PACKAGING IMPACTS DECISION REGULATION IMPACT STATEMENT

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Prepared for the former COAG Standing Council on Environment and Water

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ACRONYMS

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ADF	Advance Disposal Fee
APC	Australian Packaging Covenant
APCC	Australian Packaging Covenant Council
AWT	Alternative Waste Technology
BCR	Benefit Cost Ratio
CA	Co-regulatory Arrangement
C&I	Commercial and Industrial
CBA	Cost Benefit Analysis
CDL	Container Deposit Legislation
CDS	Container Deposit Scheme
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPHC	Environment Protection and Heritage Council (prior to SCEW)
HDPE	High Density Polyethylene
MFA	Material Flows Analysis
MJA	Marsden Jacob Associates
MRF	Material Recovery (/Reclamation) Facility
MS2	Martin Stewardship and Management Strategies
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW	New South Wales
NGO	Non-government Organisation
NLI	National Litter Index
NPV	Net Present Value
NT	Northern Territory
PET	Polyethylene terephthalate
PSO	Product Stewardship Organisation
PV	Present Value
PwC	PricewaterhouseCoopers
RIS	Regulation Impact Statement
RVM	Reverse Vending Machine
SA	South Australia
SCEW	Standing Council on Environment and Water
SOOG	Senior Officers Oversight Group
US	United States of America
WCS	Wright Corporate Strategy

EXECUTIVE SUMMARY

The purpose of this Decision Regulation Impact Statement (RIS) is to recommend the most effective approach arising from examination of the national costs and benefits and stakeholder impacts of options for additional government intervention to increase packaging resource recovery and recycling and decrease packaging litter. It undertakes this analysis in accordance with the instructions provided in the *Council of Australian Governments Best Practice Regulation Guide for Ministerial Councils and National Standards Setting Bodies* 2007.

The options for additional intervention examined include non-regulatory, co-regulatory and regulatory mechanisms for addressing the identified problems (see Chapter 3) and government objectives (see Chapter 4) and are outlined in Chapter 6. Extensive consultation with affected stakeholders and the public has taken place throughout the Packaging Impacts RIS process and is summarised in Chapter 5.The key problems being addressed through this Decision RIS are that under current arrangements the treatment of used packaging in Australia is subject to a number of market failures which are most evident where packaging is consumed in business/commercial settings and in public places. There is also a risk of regulatory failure as further fragmentation in regulatory arrangements for used packaging across Australia will drive cost impacts on businesses, consumers and taxpayers.

Notwithstanding that packaging recycling rates have risen since 2003, increases have tended to plateau in recent years. A range of market and regulatory failures have been identified which prevent markets from functioning well, with the result that some packaging does not get recycled even though it would generate a net community benefit if it did. This leads to a recycling rate below the efficient level and results in a higher rate of litter than would otherwise occur. In addition regulatory fragmentation, or the threat of it, has a dampening effect on business and imposes costs on businesses operating in a national market, placing upward pressure on the price of affected consumer products. Avoiding these types of regulatory impacts is the focus of the Council of Australian Government (COAG) reforms to reduce regulatory duplication and differences to reduce compliance costs.

This Decision RIS provides a detailed analysis of ten options to better manage packaging waste and litter. There is one non-regulatory option (option 1) which entails collaboration across governments on a strategy to improve coordination of actions and services. Five co-regulatory approaches (options 2a to 2e) provide a regulatory framework for industry to take action to improve recycling and reduce litter, while not specifying the actions that industry must take to achieve this. A further four regulatory approaches include a fee on the packaging industry to fund initiatives to increase recycling and reduce litter (option 3), and three container deposit scheme (CDS) models which operate on beverage containers (options 4a to 4c). Most of the options target packaging broadly, however all of the CDS options and option 2d legislate for beverage containers only.

IMPACT ANALYSIS

A cost-benefit analysis considering the economy-wide impacts of each option and a distributional impact analysis of the financial impacts of each option on relevant stakeholder groups has been undertaken and peer reviewed. Overall, the analysis shows that there is scope to cost-effectively address the identified problems to improve recycling and litter rates in Australia. The base case (current arrangements in place to manage packaging waste and litter) also demonstrates moderate improvements in recycling and incremental reductions in litter.

The consideration of the options takes account of a range of outputs from the analysis as well as the extent to which the option addresses the identified problems and delivers on government objectives. Key elements of the analysis are the net benefit to the community (NPV), the size of the benefit cost ratio (BCR), the sensitivity of the costs and benefits of each option to the assumptions used, and distributional impacts across stakeholders and the extent to which options deliver under a range of alternate assumptions (the sensitivity tests).

Five of the ten options assessed deliver a net economic benefit to the community, represented by the positive Net Present Value (NPV) and Benefit Cost Ratio (BCR) shown in Table E.1. These are options 1, 2a, 2c, 2e and 3.

Of these options, option 2e ($50 million) delivers the highest NPV (+$152 million) and solid packaging recycling and litter reduction benefits above the base case, while option 1 delivers the highest BCR (1.3).

Options 2b, 2c, 2d and 3 all deliver higher overall benefits in recycling improvements and litter reduction than either option 1 or 2e ($50 million), however they also have substantially higher costs, leading to their lower (2c, 3) or negative (2b, 2d) NPV and lower BCR.

Option 1 is a relatively low cost, solely government-funded option which delivers corresponding benefits over the base case with small additional recycling volumes and an NPV of +$74 million. Option 1 also delivers the smallest gains in terms of litter reduction. However, as it focuses on readily available, high pay-off recycling opportunities which produce quite large benefits from little investment, it has the highest BCR of the options (1.3).

Option 2a is also a relatively low cost option which achieves modest recycling and litter reduction benefits, but at higher government and taxpayer costs than current arrangements due to the transfer of these arrangements to a new regulatory framework under the *Product Stewardship Act 2011*.

Options 2c and 3 generate the third and second highest NPVs respectively (+$119 million and +$123 million) due to their high mandated recycling targets, which will drive industry co-regulatory arrangements (CAs) to achieve the highest additional recycling outcome of all options and generate high revenue from pursuing better quality recyclate. Options 2c and 3 also deliver high litter reduction outcomes, only 20 per cent below the CDS approaches, due to their focus on beverage containers through recycling sub-targets. However, higher costs such as infrastructure investment and government administration funding will be required for option 2c and a higher combination of industry tax contributions and government administration funding will also be required to implement option 3, leading to the lower BCR of these options.

Options 2b, 2d and the CDS options 4a, 4b and 4c demonstrate a net economic cost with negative NPVs. Therefore, under the COAG guidelines they cannot be recommended for implementation. Options 2b and 2d incur a net economic cost with an NPV of -$76 and -$107 million respectively due to their mandatory beverage container recycling sub-target. The sub-target will drive industry CAs to collect a large amount of glass beverage containers, with glass having little to no value as recyclate and limited environmental impact in the form of emissions. Therefore, returns on investment are poor. Unlike options 2c and 3, the level of investment required in options 2b and 2d is not sufficient to offset those losses by tapping larger volumes of high value recyclate.

The CDS options incur the greatest net cost to the community. They are substantially less cost-effective than other options, with net economic costs greater than $3 billion in all three models examined. The costs of these options are between seven and eight times higher than the cost of option 2e ($50 million) and are at least 400 per cent higher than options 2c and 3. The high costs stem from the need to roll out purpose-built infrastructure nationwide to manage item-by-item refund payments for over 12 billion beverage containers each year. Approximately 73 per cent of these containers would otherwise have been recycled via kerbside and other (base case) recycling systems. This re-routing of material into an alternative recycling system adds significant costs and generates minimal benefits; especially since three quarters of the beverage container recyclate targeted is glass.

CDS options achieve the highest litter reduction impact when this is measured by tonnages. This is because they involve direct price incentives to return beverage containers, which comprise 60 per cent of public place litter by weight. Option 4a achieves the greatest litter reduction (822,200 tonnes reduced from the base case by 2035).

However, all options result in reductions in litter tonnages from the base case, by reducing the amount of packaging available to be littered and by reducing the propensity of consumers to litter in public places.

TABLE E.1: CBA RESULTS FOR ANALYSIS PERIOD (2013–2035)

	Costs *PV* *$ million*	Benefits *PV* *$ million*	NPV *$ million*	BCR	Additional Recycling *Tonnes*[4]	Additional Litter Reduction *Tonnes*[5]	Recycling Cost Effectiveness per Tonne *$*[6]
Option 1	247.7	321.7	+74.0	**1.3**	1,944,400 (74.6%)[7]	142,900	180
Option 2(a)	426.9	475.1	+48.2	1.1	3,021,200 (75.0%)	284,200	167
Option 2(b)	999.9	924.4	-75.5	0.9	6,147,600 (79.0%)	577,400	254
Option 2(c)	1,382.7	1,502.0	+119.3	1.1	8,397,200 (81.4%)	628,400	227
Option 2(d)	879.0	772.4	-106.6	0.9	5,841,300 (79.8%)	576,000	273
Option 2(e) ($20m)[8]	470.0	549.4	+79.4	1.2	3,844,700 (76.7%)	330,100	172
Option 2(e) ($35m)	611.2	709.1	+98.0	1.2	4,774,500 (77.7%)	361,800	182
Option 2(e) ($50m)	732.7	884.7	**+152.1**	1.2	5,491,900 (78.5%)	377,800	184
Option 3	1,379.4	1,502.0	+122.6	1.1	8,397,200 (81.4%)	628,400	227
Option 4(a)	5,316.3	1,532.8	-3,783.5	0.3	6,067,300 (79.3%)	822,200	1,398
Option 4(b)	5,409.1	1,551.9	-3,857.2	0.3	5,871,600 (79.0%)	813,500	1,411
Option 4(c)	6,038.6	1,500.0	-4,538.6	0.2	5,338,900 (78.4%)	777,800	1,657

Source: Attachment M, p. 9 and p. 23, Attachment K, p. 22.

Notes:

4. Additional means those tonnes achieved above the base case across the entire analysis period.

5. Refers to litter reduction from the base case across the entire analysis period.

6. Refers to the level of recycling achieved for the amount invested in recycling infrastructure (calculated by PV Infrastructure costs / PV total recycling (tonnes)

7. Value in parentheses refers to total packaging recycling rate (rather than additional) in 2035

8. Option 2e is a single option, but was modelled under three different scenarios of the level of investment in recycling and litter infrastructure. Each is presented here.

SENSITIVITY ANALYSIS

These figures illustrate the CBA outcomes under the particular set of assumptions modelled in the CBA. Recognising that some of the key assumptions have the potential to significantly affect the analysis, sensitivity tests were undertaken to determine levels of certainty in the results. Key cost, benefit and discount rate assumptions were reset to see if the results changed if they were lower, on par with (central) or higher than the final assumptions used in the analysis. The consultants also used a threshold analysis to understand how changes to key cost and benefit assumptions would affect fundamental outcomes in terms of the final NPV, BCR and comparative ranking of options.

Options 1 and 2e ($50 million) were the only two options that continue to deliver a positive NPV if all test parameters were reset to pessimistic assumptions. This demonstrates that these two options are the most robust to changes in key assumptions and hence in the degree of confidence that can be placed in the outcomes these two options deliver.

NON-MARKET BENEFITS

The community also places a value on recycling and litter reduction that includes a range of market and non-market values. Market values have been fully captured in the CBA, along with some non-market benefits such as avoidance of environmental externalities associated with landfill and litter.

A further sensitivity analysis was undertaken to estimate the effect of higher recycling and higher litter Willingness to Pay (WTP) values on the NPV and ranking of the options, tested when upper and lower estimates of the community's WTP for increased recycling and reduced litter were factored in. To avoid potential double counting of benefits, all environmental externalities such as landfill emissions were excluded from the sensitivity test.

The impact of the lower and upper estimates when applied to the options is shown in Table 1 in Attachment E. Heightened or upper values for the community's WTP for recycling and litter promote the ranking of options 2c and 3. Option 3 changes to have the highest NPV, followed by option 2c. Option 2e ($50 million) still performs well, generating the third highest NPV in both scenarios. The rankings of all CDS options (4a, 4b and 4c) remain the same, even when upper WTP values are factored in, retaining a significantly negative NPV or net cost of more than $1.8 billion.

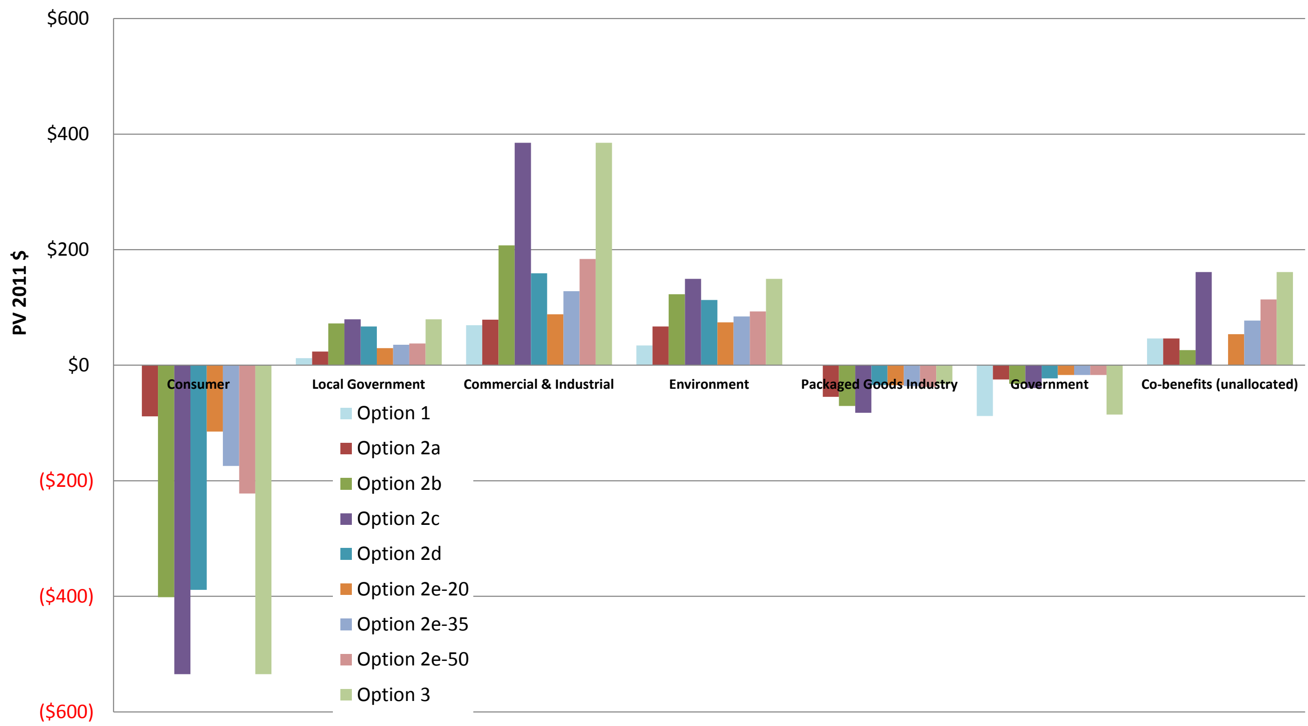
DISTRIBUTIONAL IMPACTS

The Decision RIS also includes a distributional impacts analysis of the financial impacts of the options on the following stakeholder groups: the packaged goods industry, the commercial and industrial (C&I) sector, local government, consumers, the environment and government (state, territory and Commonwealth). While all of the options require additional expenditure to support recycling and litter actions, the source of the extra funds differs depending on the option. In addition, the stakeholder group or sector accruing the benefits may differ from the one bearing the cost.

