste materials where current diversions levels are low

It will be difficult to realise the municipal solid waste 2010 target unless there is a focus on organic food waste, paper and cardboard, which make up 60% of the MSW waste now going to landfills.

The low level of diversion for organic MSW food waste appears to be related to the cost of sorting organic food waste from other waste, and the lack of high value markets for the recycled food waste. It is not clear why only 60% of paper and cardboard waste in the MSW stream is diverted to recycling, given the extensive effort in setting up recycling programs for this waste. As explained below, however, the focus on large tonnage waste streams may only produce net economic benefits to the extent that a large proportion of the recycled material is reprocessed in South Australia. Where the additional recycle is exported, the net benefits may be small or negative.

(3) Promoting the development of local reprocessing capacity

In terms of the cost-benefit analysis, the estimated net economic benefits are modest due to the need to transport a high proportion of the recycled material to interstate or overseas reprocessing plants. This is a key difference between South Australia and NSW or Victoria. The results suggest that developing local facilities for recycling material may be a prerequisite for further cost-effective waste diversion in South Australia.

(4) Focussing downstream waste policies more directly on environmental impacts

The study has confirmed the significant TBL benefits that can be realised through the enforcement of best practice leachate management at rural landfills, where leaching or emissions of pollutants could cause harm to local communities. In addition, more widespread methane capture at landfills could contribute to reducing the generation of greenhouse gas emissions in the state.

The proposed increase in the waste levy will see an increased diversion of waste from landfill, potentially mitigating some leachate pollution and greenhouse gas emissions associated with this waste. A differentiated levy could target wastes which pose greater emission impacts, and hence amplify these benefits.

However, neither levy instrument will provide an incentive for landfill operators to reduce these pollutants from the larger volumes of waste still going to landfills, and large levy increases will also lead to increases in the amount of waste dumped illegally.

Alternatively, policies could be more closely targeted at the specific environmental impacts of concern. In the case of landfill emissions, they could as in other states be included in the polluter-pays fees for air and water emissions levied on major industrial activities. In this

way, pollution fees levied at landfills would be consistent with fees faced by other industrial premises, such that overall emission reductions in the state can be achieved at lowest cost.

Beyond the broad waste streams modelled, recommendations on specific wastes are not possible. However, the study has illustrated that environmental impacts, both upstream and downstream, will vary considerably between materials. Hence, a shift in policy focus from broad tonnages to the targeting of wastes with specific and demonstrable impacts (for example batteries, electronic equipment, and so on) should increase overall net benefits from policy interventions. A corollary to this is that it would lessen the emphasis on overall diversion targets.