The analysis found that all options will see a transfer of benefits from government (by organising and funding coordination and regulatory oversight), the packaged goods industry (by funding recycling and litter initiatives) and consumers (by funding costs passed on by industry) to local government and the

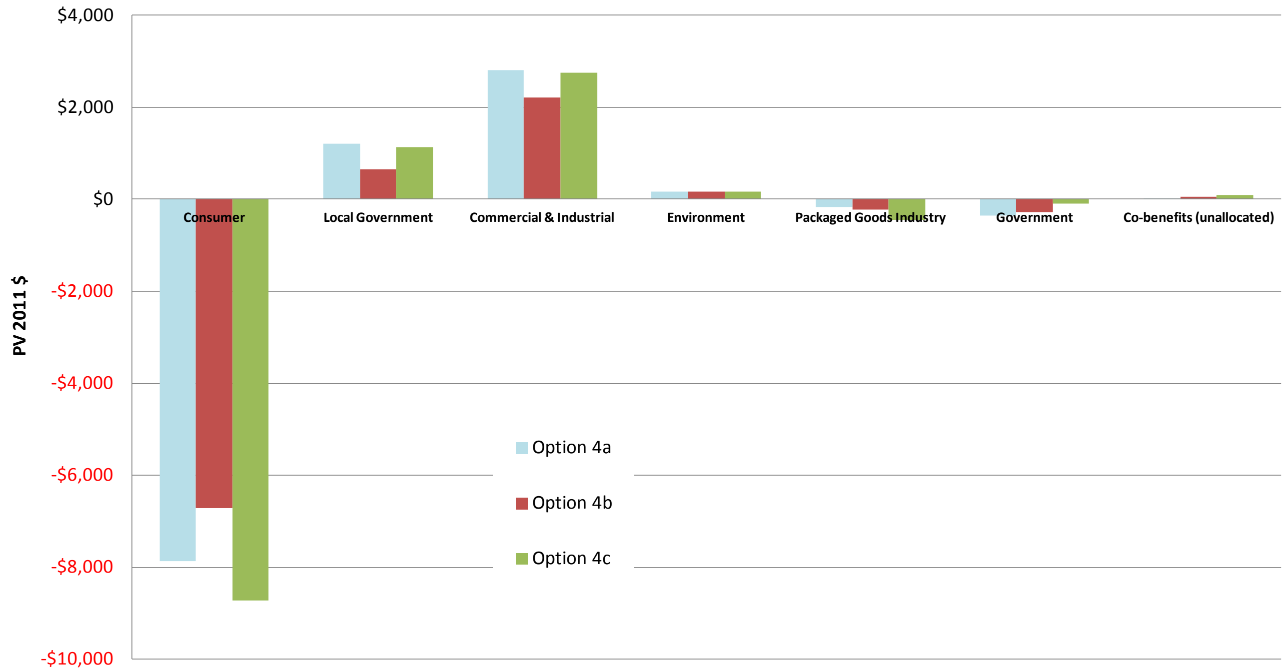
C&I sector as recyclate providers—entities that collect and dispose of valuable recyclable material—and the environment (by reducing landfill and litter externalities). See Figures E.1 and E.2.

FIGURE E.1: SECTORAL IMPACTS OF NON-CDS OPTIONS ($ MILLIONS, PV)



Source: MJA 2013c p. 39.

FIGURE E.2: SECTORAL IMPACTS OF CDS OPTIONS ($ MILLIONS, PV)



Source: MJA 2013c p. 42

RECOMMENDATION

Option 2e ($50 million) envisages an increased voluntary funding commitment by the packaged goods industry under an extended Australian Packaging Covenant-type arrangement of $50 million per year for 5 years which, over the full 20 years of the analysis, results in an average industry investment of $27.7 million annually (in 2011 dollars, excluding administration costs). This represents a total recycling and litter reduction infrastructure and education investment in real terms of PV $222 million (or an undiscounted sum of $554 million).

The modelling indicates that this investment can achieve a 78.5 per cent packaging recycling rate by 2035 and reduce the average annual amount of litter (in tonnes) from the base case by 377,800 tonnes or 23 per cent by 2035.

Option 2e achieves cost-effective recycling and litter outcomes because it is non-prescriptive in how outcomes can be achieved and not constrained by mandated sub-targets to recycle certain packaging types, which may be of low value or low environmental impact. Rather, it allows industry to select cost-effective opportunities to achieve the outcomes and a flexible and adaptable approach that is better able to respond to changes in the market and operating environment. It also has relatively low administration costs, based on existing co-regulatory arrangements under the Used Packaging Materials NEPM.

By providing a strengthened national approach and increased investment by the packaged goods industry to deliver improved outcomes under current co-regulatory arrangements, option 2e will address the problems of future regulatory fragmentation and leverage existing administration mechanisms. The design of the co-regulatory arrangement also optimises outcomes because it targets all packaging and allows engagement of all participants along the supply chain, from design and manufacture to end of life disposal.

Because of the reasons indicated above, this Decision RIS recommends Option 2e ($50 million)—Extended Australian Packaging Covenant (APC) for implementation.

1 INTRODUCTION

Packaging delivers environmental benefits, for example by reducing food waste through spoilage. However it also has adverse environmental impacts throughout its life cycle. The production and distribution of packaging and packaged goods requires the consumption of large amounts of materials, energy and water. In addition waste packaging materials that are not recycled end up in landfill or as a key component of litter, contributing to impacts such as greenhouse gas emissions and land and sea pollution.

As a result, since 1999 Australia's environment ministers have partnered with industry in a series of Packaging Covenants through which governments, the packaged goods industries and community-based organisations work together on projects and supply chain collaboration to address negative environmental impacts nationally. In addition, all environment ministers have agreed to Strategy 3 of the Council of Australian Governments' endorsed *National Waste Policy: Less Waste, More Resources* which states:

> "The Australian Government, in collaboration with state and territory governments, industry and the community will better manage packaging to improve the use of resources, reduce the environmental impacts of packaging design, enhance away-from-home recycling and reduce litter."

THIS REGULATION IMPACT ASSESSMENT

This Decision Regulation Impact Statement (RIS) provides a detailed analysis of ten options to better manage packaging waste and litter. The options analysed have been agreed by environment ministers and stakeholders to merit examination, and include non-regulatory, co-regulatory and regulatory approaches.

The non-regulatory option (option 1) entails collaboration across governments on a strategy to improve coordination of actions and services. The five co-regulatory approaches (options 2a to 2e) provide a regulatory framework for industry to take action to improve recycling and reduce litter, while not specifying the actions that industry must take to achieve this. The regulatory approaches include a fee on the packaging industry to fund initiatives to increase recycling and reduce litter (option 3), and three container deposit scheme (CDS) models which operate on beverage containers (options 4a to 4c). Most of the options target packaging broadly, however all of the CDS options and option 2d legislate for beverage containers only. Chapter 6 and Attachment I outline the options and how they work.

Environment ministers agreed to undertake this Decision RIS in August 2012 following a high level of stakeholder interest and engagement in the Consultation RIS released in December 2011 (see Chapter 5)[1]. They also agreed to increase the number of options from seven to ten. The Decision RIS analysis is guided by the requirements set out in the *Council of Australian Governments Best Practice Regulation Guide for Ministerial Councils and National Standards Setting bodies* (COAG 2007).

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[1] The Consultation RIS and stakeholder feedback are available at: http://www.scew.gov.au/consultation/packaging-impacts-consultation-regulation-impact-statement-ris

2 BACKGROUND AND CONTEXT

2.1 PACKAGING WASTE TRENDS

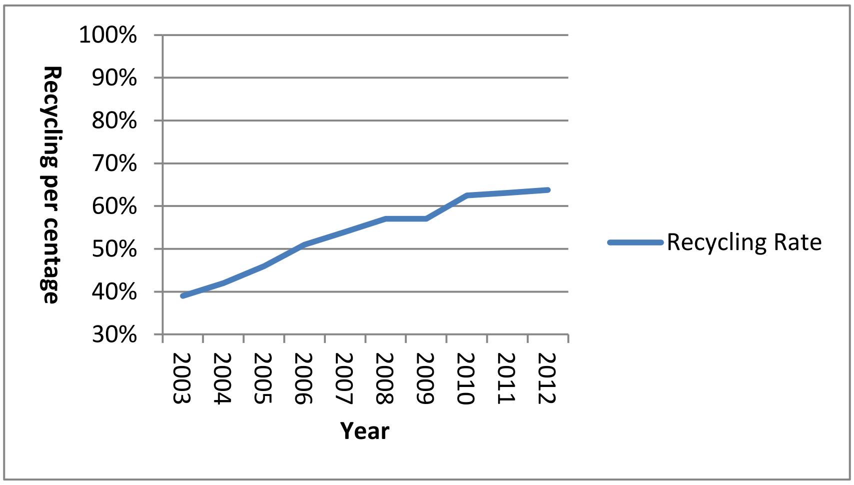
Packaging is a broad ranging term. In this Decision RIS, the term 'packaging' includes all packaging which is used to contain, protect, promote and distribute products for business and individual consumers. It covers packaging used at all stages along the supply chain and packaging used for products consumed both at home and away from home (comprising commercial and industrial (C&I) settings, public places and events, institutions and workplaces). Further background information on packaging use and trends in Australia is provided at Attachment A.

Many factors influence Australia's approach to managing the environmental impacts of packaging waste. These include government waste policies and regulations, local conditions for end-of-life management, broader economic and market conditions influencing consumption levels and waste industry investment and opportunities, the availability of technology and markets, and community expectations. Packaging trends also influence the environmental impacts of packaging, including its recyclability and litter potential. For example, increasing trends towards flexible packaging from soft and composite plastics, such as sachets for drinks, microwavable foods and detergents (Manalili et al 2011, Sustainable Packaging Alliance 2012, Ferre 2010, Streeter 2007) may reduce transport or storage impacts for businesses, but are not yet recyclable in Australia, adding to landfill volumes.

Australia's population growth, as well as demographic and lifestyle trends are leading to increased packaging consumption and an overall increase in packaging waste (by weight). Overall, packaging waste accounts for approximately 9 per cent of total waste generation in Australia, with beverage containers estimated to account for up to 2.8 per cent of total waste. Most packaging waste in Australia is disposed of through either municipal kerbside collection provided by local government, or C&I sector collection or drop-off services. Paper and cardboard represent the greatest proportion of packaging consumed in Australia, largely due to its use as distribution packaging in the C&I sector (SRU 2013). Beverage containers account for almost a third (30 per cent) of packaging consumption in Australia and are a key consumer concern as they are highly visible in litter.

At the same time, the overall packaging recycling rate increased to 63.8 per cent in 2012, up 0.7 per cent from 2011 and a significant increase from the 2003 baseline of 39.2 per cent (APCC 2012b). While significant progress has been made since 2003, progress has slowed or plateaud in recent years.

FIGURE 1: PACKAGING RECYCLING RATES 2003 TO 2012



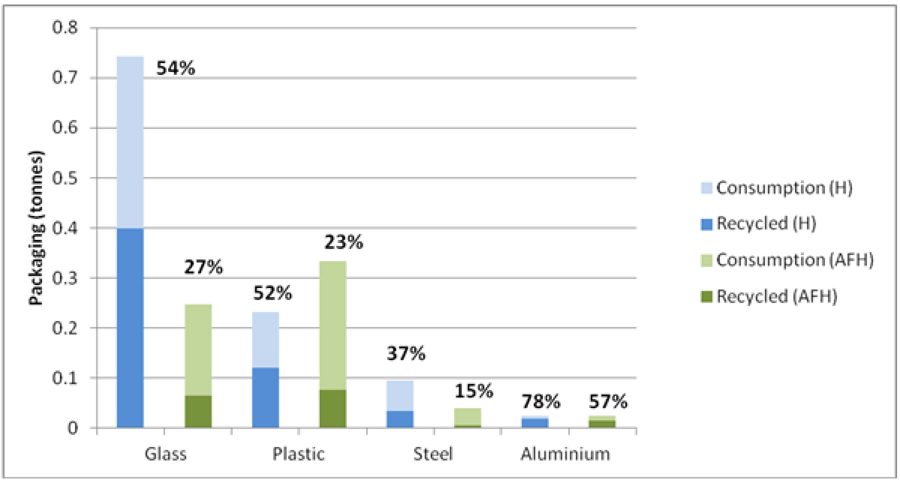
Source: APCC 2012b

However, this overall recycling rate is not uniform across sectors and across material types. For example, there are significant opportunities to reduce disposal of waste to landfill and improve recovery of resources in the C&I sector (Hyder 2012),

Collection and recycling systems for packaging materials in the C&I sector and other away-from-home areas such as public events are not yet comprehensive and face some barriers (SRU 2013, Hyder 2012). This sector also has not been subject to government intervention to stimulate recycling to the same extent as the municipal recycling sector. C&I recycling systems are mainly managed by private, commercially driven waste service providers. Some businesses will not be offered these recycling services if they are not profitable or economies of scale cannot be achieved, for example if access is difficult or there is not a sufficient market or cluster of businesses in an area to make collection and transport worthwhile. In addition, adjacent businesses may require different waste management and sorting streams and this diversity may not always be catered for. Another barrier is the cost to businesses, particularly small to medium enterprises, of contracting private recycling arrangements. Other costs include staff awareness raising and labour to sort materials for recycling, and the need to dedicate space for sorting and multiple bins. Finally, there is an identified lack of sufficient transfer stations and Material Recovery Facilities (MRFs) for the C&I sector (Hyder 2012).

Paper and cardboard is the only material packaging type which shows a uniformly high level of recycling across both at home and away from home settings. Away-from-home recycling of paper and cardboard is high due to the high volumes dealt with in the C&I sector and the high value of paper/ cardboard recyclate, which provides a commercial incentive to recycle. Where recycling rates are already high, it can be expected that any increase in recycling rates would come at a high marginal costs. For non-paper/cardboard material types recycling rates are substantially lower in the away from home sector than at home, especially for plastics and glass. Refer to Figure 2.

FIGURE 2: CONSUMPTION AND RECYCLING OF PACKAGING MATERIALS EXCLUDING PAPER/CARDBOARD AT HOME AND AWAY FROM HOME



Legend: (H) represents at home and (AFH) represents away from home. The bold percentage figures indicate the recycling rate. Source: PwC, WCS 2011, pp. 73-87. Percentage totals are calculated based on weighted averages.

Using the most recent data that provides recycling by location, if the impact of paper and cardboard is excluded, the overall national packaging recycling rate is just 37.2 per cent across all sectors (consisting of an at-home recycling rate of 52.5 per cent and an away-from-home recycling rate of 25.3 per cent).

Figure 2 also indicates that more plastic packaging is consumed away from home, with currently low recycling rates. This highlights a significant opportunity to improve recycling and resource recovery of plastic packaging away from home, which would address key externalities associated with plastic packaging in litter and marine debris. As glass packaging is also consumed frequently away from home, there are similar opportunities to improve recycling and resource recovery, however with more limited environmental impact as glass packaging does not impose externalities such as greenhouse emissions or threats to marine wildlife to the same extent as other packaging materials.

On the consumer side, the diversity of waste and recycling bins and sorting streams present in commercial locations can cause confusion and increase the rate of contamination, which in turn reduces the amount and/or value of viable recyclate. Likewise, there is a lack of consistency in the approach of local government and private waste service providers at public parks and reserves. Consumer interest in the environmental and social impacts of purchases is increasing and industry is responding through increased use of environmental certification and labelling (AFGC 2012b) and focus on the ‘social licence to operate’ (Cook et al 2013). There is likely to be continued investment in recycling technology to better address increasingly popular packaging types such as flexible plastics. However, new technologies typically are a response to new materials, once they have already become widespread and subsequently a demand or incentive has arisen to reduce their environmental impacts[2]. Without such investment, current packaging trends will, over time, reduce the proportion of recyclable packaging and increase landfill disposal.

[2] An example is recent innovations in recycling of soft plastics such as plastic bags and films.

Due to the complexity of packaging supply and recycling markets and the wide range of external factors they respond to, it is essential that policy and regulatory settings for managing packaging waste and litter are flexible enough to address issues as they emerge into the future.

2.2 INTERNATIONAL APPROACHES TO PACKAGING

Internationally, the concept of extended producer responsibility for manufactured products has been a feature of the business landscape for many years. More recently the concepts of 'closed loop' economies (edie.net et al 2013) and using waste as a resource have been focused on (OECD 2012).

Increasingly, these approaches are characterised by increased funding from industry, but with debate about the appropriate level of funding and broader competitive impacts on industry. Internationally where schemes are regulated there is also a trend of strong industry support for protection against free-riding (Martin 2013).

A number of developed economies operate container deposit schemes. These vary in their design (some are industry-led while some are government-led) and the types of containers collected (refillable, non-refillable or more recently flexible pouches and 'tetra paks') have evolved over time and across jurisdictions in response to local conditions. European systems primarily use automated Reverse Vending Machines for collection.

There has also been an increase in recent years in concern about litter and marine debris, establishing this as a priority issue driving waste and litter management approaches internationally (Martin 2013).

2.3 AUSTRALIA'S REGULATORY ARRANGEMENTS

In Australia, waste management including litter is primarily the responsibility of state and territory governments. The provision of municipal waste services for households is the responsibility of local government and arises from state and territory responsibilities for waste management. However, the provision of waste services to the C&I sector is based on a mixture of private sector and local government service delivery (where available).

The Commonwealth is responsible for ensuring that Australia's international waste obligations are met, whether through measures implemented by the Commonwealth or by state and territory governments. The Australian Government also supports national consistency and effective coordination among jurisdictions through initiatives such as the National Waste Policy, the *Product Stewardship Act 2011* and the National Environment Protection (Used Packaging Materials) Measure (NEPM) and the associated Australian Packaging Covenant (APC), in line with COAG reforms to reduce regulatory duplication and differences in order to reduce compliance costs.

The Australian Government is a party to several international conventions and regional agreements that refer to managing waste, including litter as marine debris. This is relevant in the context of packaging waste as packaging litter, particularly plastic, is prevalent in marine debris. "Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris" is listed as a Key Threatening Process under the *Environment Protection and Biodiversity Conservation Act 1999* and the Australian Government has developed the *Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life* to address this. Prevention of marine debris from land and sea sources is also addressed through state and territory legislation governing waste management, pollution, environment protection and litter.

The range of frameworks operating across Australia, reflect in part historical circumstances around the origins of recycling of packaging in Australia in the early return systems for refillable beverage containers and the subsequent focus on establishing widespread kerbside recycling to address broader packaging types. While in most states there was a shift away from refillable containers, South Australia retained this system and its associated depot network for the return of deposit items, which provided the infrastructure for a state-based container refund scheme to commence in 1977.

NATIONAL REGULATORY FRAMEWORKS

Commonwealth, state and territory and local government responses to packaging waste and litter in Australia are focused through the *National Waste Policy: Less Waste, More Resources*. One of the National Waste Policy's six key directions is taking responsibility, through product stewardship, to reduce the environmental, health and safety footprint of manufactured goods during and at end of life. Strategy 1 supports this in its aim to:

> "Establish a national framework underpinned by legislation to support voluntary, co-regulatory and regulatory product stewardship and extended producer responsibility schemes to provide for the impacts of a product being responsibly managed during and at end of life."
> (EPHC 2009, p. 9)

The *Product Stewardship Act 2011* (the PS Act) implements Strategy 1 and came into effect on 8 August 2011. Option 2 in this Decision RIS proposes several models for introducing co-regulatory product stewardship schemes for packaging, which would be implemented under on the PS Act. Televisions, computers and computer-related products are currently regulated under the PS Act through the *Product Stewardship (Televisions and Computers) Regulations 2011* and this scheme has provided an instructive working model for designing option 2.

The Used Packaging Materials NEPM, made under the *National Environment Protection Council Act 1994* by Commonwealth, state and territory environment ministers is a national mechanism designed to underpin the APC. The APC (established as the National Packaging Covenant in 1999) is a primary mechanism for implementing Strategy 3 of the National Waste Policy to better manage packaging waste.

The APC is an agreement between all levels of government, companies across the whole packaging supply chain and relevant environment and community groups to reduce the environmental impacts of packaging. The APC pursues this by funding projects to progress the following performance goals:

- Design—optimising packaging to use resources efficiently and reduce environmental impacts without compromising product quality and safety
- Recycling—efficiently collecting and recycling packaging
- Product Stewardship—demonstrating commitment by all signatories (APCC 2010).

The NEPM provides free-rider regulation to ensure that APC signatories are not disadvantaged in the marketplace by taking action to reduce the environmental impacts of packaging. Packaging brand owners with an annual turnover greater than $5 million are required to join the APC, or under the NEPM can be part of an industry arrangement achieving equivalent outcomes. If they do not meet the

APC or NEPM requirements, they are referred to state and territory jurisdictions for compliance action under the NEPM.

As at June 2013 there were 925 APC signatories (APCC 2013b). From 2005 to 2012, the APC coordinated 141 projects through an annual grants programme with a total value of $126.1 million to increase recycling, improve packaging design and reduce litter. Industry members of the APC contributed $30.6 million towards these projects, or 24 per cent of funds. The APC estimates that these projects have contributed to 32.4 per cent of the total increase in recycled packaging tonnes from 2005 to 2012 (APCC 2013c).

STATE AND TERRITORY REGULATORY FRAMEWORKS

State, territory and local governments focus activities to address packaging waste through the *National Waste Policy: Less Waste, More Resources*. They also use a range of other approaches, including local government kerbside recycling collection, landfill levies and bans, waste and litter reduction targets and strategies, voluntary product stewardship programs and legislation allowing for the introduction of extended producer responsibility schemes. They also implement legislation to give effect to the Used Packaging Materials NEPM.

Some states and territories have introduced regulations targeting specific environmental impacts or items of packaging. Victoria and South Australia have established landfill bans on items such as industrial waste containers (Victoria) and plastic packaging and glass that have been aggregated for resource recovery (South Australia).

South Australia and the Northern Territory have legislated container refund schemes, where consumers receive a 10 cent refund if they return a beverage container sold in these jurisdictions at an approved collection depot. South Australia's CDL aims to reduce beverage container litter and promote resource recovery, and has achieved an 80 per cent beverage container recycling rate and reduced beverage container litter and waste sent to landfill (EPA SA 2013). The Northern Territory scheme which commenced on 3 January 2012 aims to reduce beverage container litter and increase resource recovery, reuse and recycling (DLPE 2012a). During the first quarter of 2012, the container return rate was 21.9%, rising to 30.3% by the end of June 2012 (DLPE 2012b). These container refund schemes operate under an exemption from the *Mutual Recognition Act 1992* in order to implement their product registration and labelling requirements.

ISSUES WITH EXISTING REGULATORY FRAMEWORKS

The current co-regulatory NEPM arrangement is strongly supported by the packaged goods industry as a national framework to prevent free-riding and encourage high levels of participation in the APC. However its effectiveness relies on consistent and robust enforcement by state and territory governments. Capacity constraints can impact on the application of the NEPM. Feedback from industry is that they wish to see a robust level of compliance action and with more rapid follow up of non-compliant businesses.

The variety of other packaging waste regulations across jurisdictions has the potential to lead to increased business and compliance costs for the packaged goods and recycling industries which operate in a national market. Waste management arrangements differ substantially across jurisdictions and across municipal and commercial settings. The projected increase in the rate and complexity of packaging waste is likely to challenge existing local government capacity.

While in some cases differences may be appropriate to address specific geographic and demographic factors or to account for other relevant legislative frameworks operating, such as planning laws, in other cases they may be a result of historical circumstances. A fragmented jurisdictional approach to regulations that targets different packaging materials, life cycle stages or environmental impacts creates uncertainty about government policy. This can dampen the climate for business investment and increase the complexity and costs of government administration and business operations, leading to market impediments (EPHC 2009, EPHC 2010b). A fragmented approach can also compromise genuine outcomes by shifting attention from the environmental impacts of one type of packaging material to another or from one phase of the life cycle to another, instead of a holistic approach (OECD 2012).

2.4 NON-REGULATORY INITIATIVES IN AUSTRALIA

Voluntary initiatives operating to address packaging waste indicate that legislation is not the only driver to change recycling and litter behaviour. These include industry-led sustainable packaging initiatives and networks, such as the Sustainable Packaging Alliance, and non-government organisations (NGOs) such as Keep Australia Beautiful, Clean Up Australia and Planet Ark which undertake litter clean-up and recycling programs, community education campaigns and awards to encourage consumers and businesses to reduce waste and litter and increase recycling.

The Packaging Stewardship Forum (PSF) is a voluntary mechanism which delivers recycling, litter reduction and education programs on behalf of members who are large beverage companies and their packaging suppliers, including recycling bin infrastructure. The Plastics and Chemicals Industry Association's *Sustainability Leadership Framework for Industry* (PACIA 2008) assists industry to transform practices in moving towards a 'zero waste' goal. It participates in international moves to reduce accidental discharges of plastic pellets (a manufacturing feedstock) from sites which contribute to marine debris.

A key driver of industry actions to reduce the environmental impacts of packaging both within Australia and internationally are the associated commercial benefits that can be achieved through coordination, such as lowered manufacture, transport and supply chain costs (Consumer Goods Forum 2013, SPC 2011, Wal-Mart 2006, Green Retail Decisions, 2011). In addition, national surveys indicate a consistent, growing trend of community support for expanding recycling availability in public places and workplaces (EPHC 2010b, ABS 2009, Pollinate Green Research 2007, Ipsos Australia 2004). According to research undertaken for the mid-term review of the APC, 60 per cent of consumers believe there is not enough emphasis on reducing the environmental impacts of packaging and 40 per cent think this is because too much packaging is used (OmniAccess 2008).

ABS statistics also show strong household engagement with kerbside recycling with this being the most common way for households to recycle paper, cardboard or newspapers (94 per cent), glass (94 per cent), aluminium cans (91 per cent), steel cans or tins (96 per cent) and plastic bottles or containers (93 per cent) (ABS 2012a).Surveys about CDS schemes also find a high level of community support, especially in South Australia. A 2012 national Newspoll survey showed 82 per cent of respondents were in favour of CDL (Boomerang Alliance, 2012), which is consistent with other survey results. A 2012 study commissioned by the SA Government showed 99 per cent of South Australians supported their container refund scheme, and 98 per cent supported the introduction of a similar national scheme (Harrison Research 2012).

This widespread community support for recycling generally will be a factor in the success of any of the options presented in this Decision RIS. However, stated support cannot always be assumed to translate into participation and consumers are not in a position to reduce environmental impacts across all segments of the packaging supply chain, particularly in commercial and business settings away from home.

3 NATURE AND EXTENT OF THE PROBLEMS

3.1 WHAT PROBLEMS ARE BEING ADDRESSED?

The problems addressed in this Decision RIS are that, notwithstanding incremental improvements in the recycling rates for packaging overall and declines in litter rates, the treatment of used packaging in Australia is subject to a number of market failures which are most evident where packaging is consumed in business/commercial settings and in public places. In addition, there is a potential risk of further fragmentation in the regulatory arrangements for used packaging which adds to business costs.

This Decision RIS examines the extent to which there are net benefits to be gained by adopting additional policy interventions to reduce litter and promote further growth in the recycling of packaging by addressing the market failures operating for used packaging and by reducing the market uncertainty around further regulatory fragmentation.

Regardless of the presence of a market failure, increasing recycling may not be the most efficient outcome in all circumstances and the costs of recycling packaging may outweigh the benefits, particularly where recycling rates are already high and any further increases would face high marginal costs. In those cases, it may be that recycling is already at an 'optimal' level within current settings and technologies. It is, however, recognised that potential benefits can be derived from improving the use of materials at end of life so as to capture the value which would otherwise go to 'waste'[3]. While all materials will eventually reach the end of their useful or economic life, there is a cost to society when material is disposed of in landfill if its residual value could have been captured at a total cost which is lower than the benefits, including that residual value.

As outlined in Chapter 2 and Attachment A, overall recycling rates for used packaging have risen since 2003 and in some sectors and for some materials they are already high. In particular, public investment in municipal recycling and kerbside infrastructure has driven higher recycling rates in residential settings ('at home') for most packaging material types compared with non-residential settings ('away-from-home'). As shown in Table 1, recycling rates for glass, plastic and steel can packaging waste in business settings and public places are less than half the rates for these same materials at kerbside. The one exception is paper and cardboard recycling which has specific characteristics driving high recycling across both residential and away-from-home settings: high volumes and homogenous nature; concentration in easily accessed collection points; and ease of capturing the recyclate value. When the impact of paper and cardboard is excluded, the overall national packaging recycling rate is just 37.2 per cent across all sectors (consisting of an at-home recycling rate of 52.5 per cent and an away-from-home recycling rate of 25.3 per cent).

This indicates barriers to recycling these other materials, particularly away from home, due to factors such as dispersed collection points, lack of business awareness and recycling services that are driven by commercial incentives and thus may not service all areas (see Chapter 2). For this reason, the

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[3] The Allen Consulting Group, *National Waste Policy, Regulatory Impact Statement*, October 2009, page vii

Decision RIS focuses on how the identified market failures manifest in the away from home sector and opportunities which may exist to address them.

TABLE 1: ESTIMATED CONSUMPTION AND RECYCLING SPLIT BY LOCATION AND MATERIAL TYPE 2009–10

	AT HOME		AWAY FROM HOME	
Class	Consumption (tonnes)	Recycling (per cent)	Consumption (tonnes)	Recycling (per cent)
Glass	743,000	53.8	248,000	26.6
Plastics	232,000	51.7	333,000	23.1
Steel cans	95,000	37.0	41,000	14.6
Aluminium cans	25,800	77.5	25,800	57.3
Paper/cardboard	529,000	75.6	2,151,000	75.5
Weighted average		**60.0**		**63.9**

Source: PwC, WCS 2011, pp. 73–87.

The types of market failures identified are:

- Businesses and individuals who use/consume packaged products do not face strong financial incentives to recycle the residual packaging rather than to landfill or litter it. This is because they are not in a position to capture all the benefits of recycling, nor do they bear the costs—an illustration of *positive externalities*.

- Packaging suppliers do not pay for packaging disposal. This means that they face no financial incentives to make changes to the nature of packaging which would maximise its recyclate value, drive recycling at end of life and reduce litter impacts. This is because they are not in a position to capture this value when packaging is discarded – an illustration of *split incentives*.

- Differing arrangements and apparent confusion around what is able to be recycled in different systems leads to unintended contamination of recycling which increases costs—an illustration of *imperfect information*.

- Carbon emissions from landfill arise from the discarding of certain packaging materials such as cardboard and hence there are non-market environmental benefits from recycling—that is, recycling reduces a *negative externality of landfill*. By contrast, landfill use costs and resource values forgone when any packaging goes to waste are accounted for via their market values, and are not an *externality*.

- The collection and recycling of packaging waste is a sector that is characterised by a significant reliance on infrastructure. To the extent that it is not efficient to duplicate this infrastructure, the recycling industry may exhibit declining marginal costs, or increasing returns to scale. To the extent that these are present in the collection and recycling sectors, these aspects of the packaging supply chain may exhibit natural monopoly characteristics. Efficient policy would therefore need to recognise the risk that new policy initiatives aimed at enhancing recycling outcomes in one area could raise costs or 'cannibalise' existing efforts in some other area.

- Littered packaging harms community amenity and negatively impacts on human health (for example, broken glass) and on marine wildlife and ecosystems (for example, ingestion of plastics)—a *negative externality of pollution*.

In addition to these market failures, there are potential regulatory failures for used packaging which drive impacts on consumers and taxpayers (as higher business compliance costs and higher government administration costs are likely to be passed on to them):

- increased fragmentation of regulatory arrangements has ongoing impacts to businesses operating in a national market
- ongoing uncertainty around possible regulatory interventions increases business uncertainty, which can have the effect of discouraging investment and innovation.

To the extent that these problems prevent markets from functioning well, the result would be that some packaging does not get recycled even though it would generate a net community benefit if it did. This leads to a recycling rate below the efficient level and results in a higher rate of litter than would otherwise occur. In addition, regulatory fragmentation, or the threat of it, has a dampening effect on business and imposes costs on businesses operating in a national market, which places upward pressure on the price of affected consumer products. More detail on these problems is in Attachment B.

THE MARKET FOR RECYCLING OF USED PACKAGING

As outlined in Chapter 2, the market for used packaging is complex—packaging waste arises in a wide range of settings, including residential, commercial and public places and it is generated at a number of stages along the distribution, transport and retail sale supply chain. While packaging continues to grow in absolute terms, the nature of packaging types and materials is becoming more diverse. Packaging has experienced rapid change over recent years as businesses seek to make savings in transport, storage, handling and materials and to embrace international trends around consumer preferences. An individual product can be subject to various levels and types of packaging—from the point at which it leaves the factory in pallet-size lots, to store-ready multi-packs and finally to the individual product packaging at point of final consumption. At each stage in the supply chain packaging waste is generated, however the arrangements and incentives to manage this waste differ. Likewise, packaging waste is not managed uniformly across or within jurisdictions.

Because disposal of packaging waste is handled differently in the various settings in which it occurs, the impact of the market failures also varies. The impact of market failures is most apparent where waste is generated in business or commercial settings, at events or in public places. In these settings relationships regarding disposal are generally on a one-to-one basis with decisions regarding waste collection and recycling services relying on individual contract details, the extent of suitable infrastructure or the capacity to access new infrastructure. In addition, litter is generated by consumption away from home and its impacts are felt in public places and the natural environment.

By comparison, since the late 1980s households have benefited from substantial state and local government investment in comprehensive kerbside recycling services. These services provide convenient recycling to 94 per cent of residences in Australia (ABS 2012a) and allow for substantial economies of scale for recyclate value to be captured, largely addressing market failures in this sector. The lower recycling rates which are achieved for a range of packaging materials in away from home/commercial settings as opposed to those same materials in residential/household settings is evidence that market failures continue to operate where packaging waste is generated by businesses or in public places.

MARKET FAILURE PROBLEMS

Recycling of used packaging is a service which is substitutable for alternative disposal paths such as landfill and litter. Recycling involves a range of costs (such as collection/transport/processing) and a range of market benefits (such as the market value of recyclate and the costs avoided by not needing to landfill it) [see Appendix X on the CBA methodology]. If all these costs and benefits fell on the parties to a transaction then they would settle on the quantity of recycling at which the net benefit was maximised.

However, the identified market failures mean that in many cases recycling requires parties who are unable to capture all of the market benefits (financially) to bear some cost such as additional sorting of their waste—identified as failures deriving from split incentives. Likewise, some of the benefits of recycling (such as reduced landfill emissions) fall on parties outside the transaction—identified as market failures due to externalities.

These market failures all distort the recycling market in the same way: they contribute to the future quantity of packaging recycling under present policy settings (estimated to be 72.5 per cent in 2035) being lower than the efficient level (that which would prevail if all direct economic benefits could be captured by market participants). This is not to suggest that the benefits of recycling packaging will outweigh the costs in every circumstance and every location, nor that an efficient level of recycling is 100 per cent. Further detail on these market failures is in attach x.

INCREASED FRAGMENTATION IN JURISDICTIONAL APPROACHES

Currently, policy and regulatory frameworks surrounding waste differ across Australia, particularly in regard to the management of beverage container waste which is subject to specific mandatory refund regulation in two jurisdictions. To the extent that fragmented arrangements present impediments to the efficient operations of businesses trading packaged products in a national market, further fragmentation will lead to increased costs. The threat of further fragmentation increases business uncertainty.

Industry submissions highlight the potential for ongoing and increased costs from continuing and increasing fragmentation in policies, particularly from lack of co-ordination on product-specific arrangements[4]. The 2009 National Waste Policy Decision RIS estimated the add-on administrative cost

[4] An issue canvassed in a number of submissions from industry groups to the 2009 National Waste Policy RIS and the 2011 Packaging Impacts Consultation RIS

associated with jurisdictional duplication of about $29 million (NPV) per product stewardship regulation over a 20 year timeframe[5].

Pressure for state-specific arrangements largely arises from an absence or perceived absence of credible and effective national approaches. One driver of regulatory intervention at the state level is that current policy frameworks do not sufficiently address community concerns for better management of packaging waste, particularly packaging litter. These community concerns have been identified as non-market values for increased recycling and reduced litter[6].

Without a strengthened national approach to managing packaging waste and litter, there is a risk of further differences in jurisdictional approaches emerging, such as the introduction in 2012 of a CDS in the Northern Territory. This scheme has design features that differ from the scheme operating adjacent to it in South Australia, imposing additional costs on beverage producers and consumers[7].

The impact of increased fragmentation in jurisdictional regulatory approaches is likely to be shared by business, governments and consumers in the form of higher compliance costs for businesses, higher administration costs for governments and consequential pass through of these costs to consumers and taxpayers. In addition, the threat of increased regulatory intervention brings additional uncertainty for businesses that operate in, or would consider entering, the affected market. This is likely to deter some productive investments, meaning that some innovations (in product or price) that could occur may not do so.

CONCLUSION

Policies to address the market failures – which are currently most evident away from home – may aim to address the split incentives problems and landfill externality problem by investing in systems that make it convenient for business and individual consumers of packaging to choose to recycle, and for waste managers (generally the local government sector and the C&I sector) to capture the market value of that recyclate and reduce landfill costs. They also aim to address the problem of litter externalities by investing in opportunities to reduce the incidence of littering such as bin infrastructure, education and surveillance.

The cost benefit analysis described in Chapter 7 concludes that policy options which combine low regulation/administration costs with a flexible approach to investing in recycling opportunities (in concert with existing infrastructure and patterns of packaging usage) have significant net benefits, and retain a benefit even under pessimistic assumptions.

[5] The Allen Consulting Group, *National Waste Policy, Regulatory Impact Statement*, October 2009, page 83.

[6] These non-market benefits were difficult to quantify with sufficient confidence and therefore have not been included in the main cost-benefit analysis conducted for this Decision RIS. A discussion of the results of studies designed to quantify non-market benefits appears in MJA 2013c, Attachment M, page 31-33.

[7] See http://newsroom.nt.gov.au/index.cfm?fuseaction=viewRelease&id=11970&d=5 and http://newsroom.nt.gov.au/index.cfm?fuseaction=viewRelease&id=10860&d=5.

4 OBJECTIVES OF GOVERNMENT ACTION

Australian environment ministers agreed to progress this Decision RIS to address Strategy 3 of the National Waste Policy.

Under the National Waste Policy governments' committed to take action to better manage packaging, address market impediments and take responsibility for reducing the environmental, health and safety footprint of products.

In line with this, the government objectives guiding this Decision RIS are to address market failures affecting packaging waste and litter and identify cost-effective opportunities to increase recycling and reduce litter where these actions provide benefits to the community.

5 CONSULTATION

Extensive stakeholder consultation has been undertaken throughout the Packaging Impacts RIS process and all feedback and data received has been given due consideration. There was a high level of engagement across a wide range of stakeholders, including:

- individuals
- local government
- state and territory governments
- NGOs, such as environment groups
- packaging manufacturers
- food, beverage, fast food and retail industries (packaged goods industries)
- waste management and recycling industries
- other industry sectors using packaging including tobacco, electronics and publishing
- umbrella organisations representing a broad range of industry sectors.

Consultation took the form of stakeholder workshops, a formal consultation process including information sessions, and one-on-one engagement with key stakeholders. As a result of consultation, three additional options were included in the Decision RIS. The consultants undertaking the economic analysis also attended workshops, which enabled stakeholders to pass on up-to-date sources of primary data.

Attachment C has more detail on the consultation process and feedback.

5.2 CONSULTATION FEEDBACK

Key points of feedback are outlined below by topic.

NATURE AND EXTENT OF THE PROBLEMS

Many submissions stated that the packaged goods industries (generally businesses that manufacture or sell a packaged product) lack sufficient incentive to reduce their use of packaging and to use recyclable materials in their packaging. Packaging design was identified by a recyclers association as the single largest barrier to increased recycling rates (ACOR 2012, p. 4). This feedback indicates a split incentives problem in the relationship between packaging design and end-of-life recyclability and litter potential. A few submissions acknowledged the positive steps taken by the APC to date, but felt the level of overall industry investment and accountability was still too low and questioned the overall effectiveness of individual firms' APC action plans. Local government submissions also emphasised the costs they bear in addressing downstream impacts of packaging litter, such as litter clean-up in public places. This reflects a split incentives problem whereby producers of packaging do not pay for its disposal, including when it is littered. Instead, the cost of litter clean-up is transferred to others such as local government.

Litter was another key concern, due to its negative impacts on civic amenity and tourism, environments and wildlife, public safety and convenience and the costs of litter clean-up. Packaging litter was seen to be driven in large part by consumption of packaged goods in public places. These concerns were factored into the CBA analysis by assuming a stronger relationship between public place consumption of packaged goods and its subsequent disposal as litter, and by considering how the options would impact on consumers' propensity to litter. For example, CDS provides a financial incentive to consumers to not litter beverage containers.

Submissions from local government and the packaged goods industries noted that education and behaviour are key factors in littering as well as infrastructure. The Decision RIS modelling has therefore accounted for education expenses to support all options. Stakeholders at the Decision RIS workshop also questioned whether litter clean-up costs would significantly reduce as a consequence of the options, as non-packaging litter such as cigarette butts remain prominent. In response, the assumption that councils incur fixed costs from operating litter clean-up services was considered in the modelling. Evidence also supported a similar assumption that despite a projected decline in recyclate volumes going into kerbside bins under CDS options, local government would still be required to continue a minimum level of bin collections.

Submissions from industry groups stated a preference for minimal regulatory intervention and more flexible arrangements such as the current NEPM and APC co-regulatory framework, rather than legislated mandatory approaches. Some of this feedback was based on the view that the current APC arrangements are adequate due to the projected recycling rates in the Consultation RIS (SCEW 2012a, p. 5). However recycling projections used in the Consultation RIS were revised substantially downward for the Decision RIS, with broad stakeholder agreement that they were overly optimistic (see discussion in the next section).

Industry submissions noted that improved packaging recycling is contingent on a range of external factors, and any regulation needs to be resilient and adaptable to significant changes in those factors. The sensitivity analysis in the Decision RIS tests the options for their resilience to changes in key assumptions, such as material prices.

BASE CASE

Submissions by the SA Government, a number of NGOs and industry associations, and comments at public forums considered that the Consultation RIS overestimated future recycling and litter outcomes in the base case without additional intervention (SCEW 2012a, p. 6). Submissions cited uncertainty around factors which impact on recycling rates such as future infrastructure and community education activities, and the uncertain and varied policy environment. They also questioned whether an increase in the overall recycling rate can necessarily be assumed to lead to an overall reduction in litter.

In response, the base case assumptions and data were revisited during Decision RIS consultation and evidence supported a more moderate estimate of base case performance in the absence of additional intervention. New data from primary industry sources about beverage container consumption also led to revisions. In addition, assumptions were refined to clarify that the relationship of recycling to litter volumes primarily relates to accessibility of waste and recycling infrastructure in public places.

IMPACTS OF OPTIONS

Potential impacts and risks of the options identified by stakeholders were addressed where appropriate in the modelling. In particular, feedback on administrative, compliance, enforcement, data collection and reporting costs for governments and industry informed CBA assumptions. Concerns raised about design efficiencies were reflected where possible in amendments to option designs.

IMPACTS OF OPTION DESIGN

TABLE 2: POTENTIAL IMPACTS OF OPTION DESIGN

Potential Impacts Raised	Modelling
Option 1: risk of inefficiency and duplication of efforts.	Addressed by collaboration in option design.
Options 2a, 2b and 2c: additional compliance and enforcement/data collection/reporting costs for governments and industry; flexibility and efficiency in industry delivery; complements existing efforts; and increased glass recycling efficiencies.	Feedback on administration and compliance costs informed assumptions in the CBA. Increased efficiencies likely from option design.
Options 2a, 2b, 2c, 2d, 3: weight-based producer fees or a weight-based tax burden could provide financial incentives to producers to alter packaging designs to lighter weighted materials which may not be readily recyclable.	This is possible, but such 'second-order' economic effects are not modelled in the CBA. Also, the scale of such financial impacts on each individual producer is very small relative to the value of products they bring to market.
Option 2d: increased compliance/enforcement costs for governments and industry; potential 'opportunity cost' for core beverage industry business; lower local government costs; greater beverage industry responsibility for capital infrastructure and operational costs; and flexibility and efficiency in industry delivery.	Feedback on administration and compliance costs informed assumptions in the CBA. Modelling did not include an opportunity cost (from focus on recycling). Modelling included costs for the beverage industry for capital infrastructure and operations.
Option 2e: costs/benefits similar to 2a–2d; compliance/ enforcement costs generally lower under the NEPM as it is the current national framework.	Feedback on administration and compliance costs informed assumptions in the CBA.
Option 3: potential for market distortions based on packaging weight's influence on the fee; and greater administration and compliance costs for government.	Potential market distortions cannot be accounted for in the CBA; they are an implementation consideration. Feedback on administration and compliance costs informed assumptions in the CBA.
Options 4a, 4b 4c: increased administration and compliance costs for governments, industry and retailers; potential market distortions between beverage types; increased beverage prices for consumers; and local governments would have: reduced recyclate income for local governments; reduced collection costs; transitional costs in metropolitan areas; reduced contamination and processing costs for recyclate.	The CBA drew on a material flows analysis and data from industry sources and governments to model appropriate CDS costs at a national level for all options. The CBA analysis includes loss of producer surplus impacts on beverage producers.
Option 4a: additional labour costs, floor space opportunity costs and occupational health and safety costs to retailers due to requirements to install RVMs; retailer sales gains from RVM vouchers.	The CBA drew on data from industry sources to estimate retailer costs. An assessment of option 4a's financial flows in relation to a deposit surplus fund was also conducted on stakeholder request.

IMPACTS ON STAKEHOLDERS

Industry sector

Representatives from relevant industry sectors were concerned about distributional impacts from the CDS options such as increased beverage prices impacting demand for products, market distortions between beverage types and labelling requirement impacts on importers. It was also noted that there is potential for retailer sales gains through reverse vending machine vouchers (particularly option 4a).

Industry representatives expressed the view that the ability of producers, suppliers, manufacturers, and retailers to 'pass on' the costs/liabilities of a range of options is limited by factors such as market power, economies of scale, and levels of competition. The Decision RIS modelling notes that such factors are likely to be short run and assumes that under all options the costs to industry are passed on to consumers. Some industry feedback also indicated a belief that employment would be negatively affected by CDS impacts, while other stakeholders suggested a CDS would create many new jobs in the recycling industry. The Decision RIS modelling analysed the diversion of resources from other economic functions to a CDS (including jobs) but assumes the jobs created are fully offset by reduced employment in other sectors of the economy and there is no net increase.

There were also concerns that under mandatory recycling targets liable industry parties could bear a range of macroeconomic risks, such as unexpectedly high scheme costs if the value of recyclate decreased, placing pressure on recycling outcomes. This risk is examined in the CBA sensitivity analysis.

Local Government

Submissions from local government indicated a range of views and provided several studies of the projected impacts of CDS on existing kerbside systems and landfill and litter clean-up costs. Local government submissions generally indicated a belief that a CDS would reduce costs by providing refund revenue from those beverage containers remaining in kerbside. However other analyses indicated that a CDS would result in an overall loss of revenue due to the reduced overall volumes of beverage container recyclate in kerbside bins. A study prepared for and submitted by the National Packaging Covenant Industry Association concluded there will generally be a negative overall impact for metropolitan/urban local councils and generally a positive overall impact for regional local councils (Equilibrium 2012). This view was both supported and contested by other councils based on varied local circumstances. The Decision RIS modelling assessed the available evidence and used a Material Flows Analysis to analyse the impacts of recyclate value, sorting and other cost drivers for local government under the CDS options.

A large metropolitan local council highlighted that a CDS scheme would not address broader issues such as difficulties with access to recycling services and the high cost of providing recycling services to high rise apartment buildings and small-to-medium businesses in city centres. These issues result in lower recycling rates from these sources. Concerns were also raised about the impact of the bin infrastructure component of option 2b, which could increase costs to local governments through high contamination and ongoing maintenance costs. It was noted that the cost of servicing more bins is high and was underestimated in the Consultation RIS.

Individuals/consumers

Consumers play an important role in making packaging consumption, recycling and littering decisions. Stakeholders considered it likely that increased costs to local government would be passed on to ratepayers, and industry costs would be passed on to consumers. In addition regulatory requirements such as labelling and registration of products can create barriers that lead to less consumer choice in small markets like the NT. These impacts and other consumer costs such as transfers incurred by failing to redeem container refunds and participation costs incurred while redeeming container deposits were analysed based on observed values.

The majority of individuals sending submissions and CDS campaign letters stated a belief that any CDS price increase would only be 10 cents per container, equal to the value of the deposit. Campaign submissions stated that the net cost of such a scheme would be less than half a cent per container. However, analysis of existing CDS systems determined that there are a range of observed costs, including handling costs, which informed the modelling.

CONTAINER DEPOSIT SCHEMES

Stakeholder views were diverse in relation to CDS, with generally high levels of support from individuals and environment groups, low support or opposition from the majority of industry submissions and mixed views from local government and the waste and recycling industry.

Around 3,000 campaign submissions supported a national CDS in Australia to tackle beverage container waste and litter. These submissions did not comment on the details of the CDS options being investigated through the RIS process and how they would operate. They stated overall positions and preferences based on campaign pro formas. Many (107) substantive submissions from individuals also generally supported a CDS as an effective way to reduce beverage container litter and some noted that it would reduce the cost burden to local governments of litter clean-up services and landfill.

Many submissions cited participation in previous beverage company schemes to return refillable bottles in Australia, and opportunities for charities to fundraise and children and low-income people to earn pocket money, as positive features of CDS. However previous bottle return schemes were not regulatory and hence operated differently to the CDS options currently under consideration. Consequential fundraising opportunities are also outside the stated policy objective of a CDS, which is to reduce the environmental impacts of beverage container waste and litter.

The Decision RIS modelling has accounted for the cost impacts of CDS options raised by stakeholders, based on observable evidence.

Boomerang Alliance (the proponent of option 4a) stated that the Consultation RIS overestimated costs and underestimated potential benefits of this option. They also identified that the option 4a analysis did not include the ‘unclaimed deposit’ fund to incentivise domestic recycling, an element of this model. This feature has been modelled in the Decision RIS financial assessment of the CDS options.

A number of substantive submissions from individuals and state and territory governments commented on the high recycling rate and low litter rate for beverage containers in SA as evidence that its CDS is working. Many of these submissions suggested that the SA CDS should be used as a model for a national approach due to its success and longevity. However one confidential submission from the recycling industry described the SA CDS as unnecessarily complex and said there are high costs associated with the scheme as a result.

In response to the feedback to model a working scheme, the Decision RIS includes the new option 4c, which has been analysed using available evidence of the performance, costs, benefits and legislative provisions of the existing SA scheme.

6 OPTIONS

The ten options outlined in this chapter are used as the basis for the CBA modelling. They reflect option descriptions from proponents and refinements where necessary. Each of the options seeks to address the problems identified in Chapter 3 and achieve governments' stated objectives in Chapter 4.

The options differ in terms of the extent of regulation that is involved and the type of packaging they seek to address. The CDS options (4a to 4c) and option 2d specify obligations for beverage containers only, while the remaining options seek to address all packaging,

Option 1 is the only option which does not involve regulation. The nature of the regulation for the other options differs as follows:

- Options 2a to 2d are variants of an industry product stewardship approach that involves replacing the current APC/NEPM mechanism with a product stewardship arrangement under the *Product Stewardship Act 2011.* Under these options, the legislation specifies the outcomes to be achieved but leaves industry to seek the best way to achieve them. In order for the recycling targets to be met under which there are obligations on packaging brand owners to join co-regulatory arrangements which are in turn responsible for meeting hard recycling targets. Under this design the legislation specifies the outcomes to be achieved but leaves industry to seek the best way to achieve this.
- Option 2e is an expansion of the current industry co-regulatory arrangement of the APC underpinned by the Used packaging Materials NEPM. Under this design industry would invest substantially more than currently under the APC in a range of projects and initiatives to increase recycling and reduce litter
- Option 3 imposes an up-front tax on packaging which will collect a levy to fund a range of projects and initiatives to increase recycling and reduce litter
- Options 4a to 4c are variants of container deposit schemes. The legislation prescribes either an upfront deposit (option 4a) or a mandated refund amount (option 4b and 4c) to be funded by the beverage sector.

Detailed option descriptions are provided at Attachment I.

The performance of the options in achieving outcomes is assessed in the CBA in terms of how they would perform relative to a 'base case' scenario.

BOX 1: THE BASE CASE

The base case refers to the projected performance of the continuation of current arrangements across Australia to deal with packaging recycling and litter prevention. These include the operation of kerbside collection across Australia by local governments, government initiatives including the National Waste Policy and existing CDSs operating in South Australia and the Northern Territory, other state and territory policies such as landfill levies and bans, product bans and waste and litter strategies, industry/government initiatives such as the Australian Packaging Covenant, and industry initiatives such as the Packaging Stewardship Forum and other private sector actions.

6.1 OPTION 1: NATIONAL PACKAGING WASTE AND LITTER STRATEGY

Option 1 involves a national government strategy to improve the recovery and recycling of packaging waste and reduce packaging litter. It seeks to address the problems due to imperfect information resulting from lack of consistency of approach and leading to reduced recycling and poor litter outcomes, including in relation to marine debris. To the extent that it also reflects a coordinated jurisdictional approach it also seeks to address the problem of increased fragmentation of jurisdictional approaches.

APPROACH/IMPACT

This is the only option that includes no new form of regulation, instead adopting a collaborative approach of improving coordination of state, territory and local government actions. These actions would include continued support for activities identified as part of the base case, including existing jurisdictions' initiatives and policies, the Australian Packaging Covenant, industry initiatives such as the Packaging Stewardship Forum and other private and NGO sector recycling and litter initiatives.

The option is designed as a low cost approach to deliver modest improvements through improved government collaboration. The primary focus of the strategy will be on current activities and the use of current infrastructure, such as kerbside systems and away-from-home bin networks and supporting the capacity of MRFs, for example by providing targeted information and advice to consumers to reduce contamination and increase recovery, and sharing information across governments. It does not contemplate substantial additional programs or actions.

Elements of the strategy may include:

- a national litter methodology for consistent measurement and monitoring of litter rates
- coordinated programs to increase away-from-home recycling at mass consumption areas
- coordinated litter campaigns
- consistent labelling of recycling bins
- voluntary standards for end products and packaging labelling to highlight recyclability
- a coordinated education initiative aimed at litter prevention.

FUNDING

The cost of option 1 will be funded from additional government resources to the year 2020, with no additional financial impact on industry beyond what currently exists in the base case. Costs under this option will involve a mix of administrative (data collection and coordination, standards development), and some limited program funding (labelling schemes, away-from-home recycling programs), advertising (litter campaigns) and infrastructure investment costs.

6.2 OPTION 2: CO-REGULATORY PACKAGING STEWARDSHIP

The five co-regulatory options presented under option 2 seek to improve existing outcomes through an enhanced product stewardship approach for industry to address the market failures identified. They also seek to address the risk of increased fragmentation in jurisdictional approaches through a national approach.

Four of the five options (2a-2c and 2e) address problems across all packaging materials, with increasing levels of industry action and funding, while option 2d addresses problems in relation to beverage containers only. To the extent that options 2b and 2c also include a component specifically addressing beverage containers in away from home settings, these options seek to specifically address concerns about beverage containers in the litter stream.

APPROACH/IMPACT

All of the options take a co-regulatory product stewardship approach by which industries that produce or use packaging take greater responsibility (stewardship) for the environmental impacts of packaging. It encourages approaches which do not solely rely on end-of-pipe solutions, as the industries are best placed to develop innovative solutions to reduce usage and improve recyclability. They envisage industry providing funds for investments in projects and actions that will stimulate market recycling activities.

The options differ in their regulatory approach, level of industry commitment and the scope of packaged goods covered. For option 2d these requirements would be applied to beverage containers only, while the other options cover all packaging types.

Options 2a to 2d involve replacing the current APC/NEPM mechanism with a product stewardship arrangement under the PS Act. The practical impact of this is that targets would be set in regulation and the current whole-of-supply-chain involvement of the packaging sector in the APC would be replaced by 'prescribed parties' in the legislation which will comprise only those parties which bring packaging to market.

- Under option 2a the current packaging recycling, litter reduction and sustainable design commitments of industry under the current APC/NEPM framework transition under the co-regulatory provisions of the PS Act. This is not intended to impose on industry any increase over current recycling and litter targets identified by the APC, however as noted above it is anticipated that the regulatory nature of the targets will drive improved delivery of the targets.
- Option 2b is based on the proposal for a National Bin Network developed by the Packaging Stewardship Forum/Keep Australia Beautiful. It builds on option 2a and has an all-packaging target plus an 'added-on' component to focus on away-from-home beverage container recycling, a packaging litter reduction target and targeted initiatives on beverage containers and glass market development. This would involve additional funds being spent on initiatives and projects to address these areas. A specific additional beverage container target would be a feature of the regulation under this option.

- Option 2c further builds on the commitment from industry groups under option 2b, to include a higher regulated packaging recycling target for co-regulatory arrangements in addition to the beverage-only target in option 2b. To meet these higher regulated targets there will be a need for further increased industry investment.
- Option 2d focuses solely on beverage container recycling and litter and is designed as a response to this being identified through public consultation as a key problem area. It also provides a comparison for the CDS options in terms of mechanisms to address the beverage container component of packaging waste. Under this option the 'liable parties' identified under the legislation would be beverage manufacturers only – a subset of the broader packaging sector. This option puts the onus on the beverage sector to take responsibility for product brought to market by achieving a national beverage container recycling rate which would be set by regulation.

Option 2e retains the current co-regulation and builds on the current whole-of-supply chain APC approach underpinned by the Used Packaging Materials NEPM, with increased industry investment in initiatives to address the problems and meet performance goals. It is designed on the operations of the existing APC and operates through an industry-government agreement. A substantial increase in the level of industry funding will be used to invest in a range of on-ground projects to address infrastructure gaps, data gathering activities and research and development designed to improve packaging design, increase recycling capability and address market impediments.

This option differs from the options under the PS Act in that there are no mandatory targets set in regulation. However the current APC sets and reports against publicly available performance targets and Industry, government and community representatives on the APC Council monitor its performance. Brand owners who fail to comply with APC requirements are referred to jurisdictions for enforcement under the relevant NEPM.

IMPACT

The recycling targets modelled for options 2a to 2c rise as the level of commitment from industry increases and are designed to build on the recycling already being undertaken by parties outside the packaged goods industry (such as local government and businesses). For 2d the target takes account of the fact that this is a beverage container approach and involves the beverage industry achieving full stewardship of beverage containers.

Option 2e outcomes are set in the industry-government agreement. The scheme has been modelled to deliver a national recycling rate for all packaging of up to 76.4 per cent by 2020.

All of the options incorporate a litter reduction plan or obligation to reduce litter.

FUNDING

These options are industry funded. For options 2a to 2d, CAs would charge fees to their members reflecting their costs to meet targets. For option 2e an annual industry investment amount would be agreed and committed upfront. A range of lower, middle and upper investment profiles have been modelled for this option, expressed in the option descriptions as $20 million, $35 million and $50 million per annum (see Attachment I).

6.3 OPTION 3: MANDATORY ADVANCE DISPOSAL FEE

Option 3 involves the collection of an advance disposal fee (ADF) on all packaging materials by government and its revenue would be earmarked to fund packaging recycling and litter initiatives. The option seeks to reduce packaging waste being sent to landfill, by influencing producer choices about the amount and type of materials in packaging. It seeks to address the market failures associated with split incentives for producers of packaging to bear the costs of packaging disposal and externalities associated with landfill and litter. To the extent that this would lead to enhanced outcomes it also seeks to address the risk of increased fragmentation in jurisdictional approaches.

APPROACH/IMPACT

This option uses mandatory regulation in the form of taxation. The ADF would be a weight-based fee per tonne of packaging materials. Different types of material would attract a different ADF, based on the weight per tonne of packaging materials brought to market. The rate at which the fee would apply to different types of packaging materials would be determined during implementation through consultation, with a view to ensuring fair and equitable contributions. Depending on the final design of the ADF there are a number of ways that it may meet intended outcomes, including:

- source reduction by packaging manufacturers and brand owners (due to the increased cost of packaging)
- reduction in consumption of packaging (due to the increased cost of packaging).

FUNDING

The ADF would be collected by government and its revenue earmarked to fund various packaging recycling and litter initiatives. For example, funds could be employed to implement actions described under Option 1, but on a significantly increased scale.

6.4 OPTION 4: MANDATORY CONTAINER DEPOSIT SCHEME

Option 4 includes three options for a national Container Deposit Scheme (CDS). A CDS increases beverage container recycling and reduces beverage container litter by providing a direct incentive (10 cent refund) for the return of used beverage containers. These options seek to address market failures associated with the split incentives for businesses and individuals to recycle containers and the negative externalities associated with litter. To the extent that a national CDS would be implemented, these options seek to address the risks of further jurisdictional fragmentation.

Option 4a was developed by the Boomerang Alliance. Option 4b, the Centralised Container Refund model, is based on case studies of international schemes, particularly in British Columbia, and analysis of a potential Australian CDS by Martin Stewardship and Management Strategies (MS2 2011). Option 4c is based on national application of the existing South Australian CDS.

APPROACH/IMPACT

All of the CDS options would operate under mandatory legislation of Commonwealth and state parliaments, and target both at-home and away-from-home recovery, recycling and litter reduction by introducing a refund on specified beverage containers.

Due to the focus on beverage containers, the options have limited application to broader litter recovery and prevention. However, there may be co-benefits from recycling other packaging materials where consumers use approved collection depots for this purpose. The potential for co-benefits is assessed in the CBA. Options 4a and 4b have the same objective of an estimated 77.5 per cent container return rate by 2020 and cover the same set of containers. Option 4c is based on SA's current product coverage and excludes some containers and as such aims to achieve a 76.0 per cent container return rate by 2020.

The legislation and/or regulations that would underpin each CDS model differ based on whether a deposit model or refund only model is used, and on the types of mandatory requirements placed on brand owners, depots and retailers to facilitate a beverage container collection system.

- Option 4a involves an upfront 10 cent levy per container (deposit) payable by beverage companies and importers based on product brought to market. This creates a fund, from which 10 cent refunds for the return of the containers are paid, as well as scheme administration costs. Any surplus in the fund (from unredeemed containers could be used for additional recycling and litter initiatives.
- Option 4b also involves an upfront levy per container, but the amount of this levy would be determined by the forecast total costs of the system and adjusted as necessary from year to year, rather than being 'locked' to the refund amount. Accordingly, 4b is not expected to have any structural surplus/deficit.
- Option 4c has no upfront deposit and invoices liable parties for the costs of the scheme based on the number of refunds paid to consumers for redeemed containers, plus associated expenses and revenues.

Option 4a includes legislative requirements for a comprehensive collection network of automated container redemption points—RVMs located near larger beverage retailers. This would be the primary mechanism for individuals to redeem their containers and receive refunds. Major retailers would receive an incentive payment (from scheme funds) for establishing and managing these redemption points. This model also involves larger-scale collection hubs for bulk C&I redemptions, redemptions from kerbside operations and the collection and processing of containers from convenience points and sub-depots.

Option 4b has more flexibility in how consumers redeem containers and receive their refund. For example, collection points may be depots, or located at retailers, sporting clubs and entertainment venues; RVMs may be used in conjunction with store-front style depots; a refund lower than 10 cents per container may apply for bulk redemptions determined by weight, where containers cannot be counted individually, such as containers collected through kerbside collection services. The scheme coordinator remunerates depots for operating costs (such as handling and transportation fees, and reimbursement of refunds).

Option 4c is modelled on national application of the model currently operating in South Australia. Under option 4c, consumers receive their refund for eligible containers only from government-approved collection depots (a legislative requirement). These would mainly be drive-up depots, although the South Australian legislation also includes scope for alternatives. The collections from depots go to multiple, competing private coordinators (known as super-collectors) for recycling. The super-collectors reimburse each depot a 10 cent refund and a negotiated handling fee for each eligible container it received and invoice the liable parties for costs based on redeemed containers.

As a CDS targets beverage containers specifically, it is assumed that the APC would continue under these options as part of the base case, noting that beverage companies would potentially be subject to two sets of regulation. In addition, option 4a would require transitional arrangements for the South Australian and Northern Territory CDSs to bring them into alignment with the model of an extensive RVM redemption network.

FUNDING

In options 4a and 4b, the deposit levy collected by government will fund collection infrastructure and refunds to consumers. In option 4c, super-collectors will collect fees from their members to cover the costs of collecting their containers (via depots) and paying refunds to their customers.

7 IMPACT ANALYSIS—RESULTS AND OUTCOMES

The impact analysis comprises two integrated components:

- a **Cost Benefit Analysis (CBA)** that considers the economy-wide impacts of each of the options compared to the base case
- a **financial analysis** of the **distributional impacts** of the options on different stakeholder groups (industry, governments, consumers) and regions (states, metro, non-metro).

Some cost and benefit items will appear in the CBA analysis but not the distributional impact analysis, due to the different impacts these models analyse. For example, a CDS operator would have to pay corporate tax or personal income tax under a new scheme, which is a relevant financial impact for the distributional analysis, but is not relevant to the overall economic analysis (CBA).

The base year for analysis is 2013 as revenue and costs will not start to accrue until 2014 (depending on the option). A standard discount rate of 7 per cent has been used as approved by the Department of Finance. In addition, sensitivity analysis rates of 3 and 10 per cent have been used.

Further details of the modelling approach and the analyses are in the Data Assumptions Report at Attachment K and the Regulation Impacts Report at Attachment M. The Decision RIS drew on a review of relevant literature and consultation feedback to refine assumptions. The revisions of most impact to the analysis are summarised in Table 1 of the Data Assumptions Report and Attachment D, as are elements and uncertainties which are excluded from the modelling.

The impact analysis has been peer reviewed by the Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES), with their comments at Attachment O.

7.1 KEY CBA RESULTS

The CBA does not assume that additional recycling is inherently valuable, nor that there is some ideal recycling rate which should be attained (a discussion of the inherent value placed on recycling by the community in the context of willingness to pay is included in the sensitivity analysis, as outlined in Attachment E). Rather, the CBA considers all the direct costs associated with regulation, administration, collection, sorting and transportation of additional recyclate and compares all the benefits in terms of the materials' market value, the avoided landfill costs and avoided litter costs. Where the present value (PV) of those benefits over the period to 2035 exceeds the PV of those costs, then the net present value (NPV) appears in Table 3 as a positive number.

The CBA provides the **Net Present Value (NPV)** and **Benefit Cost Ratio (BCR)** of each option relative to the base case (current arrangements). The NPV is calculated by subtracting the present value (in 2013 dollars) of costs from the present value of benefits for each option over the assessment period. The BCR is the ratio of benefits to costs (in present values) over the same assessment period.

A **positive NPV** indicates that an option would have a net benefit to the Australian community compared to the base case. A **negative NPV** indicates an overall net cost to the community. Likewise, a **BCR greater than one** indicates the policy has an overall net benefit to the community, however a **BCR less than one** indicates the policy has an overall net cost.

ANALYSIS OF KEY RESULTS

Five of the ten options assessed deliver a net benefit to the community, represented by the positive Net Present Value (NPV). These are options 1, 2a, 2c, 2e and 3 (see Table 3).

TABLE 3: KEY CBA RESULTS IN PRESENT VALUES FOR ENTIRE ANALYSIS PERIOD (2013–2035)

	Costs *PV* *$ million*	Benefits *PV* *$ million*	NPV *$ million*	BCR	Additional Recycling *Tonnes*[1]	Additional Litter Reduction *Tonnes*[2]	Recycling Cost Effectiveness per Tonne *$*[3]
Option 1	247.7	321.7	+74.0	**1.3**	1,944,400 (74.6%)[4]	142,900	180
Option 2(a)	426.9	475.1	+48.2	1.1	3,021,200 (75.0%)	284,200	167
Option 2(b)	999.9	924.4	-75.5	0.9	6,147,600 (79.0%)	577,400	254
Option 2(c)	1,382.7	1,502.0	+119.3	1.1	8,397,200 (81.4%)	628,400	227
Option 2(d)	879.0	772.4	-106.6	0.9	5,841,300 (79.8%)	576,000	273
Option 2(e) ($20m)[5]	470.0	549.4	+79.4	1.2	3,844,700 (76.7%)	330,100	172
Option 2(e) ($35m)	611.2	709.1	+98.0	1.2	4,774,500 (77.7%)	361,800	182
Option 2(e) ($50m)	732.7	884.7	**+152.1**	1.2	5,491,900 (78.5%)	377,800	184
Option 3	1,379.4	1,502.0	+122.6	1.1	8,397,200 (81.4%)	628,400	227
Option 4(a)	5,316.3	1,532.8	-3,783.5	0.3	6,067,300 (79.3%)	822,200	1,398
Option 4(b)	5,409.1	1,551.9	-3,857.2	0.3	5,871,600 (79.0%)	813,500	1,411
Option 4(c)	6,038.6	1,500.0	-4,538.6	0.2	5,338,900 (78.4%)	777,800	1,657

Source: MJA 2013c (Attachment M) p. 9, p. 23, MJA 2013a (Attachment K), p. 22.
Notes:
1. Additional means those tonnes achieved above the base case across the entire analysis period.
2. Refers to litter reduction from the base case across the entire analysis period.
3. Refers to the level of recycling achieved for the amount invested in recycling infrastructure (calculated by PV Infrastructure costs / PV total recycling (tonnes).
4. Value in parentheses refers to **total** packaging recycling rate (rather than additional) in 2035.
5. Option 2e is a single option, but was modelled with lower, middle and upper scenarios of the level of investment in recycling and litter infrastructure. Each is presented here.

The consideration of the options takes account of a range of outputs from the analysis as well as the extent to which the option addresses the identified problems and delivers on government objectives. Key elements of the analysis are the net benefit to the community (NPV), the size of the benefit cost ratio (BCR), the distributional impacts across stakeholders and the extent to which options deliver under a range of alternate assumptions (the sensitivity tests).

Of the five options with a positive NPV, option 2e ($50 million) delivers the highest NPV (+$152 million), while option 1 delivers the highest BCR (1.3). Options 2b, 2c and 3 all deliver higher overall benefits in recycling improvements and litter reduction than either option 1 or 2e, however they also have substantially higher costs, leading to their lower NPV and BCR.

These figures illustrate the CBA outcomes under the particular set of assumptions modelled in the CBA. Recognising that some of the key assumptions have the potential to significantly affect the analysis, sensitivity tests were undertaken to determine levels of certainty in the results. Key cost, benefit and discount rate assumptions were reset to see if the results changed if they were lower, on par with (central) or higher than the final assumptions used in the analysis. The consultants also used a threshold analysis to understand how changes to key cost and benefit assumptions would affect fundamental outcomes in terms of the final NPV, BCR and comparative ranking of options.

Options 1 and 2e ($50 million) were the only two options that continue to deliver a positive NPV if all test parameters were reset to pessimistic assumptions. This demonstrates that these two options are the most robust to changes in key assumptions and hence in the degree of confidence that can be placed in the outcomes these two options deliver.

In terms of outcomes and who bears the cost, Option 2e delivers additional recycling to lead to a 78.5 per cent packaging recycling rate in 2035, at a cost to consumers and the packaging industry of PV $260 million. Litter will also be reduced relative to the base case by 377,800 tonnes by 2035.

By contrast, option 1 is the lowest cost option with a net cost to government of PV $88 million to fund improved coordination of recycling and litter initiatives and also delivers the highest BCR (1.3). It delivers benefits over the base case with small additional recycling volumes and an NPV of +$74 million. Due to the lower level of investment, outcomes are smaller. Option 1 achieves a 74.6 per cent packaging recycling rate in 2035 which is just over one-third of the additional recycling delivered by option 2e ($50 million) and is the lowest of all of the options. Option 1 also delivers the smallest gains in terms of litter reduction. However, as it focuses on readily available, high pay-off recycling opportunities which produce quite large benefits from relatively little investment; it has the highest BCR of the options (1.3).

Option 2e achieves cost-effective recycling and litter outcomes because it is not constrained by mandated sub-targets to recycle certain packaging types, which may be of low value or low environmental impact. Rather, it allows industry to invest in recycling opportunities which would yield the greatest tonnage for the lowest cost. It also has relatively low administration costs, based on existing co-regulatory arrangements under the Used Packaging Materials NEPM. Option 2e was also modelled at two other levels of investment ($20 million and $35 million) and delivers a net economic benefit and a BCR of 1.2 at the two other levels of investment modelled. Option 2e at all levels of investment achieves moderate litter reduction outcomes that are greater than option 1 and 2a but lower than other, higher-cost options.

Under the conditions of the NEPM, brand owners have a choice of either joining the APC (and paying the relevant membership fee) or being subject to compliance action implemented by the laws and other arrangements of participating jurisdictions. Brand owners subject to these conditions, determined to be 'liable party', are those which have an annual turnover of greater than $5 million. Although the requirements of compliance action vary from one jurisdiction to the next, it is generally understood that the costs of such compliance exceed the cost of membership of the APC. Accordingly, in an economic sense, liable parties have a high incentive to join the APC.

In practical terms, Option 2e will fund higher levels of investment in infrastructure and projects by requiring parties to make a larger financial contribution through increased membership fees to the APC.

APC signatories are currently required to undertake compliance and reporting activities. These arrangements will continue to apply under Option 2e and consist of:

- submitting an action plan within three months of joining the APC that meets certain obligations of the APC and sets outs what the signatory proposes to do to contribute to the Covenant's objective and goals.
- by 31 March each year (following the year in which a company becomes a signatory), submit an annual report that meets the reporting obligations of the APC and outlines performance against all of the action plan commitments.
- allowing independent audits of annual reports and the implementation of action plans (including allowing access to relevant supporting information).
- publishing the organisation's action plan and annual reports on its web site in a prominent and readily identifiable way.
- making annual financial contributions to the Covenant Fund ('membership fees').
- implementing design and procurement processes that drive sustainable design of packaging, consistent with the APC's Sustainable Packaging Guidelines.
- implementing policies or procedures to buy products made from recycled materials.
- establishing collection and recycling programs for used packaging materials generated on-site.
- taking action, where appropriate, to reduce litter.
- assisting the Covenant Council to respond to complaints from the public about the design and use of packaging materials [8].

[8] Australian Packaging Covenant (APC) 2013. *Signatory Obligations*, viewed 10 April 2014, <http://packaging covenant/org.au/pages/signatory-obligations.html>

Projects and infrastructure investments that are undertaken on behalf of APC members, funded by the membership fees, are determined by industry. Business will incur costs to fund the increased infrastructure investments to be made by the APC, and will fund additional APC administration costs. These costs total $235 million NPV over the 20 year study period.[9]

Of the remaining options with a positive NPV, option 2a has both the lowest cost and the lowest benefit of the product stewardship approaches and represents only a modest improvement in terms of recycling and litter reduction. For the benefits derived, the costs of this option are comparatively high, reflected in its BCR of 1.1 By contrast, options 2c and 3, which also have a BCR of 1.1, generate the third and second highest NPVs respectively (+$119 million and +$123 million), however at higher absolute cost. This stems from higher mandated recycling targets (estimated recycling rate of 81.4 per cent in 2035), which will drive industry co-regulatory arrangements (CAs) to achieve the highest additional recycling outcome of all options. Consequently, these options will generate high revenue from better quality recyclate (e.g. paper and cardboard, and non-packaging material). However, higher levels of infrastructure investment will be required for option 2c to achieve the high recycling outcomes (PV of consumer and industry impacts are $617 million) and greater government administration funding (PV $39 million from government). For option 3, a higher combination of industry tax contributions and government administration funding will be required to operate the scheme (PV $568 million from consumers and industry plus higher costs of PV$86 million for government).

Options 2c and 3 also deliver high litter reduction outcomes, only 20 per cent below the CDS approaches, due to their focus on beverage containers through recycling sub-targets. However, in terms of cost-effectiveness of achieving litter reduction outcomes, the CDS options have total costs at least 400 per cent higher than options 2c and 3.

The remaining options (options 2b, 2d, 4a to 4c) demonstrated a net economic cost with negative NPVs and under the COAG guidelines for best practice regulation cannot be recommended for implementation. Options 2b and 2d incur a net economic cost with an NPV of -$76 and -$107 million respectively due to their mandatory beverage container recycling sub-targets. The sub-target will drive industry CAs to collect a large amount of glass beverage containers, with glass having little to no value as recyclate and limited environmental impact in the form of emissions. Therefore, returns on investment are poor. Unlike options 2c and 3, the level of investment required in options 2b and 2d is not sufficient to offset those losses by tapping larger volumes of high value recyclate.

The CDS options (4a, 4b and 4c) incur the greatest net cost to the community. They are substantially less cost-effective than other options, with net economic costs greater than $3 billion in all three models. The costs of these options are between seven and eight times higher than the cost of option 2e ($50 million). The high costs stem from the need to roll out purpose-built infrastructure nationwide to manage item-by-item refund payments for over 12 billion beverage containers each year. Approximately 73 per cent of these containers would otherwise have been recycled via

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[9] Incremental costs associated with infrastructure and investment and operations, and administration and compliance costs, see Table 26 on page 77 of the Regulation Impact Report (Attachment M).

kerbside and other (base case) recycling systems. This re-routing of material into an alternative recycling system adds significant costs and generates minimal benefits; especially since three quarters of the beverage container recyclate targeted is glass.

CDS options achieve the highest litter reduction impact when this is measured by tonnages. This is because they involve direct price incentives to return beverage containers, which comprise 60 per cent of public place litter by weight. Option 4a achieves the greatest litter reduction (822,200 tonnes reduced from the base case by 2035). However, all options result in reductions in litter tonnages from the base case, by reducing the amount of packaging available to be littered and by reducing the propensity of consumers to litter in public places.

An analysis of the co-benefits of each option (that is, increased collection and recycling of other recyclable materials and increased recyclate quality or value) was also undertaken and the results included in the CBA. This is discussed in more detail in Attachment F.

DISTRIBUTIONAL IMPACTS

While all of the options require additional expenditure to support recycling and litter actions, the source of the extra funds differs depending on the option. In addition, the stakeholder group or sector accruing the benefits may differ from the one bearing the cost. The six sectors analysed for distributional impacts are: consumers, local government, the commercial and industrial (C&I) sector, the packaged goods industry, the environment, and government (see Figures 3 and 4).The packaged goods industry (which includes beverage companies) is expected to incur net costs under the regulatory options ranging from (PV) $33 million (option 3) to (PV) $455 million (option 4c), depending on the type of regulation introduced.

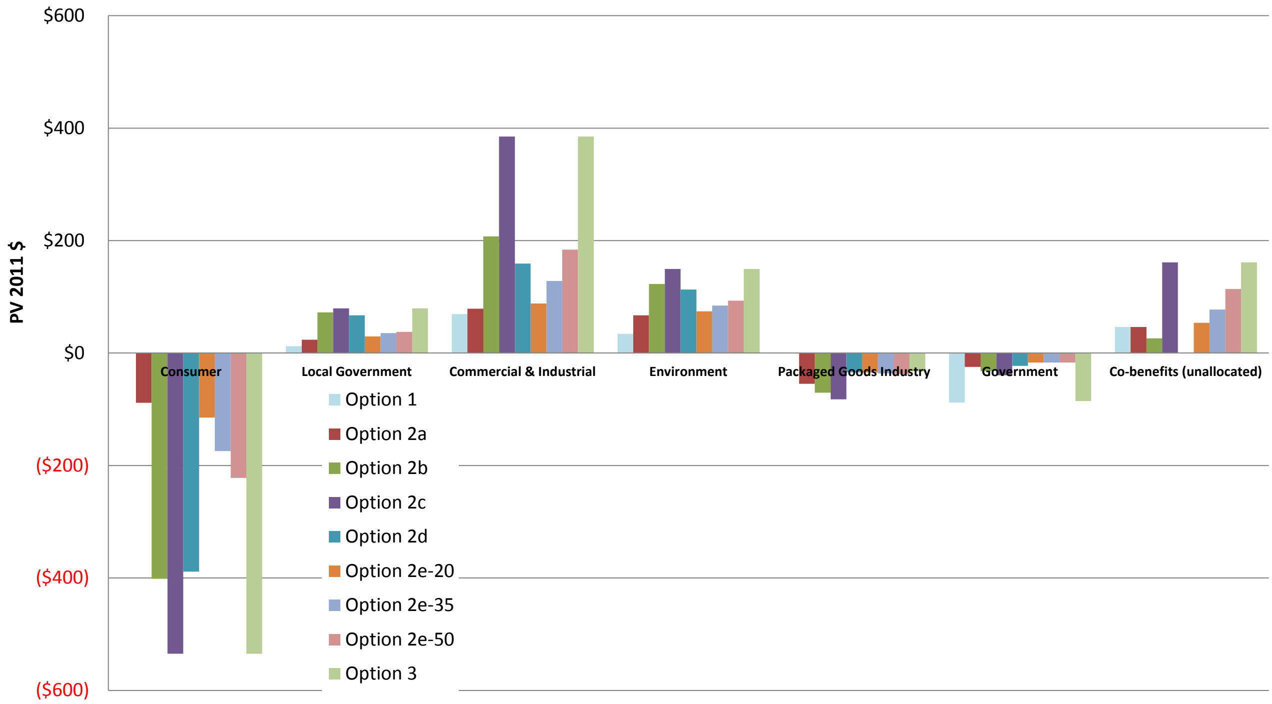
Consumers bear the highest costs in all options, except option 1 where costs are borne by government (and therefore taxpayers). It is assumed that the packaged goods industry will pass costs of funding additional recycling and litter reduction onto consumers when possible in the form of higher prices for packaged goods. The cost to consumers ranges from PV $88 million (option 2a) to PV $8 billion (option 4c).

When impacts are aggregated nationally, local government is a net beneficiary in all options. This represents a degree of internalization of the externalities created by packaging design, production and waste. Specifically, because each option increases the national recycling rate and reduces litter through industry and government investment, landfill and litter volumes and costs are reduced and this potentially delivers some net value in income from recyclate value. For the non-CDS options, local governments stand to benefit between PV $12 million (option 1) to PV $80 million (options 2c and 3). While local government will still incur transport and collection costs, this would be offset by the value of recyclate, avoided landfill operation costs, avoided litter costs and co-benefits. Local government stands to gain substantially under a national CDS, largely from the value of beverage containers that a proportion of consumers will still recycle through kerbside recycling bins.

Options 4a and 4c provide local government with the highest benefits of PV $1 billion, while option 4b provides smaller benefits of PV $569 million due to the ability in this option to pay local government refunds at a discount (less than 10 cents). Additional benefits may also accrue to local government from avoided landfill levy payments. Landfill levy rates differ from state to state and are paid by all landfill users (including local government) to state government treasuries (with the exception of Queensland which has no landfill levy). Reductions in disposal of packaging to landfill will reduce waste levy payments, which would result in savings for households and the C&I sector. However, the distributional analysis does not take into account the effects of the waste levy due to the complexity and uncertainty associated with calculating its effects.

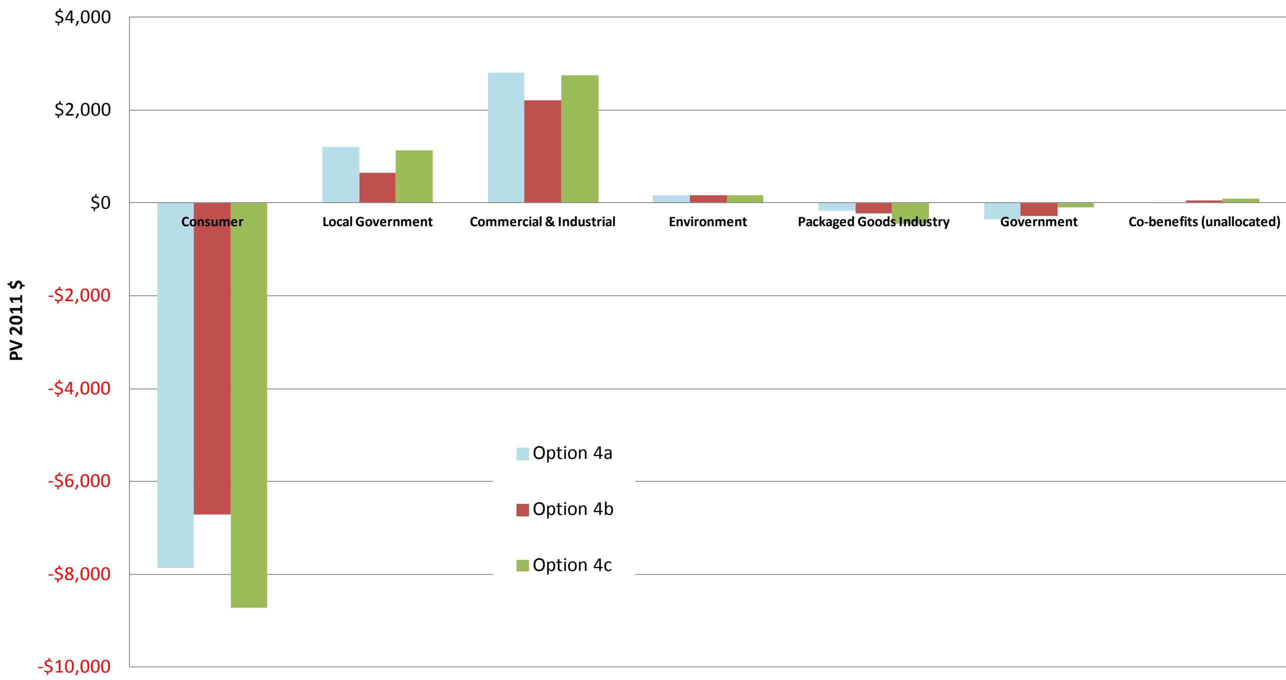
Impacts to governments and the split of metro and non-metro impacts are presented in Attachment F. As a general rule, states and territories benefit in proportion to their waste production; that is, if a state or territory produces more waste, it will receive more benefits.

FIGURE 3: SECTORAL IMPACTS OF NON-CDS OPTIONS ($ MILLIONS, PV)



Source: MJA 2013c (Attachment M) p. 39

FIGURE 4: SECTORAL IMPACTS OF CDS OPTIONS ($ MILLIONS, PV).



Source: MJA 2013c (Attachment M) p. 42

SENSITIVITY ANALYSIS OF KEY ASSUMPTIONS

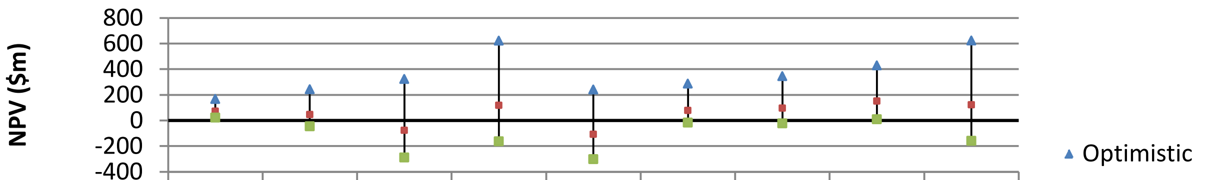
The Decision RIS analysis acknowledges the potential sensitivity of the NPV results to changes or errors in assumptions by undertaking sensitivity testing and acknowledging general risks and uncertainties (see Attachments D and E). These factors include social discount rates; an increasing marginal cost for the recovery of recyclate material; the valuation of avoided litter clean-up costs; the extent to which some of the proposals will impact on other, existing arrangements; the extent to which landfill can be avoided and the value of that reduction; and the environmental and social benefits from litter reduction. Changes to the values attributed to these factors would alter the cost/benefit analysis and NPV of each option.

The outcomes of the modeling also depend on some factors that may change in the future. These include the values of recyclate; business and household behaviour; and packaging production and consumption trends.

Where modelling assumptions have potential to significantly affect outcomes of the analysis such as the NPV, sensitivity tests were undertaken to determine levels of certainty in the results. The consultants also used a threshold analysis to understand how changes to key cost and benefit assumptions would affect fundamental outcomes in terms of the final NPV, BCR and comparative ranking of options. For more details of the methodology, refer to MJA's Data Assumptions Report at Attachment K.

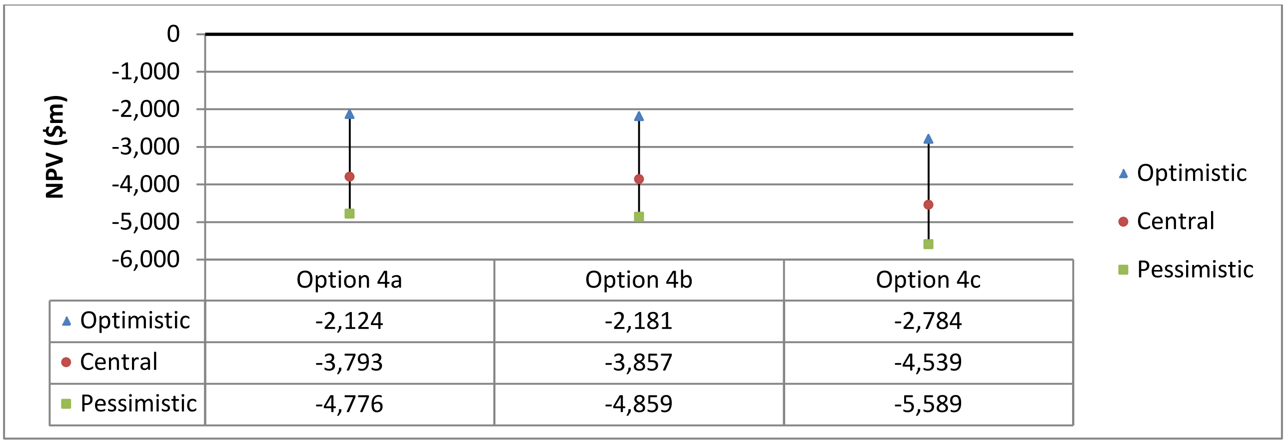
To test the sensitivity of the CBA results, key cost, benefit and discount rate assumptions were reset to see if the results changed if they were lower (pessimistic), on par with (central) or higher (optimistic) than the final assumptions used in the analysis.

FIGURE 5: RANGE OF NPVS FOR NON-CDS OPTIONS FOLLOWING SENSITIVITY ANALYSIS



	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e ($35m)	Option 2e ($50m)	Option 3
Optimistic	169	245	325	624	243	289	347	431	625
Central	74	48	-75	120	-106	80	98	153	124
Pessimistic	24	-44	-287	-161	-300	-15	-21	11	-157

FIGURE 6: RANGE OF NPVS FOR CDS OPTIONS FOLLOWING SENSITIVITY ANALYSIS



	Option 4a	Option 4b	Option 4c
Optimistic	-2,124	-2,181	-2,784
Central	-3,793	-3,857	-4,539
Pessimistic	-4,776	-4,859	-5,589

Source: MJA 2013c (Attachment M) p. 30

Figures 5 and 6 show that in the optimistic scenario (for example, assuming higher recyclate value and lower recycling costs) all non-CDS options demonstrate a net economic benefit and options 2b and 2d no longer show a net economic cost. The options which produce more recyclate perform substantially better due to the assumed higher value of the recyclate and lower recycling costs. The ranking of the options also changes as option 3 generates the highest NPV ($625 million), closely followed by option 2c ($624 million). Option 2e still delivers a high net benefit, achieving the third highest NPV ($431 million).

In the pessimistic scenario, options which produce more recyclate demonstrate the most sensitivity to changes in assumptions. In fact, all options that generate a positive NPV in the central case (with the exception of options 1 and 2e ($50 million)) fall below $0 and incur a net economic cost (options 2a, 2c, and 3). Options 1 and 2e continue to deliver a positive NPV and are the most robust to changes in assumptions, due to lower administration costs and design to invest in high pay-off recycling opportunities. Additionally, options 1 and 2e have the highest benefit to cost ratio, with option 1 having the highest benefit but delivering the smallest gains in terms of litter reduction and minimal benefits over the base case.

The analysis shows that even in an optimistic scenario, none of the CDS options achieve a positive NPV. This is due to their substantial net costs, which is a result of both the cost of national infrastructure rollout and re-routing of over 70 per cent of containers from existing kerbside collection or other recycling systems in the base case.

7.3 THE PREFERRED OPTION

Because of the reasons indicated above, this Decision RIS recommends Option 2e ($50 million)—Extended Australian Packaging Covenant (APC) for implementation.

Option 2e addresses the problems identified of a range of market failures in the packaging waste and recycling sector leading to sub-optimal recycling and litter outcomes.

By providing a strengthened national approach and increased investment by the packaged goods industry to deliver improved outcomes under current co-regulatory arrangements, this option will address the problems of future regulatory fragmentation and leverage existing administration mechanisms. Option 2e has a number of other key benefits which distinguish it from the other options:

- the design of the co-regulatory arrangement optimises outcomes because it targets all packaging and covers all participants along the supply chain (above the nominated turnover threshold), from design and manufacture to end of life disposal
- it is non-prescriptive in how outcomes can be achieved, with a flexible and adaptable approach that is better able to respond to changes in the market and operating environment (reflected in the sensitivity analysis).
- no new regulation is required.
- it has demonstrated that it can operate alongside a range of existing regulatory arrangements.
- has more moderate impacts for business when compared with some of the higher-cost options.

The extended APC-type arrangement has a broader remit across all packaging than the beverage container options (2d and CDS). It targets a wider range of packaging materials that cause negative externalities, such as harmful litter and marine debris and greenhouse gas emissions. In addition as there are no sub-targets mandating the pursuit of glass beverage containers in this option, it is more likely that higher value materials will be recycled and generate revenue benefits to partially offset costs.

The flexible approach of option 2e also encourages substantial capture of non-packaging materials (co-benefits) which may be cost effective to collect in many circumstances but which options with specific regulated targets to meet (options 2a, 2b, 2c, 2d) could not pursue with the same degree of flexibility. The value of co-benefits from collecting high value materials such as office paper can offset the costs of collecting and recycling packaging and provide incentives for a business to more holistically manage waste, leading to broader benefits such as efficiencies in collecting and managing several waste streams.

Option 2e will build on the successful APC approach of co-regulation across the entire packaged goods supply chain. Those businesses who participate in the APC support the approach in that it reduces the potential for other industry participants to 'free ride' on existing efforts. This approach has shown a capacity for innovative and cost-effective solutions that minimise environmental and supply chain impacts across the product life cycle. This is important as the recycling industry has identified that the design and manufacture stages of the life cycle are key to improving recyclability and reducing environmental impacts[10]. In contrast, the other options focus more narrowly on using funds to invest in end-of-life management solution.

Option 2e delivers a positive NPV. When sensitivity testing has been applied to acknowledge the general risks and uncertainties a positive NPV is retained.

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[10] See submissions from Australian Council of Recycling and Umprun Incentive Recycling: http://www.scew.gov.au/consultation/packaging-impacts-consultation-regulation-impact-statement-ris

Option 2e will increase costs for the packaged goods industry through a higher membership fee. Option 2e also has the lowest government administration costs of the regulatory options, based on maintaining implementation of the existing NEPM. In addition, it is expected that governments will continue to consider opportunities to streamline NEPM implementation (see Chapter 8). Option 2e does not require new legislation. The NEPM has successfully operated since 1999 and is implemented through the most appropriate legislative, regulatory or policy framework in each jurisdiction. It is a national approach that can operate effectively alongside existing regulations and schemes. For example, existing CDS schemes would not need to be discontinued under option 2e.

Under current arrangements, brand owners who have a turnover of greater than $5 million currently have a choice between joining the APC or meeting compliance measures implemented by laws and other arrangements of participating jurisdictions. Brand owners below the threshold retain the option to join the APC voluntarily. Under Option 2e these arrangements are retained.

In contrast, option 2d, 3 and 4 impose an additional layer of regulatory obligations on the packaged goods industry, or the beverage sector, and hence are less likely to coexist with existing arrangements. These options would have the potential to compete with current arrangements such as the APC and provide a disincentive for affected business and industry organisations to participate in them, dividing existing cooperative relationships. In addition options 4a and 4b involve national scheme models that differ to the current models operating in South Australia and the Northern Territory, and their implementation would require harmonisation measures.

Option 2e envisages the packaged goods industry agreeing to a substantially increased level of investment and product stewardship responsibility above current arrangements to achieve increased recycling and litter outcomes. To support this and ensure success, governments will need to commit to the approach as the primary national solution and continue to enforce the NEPM. A strengthened national approach underpinned by the NEPM as the primary regulation will improve the clarity of market signals and certainty about government policy for businesses and community members. It will also prevent the further emergence of fragmented approaches that increase cost and complexity to packaging businesses operating in the national market, for example the need to have bespoke CDS registration and labeling requirements in some jurisdictions but not others.

Option 2e also aligns with the principles of the National Waste Policy agreed by all jurisdictions to guide government action.

8 IMPLEMENTATION AND REVIEW

It is expected that implementation details for the preferred option will need to be refined in consultation with affected stakeholders. Issues that are likely to require further consultation include:

- developing appropriate governance, strategic planning, data gathering and operational arrangements to enable the expanded APC-type arrangement to deliver the increased outcomes expected
- consideration of any arrangements required to maintain and enhance enforcement of the Used Packaging Materials National Environment Protection Measure (NEPM)
- development of appropriate performance indicators, considering issues such as avoiding potential distortion to markets and perverse incentives that would compromise environmental outcomes.

8.1 TIMING

The term of the current APC agreement and Strategic Plan ends on 30 June 2015, which allows for a transition period so that implementation of the expanded arrangement could commence mid-2015.

If environment ministers approve the implementation of option 2e, detailed discussions with the packaging industry would commence to gain industry acceptance of the extended arrangement and responsibilities and to undertake transitional arrangements in an effective manner. The current APC Council would also begin preparing for the transition to increased funding and responsibilities. This will involve consultation to develop and implement a new Covenant agreement signed by all packaging brand owners and participants in the supply chain and Commonwealth, state and territory governments which sets out required outcomes, roles and responsibilities.

The APC will also need to advise current signatories of their obligations under the new and expanded agreement. Existing APC signatories must continue to report on their performance under the current Covenant agreement until 30 June 2015.

If there is a need to amend or re-make the NEPM, this could take some time to take effect given the range of jurisdictional actions that are needed. This may entail amendments to the NEPM being finalised after mid-2015. Previously, the APC has continued to pursue business as usual through industry-government collaboration while NEPM amendments have been considered and implemented.

8.2 REGULATORY APPROACH, LEGAL FRAMEWORK AND GOVERNANCE

The legal framework for implementing option 2e is already in place. It takes the form of a voluntary Covenant agreement signed by industry participants and governments, underpinned by the Used Packaging Materials NEPM made under the *National Environment Protection Council Act 1994*.

Option 2e would build on current APC and NEPM arrangements, which currently operate alongside specific schemes operating in particular jurisdictions, such as the CDSs in South Australia and the Northern Territory. Therefore, implementation should not require extensive transitional arrangements or changes to other existing legislative instruments or schemes.

It is a challenge for a nationally consistent approach to be achieved in a jurisdictional landscape where different approaches are currently employed by states and territories to address packaging waste and litter. As discussed in Chapter 7, Option 2e allows for national jurisdictional collaboration within this context of different approaches (noting that the Northern Territory has to date chosen to remain outside the APC arrangement).

The NEPM provides regulatory protection for APC members against free-riders that may competitively disadvantage them in the national marketplace, and sets nationally consistent requirements for packaging brand owners that are not APC members. Governments will continue to effectively enforce the Used Packaging Materials NEPM under the relevant state and territory legislation, regulation or policy, including during the transition period. The APC has penalties for non-compliance such as being removed from the register of signatories and being referred to the relevant jurisdiction for action under the NEPM, which contains targets for action and penalties for non-compliance.

The increased industry commitment sought under the extended APC-type arrangement may necessitate amendments to the NEPM, including streamlining its operation, which will need to be considered in the transition period. Adjustments to improve the efficiency of NEPM implementation and support a high rate of voluntary brand owner compliance will also continue to be undertaken. To date, these changes have involved the APC secretariat taking greater responsibility for signatory compliance and monitoring so that non-compliant and non-signatory brand owners are referred to jurisdictions for action under the NEPM as a 'last resort' (EPHC 2010d). In addition, state and territory jurisdictions will continue current efforts to minimise the compliance burden on brand owners.

Currently, a governance board (known as Covenant Council) consists of all levels of government, brand owners and NGO representatives. A new governance board will be established to oversee the new co-regulatory arrangement and will be supported by a secretariat. During the transition period, the board will be required to develop the new, expanded industry-government agreement and consult closely to consider the appropriate governance and operational mechanisms to ensure the arrangement can deliver the significantly increased responsibilities and outcomes required under option 2e. There may also be a need for the board to assess sector capacity building requirements to ensure a successful expansion of responsibilities and investment opportunities. The board will provide strategic direction and oversight of recycling and litter initiatives and consider issues such as the availability of new initiatives across jurisdictions and regions and their longer term sustainability and operating costs.

All brand owner APC signatories currently contribute to the costs of the organisation through membership fees to an industry body. During the transition period appropriate cost-sharing arrangements will need to be developed by the industry association so that the burden of increased costs falls equitably across large and small industry players and reflects environmental costs and benefits of different material types in the recycling and litter streams. Brand owners are also currently required to develop and report annually against Action Plans to reduce the environmental impacts of packaging in relation to their own business.

There will need to be close consideration taken in the transition consultations to ensure the revised arrangements do not lead to perverse incentives arising and to mitigate potential performance risks.

Because option 2e allows flexibility in investment choices, there could be a range of mechanisms for industry to meet the recycling and litter objectives and less likelihood of targeting particular materials with a distortionary effect. However, for example if the recycling objective were to be measured and reported in terms of weight, this could incentivise targeting heavier materials such as glass to meet a tonnage target more quickly, which may limit environmental impact as glass has few externalities in landfill. The board will need to consider well-designed performance indicators to ensure environmental outcomes are maintained.

Packaging brand owners will be expected to continue to work with participants across the packaging supply chain, including the waste and recycling industry and local government, to deliver the expanded outcomes of option 2e. Community and environment groups and Commonwealth and state and territory governments will continue to be involved, with the role of ensuring accountability in meeting the outcomes and representing the expectations of stakeholders and environment ministers respectively.

A strategic approach to investing in recycling and litter reduction initiatives to meet the outcomes will be developed jointly by industry and government representatives on the governing board. The types of projects to be supported could include, but are not limited to: a substantial grants program to address recycling and packaging litter market failures; data gathering activities; and research and development to improve packaging design, increase recycling capabilities and address market impediments.

Commensurate with the principle of product stewardship, option 2e will complete the transition begun under the current APC of the packaging industry and brand owners taking greater responsibility and leadership to reduce the environmental impacts of their products. Funding for the activities will need to be negotiated with and provided by the packaged goods industry and established via an industry-government agreement. Governments will no longer contribute funding to initiatives or a secretariat. Governments' role will be to work with the industry in the development and implementation of the new arrangements and to remain a partner with industry in developing strategic direction through the governing board and enforcing the NEPM.

The expanded APC-type arrangement will continue to report on performance to environment ministers. Jurisdictions and the new arrangement will also continue to report annually to the National Environment Protection Council (NEPC) on the implementation of the NEPM.

INTERNATIONAL OBLIGATIONS

Option 2e builds on existing arrangements. Implementation of the option will take into account relevant legal considerations.

IMPACTS ON COMPETITION

The APC provides a forum for increased cooperation throughout the packaging supply chain between brand owner companies and the APC Council includes industry representatives of sector umbrella organisations. In expanding this type of arrangement, option 2e is unlikely to restrict competition because the NEPM applies equally to all eligible brand owners. The NEPM and APC implement outcomes that cover all eligible packaging brand owners over a threshold, rather than targeting a specific type of product or brand owner.

In 2005 NEPC established a threshold so that only brand owners with over $5 million in annual packaging-related turnover are liable under the NEPM. This is consistent with Clause 12 of the NEPM that "it is not the intention of Council that enforceable obligations will be placed on brand owners that do not significantly contribute to the waste stream". The NEPM is applied to brand owners because they are at the most influential point in the packaging supply chain to address the environmental impacts of their products. Under the threshold set by NEPC in 2005, it was considered that brand owners who fall below the $5 million threshold have too little market share (less than 1 per cent) for the threshold to restrict competition. The level of the threshold limits the impact on small business and improves compliance efficiency.

In 2013 the APC had more than 30 signatories who are below the $5 million threshold. This suggests that for these businesses, the APC provides benefits which exceed costs and potential impacts on their competitive position, such as access to project funding, enhancing their environmental stewardship credibility or enhancing their supply chain operations. It also reinforces the findings of the 2010 Used Packaging Materials NEPM Decision RIS that the competition impacts on small firms are not likely to be substantial (EPHC 2010d). Appropriateness of the threshold would be reviewed as part of the transition arrangements for the expanded industry-government agreement.

8.3 REVIEW

To ensure regulation remains relevant and effective over time it is important that regulation is reviewed periodically (COAG 2007, p.6). The performance of the expanded APC-type arrangement and the NEPM in delivering the outcomes will be reviewed every five years. The first review will occur by the end of 2020 and will consider performance data from the first five years of implementation.

These review provisions are consistent with the previous recommendation of the Used Packaging Materials Decision RIS, accepted by the EPHC in 2010, that the NEPM would be 'subject to review every five years as part of any comprehensive evaluation of the Covenant' (EPHC 2010d). To assist the review process, the expanded APC-type arrangement will continue to annually collect data on each of its key performance indicators and seek to develop and improve methodologies for collecting, analysing and verifying performance data, where necessary. Given the absence of regulatory targets under this approach, governments will need to carefully consider the outcomes of the first review and consider alternative regulatory approaches if the extended APC-type arrangement is not delivering agreed outcomes.

The EPHC previously agreed that the first major review of the NEPM would occur by 2015 and would consider the transition of the APC to the *Product Stewardship Act 2011* (EPHC 2010d, p. 54). The Packaging Impacts Consultation and Decision RIS process has considered this scenario as option 2a. The Decision RIS impact analysis has also found the NEPM arrangement to be cost-effective in examining option 2e and recommending it as the preferred option. The RIS process has therefore satisfied the 2015 review considerations requested by EPHC and an additional review of the NEPM in 2015 would be duplicative. It is therefore proposed that the next major review of the NEPM and expanded APC-type arrangement be undertaken by the end of 2020. In the interim, the expanded

APC-type arrangement will continue to produce annual performance reports and the current APC Council will prepare to evaluate its performance under the current Covenant agreement, which runs until 30 June 2015, based on annual signatory reporting.

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ADDITIONAL BACKGROUND

WHAT IS PACKAGING?

There are several types of packaging, used for products that are consumed both at home and away from home:

- primary packaging (or sales packaging) used for products supplied to consumers
- secondary packaging (or distribution packaging) used to help secure or bundle multiple units of product, such as cardboard boxes or shrink film overwrap
- tertiary packaging (also known as distribution packaging) used to secure or bundle multiples of secondary packaging, such as pallets, pallet wrapping, and stretch film, shrink film and strapping.

Packaging plays an essential role in the safe preservation and delivery of most products and helps to reduce waste by minimising product damage and extending shelf life. Packaging also plays a key role in preventing food wastage, which has a significantly larger environmental footprint than packaging over the food production life cycle (OECD 2012). The packaging life cycle can be divided into three main phases: manufacture (using extracted resources), consumption and end-of-life disposal and management. The design of packaging can influence environmental impacts in all of these phases.

Collectively, the packaged goods industry encompasses raw material suppliers, packaging manufacturers, packaging suppliers such as retail, food and grocery, beverage and hospitality industries and the brand owners of packaged products, for example McDonalds and 7-Eleven.

WHAT ARE THE KEY TRENDS IN PACKAGING USE, WASTE AND RECYCLING?

Overall, packaging waste accounts for approximately 9 per cent of total waste generation in Australia. Beverage containers currently account for up to 2.8 per cent of total waste and almost a third (30 per cent) of packaging consumption and are a key item of consumer concern as they are also highly visible in litter. Paper and cardboard represent the greatest proportion of packaging consumed in Australia, largely due to its use as distribution packaging in the C&I sector (SRU 2013).

The proportion of packaging waste to total waste may change over time, for example if other types of waste increase to form a larger proportion of total waste. As a whole, the waste and resource recovery and packaging sectors in Australia are continuing to grow following the Global Financial Crisis in 2008–09 (SRU 2013, DIISRTE 2012 and WRAP 2011). However, it has been identified that there are significant opportunities to reduce disposal of waste to landfill and improve recovery of resources in the Commercial and Industrial (C&I) sector (Hyder 2012) which also includes public places and events, institutions and workplaces.

The packaging and waste and resource recovery sectors respond to a wide range of domestic and global social and economic developments. Responses to economic trends and consumer demands influence the environmental impacts of packaging, such as recyclability and litter potential. For example, there is an increasing trend internationally and in Australia towards the use of flexible packaging made from soft and composite plastics, such as sachets for drinks, microwavable foods and detergents (Manalili et al 2011, Sustainable Packaging Alliance 2012, Ferre 2010, Streeter 2007). These new types of packaging might reduce transport or storage impacts for businesses, but are not yet recyclable in Australia, adding to landfill volumes.

Between 2003 and 2012 Australia's population grew at an average rate of 1.45 per cent per annum (ABS 2013a). Rising population, along with rising incomes and living standards, is promoting increased overall consumption of resources and products, including packaging. In addition, demographic and lifestyle trends such as the increased ageing population and number of households (EPHC 2010b, ABS 2010) and use of 'convenience' packaging based on per person units (for example, ready-made meals) are increasing packaging consumption. Because packaging is a fast moving consumer product that becomes waste as soon as it is used, increased consumption is leading to an overall increase in packaging waste (by weight).

As a result of continuing overall growth in packaging waste, there will be a future need for additional waste management and resource recovery infrastructure in Australia. There will also be a need to manage patterns of waste generation and develop end markets to address the challenges presented by Australia's mix of highly concentrated urban population in the eastern and south western coastal regions, with areas of landmass being sparsely inhabited over large distances (EPHC 2010b, SRU 2012).

HOW DOES AT-HOME AND AWAY-FROM-HOME RECYCLING DIFFER?

Collection and recycling systems for packaging materials in the C&I sector and other away-from-home areas such as public events are not yet comprehensive and face some barriers (SRU 2013, Hyder 2012). This sector also has not been subject to government intervention to stimulate recycling to the same extent as the municipal recycling sector. These factors have led to uneven performance in recycling materials other than paper and cardboard away from home compared to at home.

Waste in other away-from-home spaces such as public parks and reserves are mainly collected by local government, although private waste service providers can also be involved. The capacity for recovery here also depends on the terms and scope of waste services contracts and the availability and capacity of bin and reprocessing infrastructure. For example, a park in one local government area may have separate bins for recyclables and general waste, while a park nearby in a different local government area may have a single bin for all waste. This lack of consistency can again cause confusion for consumers and increase contamination. Because local councils generally rely on rates from residents to provide municipal services, there are limits to their ability to enhance and expand these services.

There is strong community and environment group demand for recycling and reuse of packaging materials. Consumer interest in the environmental and social impacts of purchases is increasing and industry is responding through increased use of environmental certification and labelling (AFGC 2012b) and focus on the 'social licence to operate' (Cook et al 2013).

There is likely to be continued investment in recycling technology to better address increasingly popular packaging types such as flexible plastics. However, based on past experience new technologies typically do not come into effect until well after new materials have been introduced and already become widespread, and subsequently a demand or incentive has arisen to reduce their environmental impacts[1]. Without such investment, current packaging trends will, over time, reduce the proportion of recyclable packaging and increase landfill disposal.

[1] An example is recent innovations in recycling of soft plastics such as plastic bags and films.

1 INTERNATIONAL APPROACHES TO PACKAGING

Australia is in line with international trends in its efforts to encourage extended producer responsibility through the National Waste Policy. Internationally, the concept of extended producer responsibility for manufactured products has been a feature of the business landscape for many years. More recently the concepts of 'closed loop' economies (edie.net et al 2013) and using waste as a resource have been focused on (OECD 2012). This has led to an increase in a range of different product stewardship approaches being implemented around the world (Martin 2013). These include both regulatory (such as in the European Union and more recently China) and voluntary (such as in Australia, Singapore and New Zealand) approaches.

The European Union, China, Japan, South Korea, Israel and some Canadian provinces have introduced producer responsibility regulations for packaging (Martin 2013). South Africa and several US states are also considering legislated schemes. The European Parliament and Council Directive 94/62/EC requires member states to design reusable or recoverable packaging, minimise packaging weight and volume, reduce hazardous substances and materials in packaging and meet packaging material recovery and recycling targets. China's regulations require firms, particularly those dealing with food, beverage and cosmetic packaging, to eliminate excessive packaging (APCC 2013a).

Other countries, such as Singapore and New Zealand, have adopted voluntary agreements similar to the Australian Packaging Covenant to address the environmental impacts of packaging.

INTERNATIONAL EXAMPLES OF CONTAINER DEPOSIT SCHEMES

Several international jurisdictions have long-running container deposit schemes (CDSs), including Norway, California and other US states, British Columbia and other Canadian provinces, Denmark, Sweden and Germany (MS2 2011). Germany expanded its CDS in 2010 and Fiji introduced a CDS in 2011.

Research on the operation of CDS systems internationally was commissioned for the Consultation RIS and has informed the development and analysis of the CDS options (Packaging Impacts Consultation RIS 2011).

Some international CDSs are industry-led and operated (Norway, Sweden), some are government-led (California) and others are coordinated by not-for-profit product stewardship organisations (British Columbia, Denmark). The types of containers collected (refillable, non-refillable or more recently flexible pouches and 'tetra paks') have evolved over time and across jurisdictions, based on local conditions and preferences (MS2 2011). European systems primarily use automated Reverse Vending Machines for collection.

In 2011 PwC Germany assessed the German CDS, finding that beverage container collection and recycling rates were significantly higher under the CDS than under other recovery systems. The study also found that the costs and benefits of beverage container recovery systems are influenced by secondary material prices, the weight of packaging and the number of units (PwC Germany 2011).

CDSs in overseas jurisdictions have also faced implementation issues and have been implemented in food and beverage retailing circumstances that are different to Australia, which could affect their applicability and performance here (MS2 2011). European CDSs have had issues with cross-border purchases and redemptions and imported products.

In 2012, the Dutch Parliament decided to cease its PET plastic deposit scheme from 2015 with the aim of boosting recycling of more packaging types and allowing a range of approaches to be undertaken by industry working voluntarily with municipalities to meet recycling and litter targets (European Environment and Packaging Law 2012). In 2010, Delaware in Ohio repealed its CDS and implemented kerbside recycling, as retailers became reluctant to process containers, undermining the effectiveness of the scheme (The Environmental Magazine 2011).

2 AUSTRALIA'S REGULATORY ARRANGEMENTS

HISTORICAL DEVELOPMENT

There are a number of existing legislative frameworks in place for managing packaging waste in Australia and some of these have pre-dated moves towards national consistency, such as the national roll out of kerbside recycling.

Recycling of packaging in Australia dates back to the 1900s, when return systems for refillable beverage containers for beer and carbonated drinks were run on a commercial basis in some states. Some states also had a depot network for the return of deposit items. These were a remnant of the 19th century material recovery network based on government-authorised 'Marine Store Dealers,' who were allowed under licence to trade in recoverable items, including bottles. In the mid-1970s South Australia's beer and soft drink sector were still using refillables, supported by a deposit return system through existing depots and retailers. South Australian consumers returned soft drink bottles to retailers and beer bottles to 'marine stores' for a refund amount that was set and managed by industry. Marine stores were originally established by the Adelaide Bottle Company to collect, wash and re-hire glass bottles for refilling by local breweries, such as the South Australia Brewing Company and Coopers Brewery.

In other states similar manufacturer-led programs to collect containers for reuse, such as the Comalco 'cash for cans' program, were also popular in the 1970s (Planet Ark 2012, 2008). However these were not regulatory and hence operated differently to the more extensive, national-scale CDS options that are modelled to be legislated in this Decision RIS.

These smaller-scale, producer-led programs and the subsequent introduction of container deposit legislation (CDL) in South Australia in 1977 (see Box 1) pre-dated kerbside recycling.

BOX 1: CONTAINER DEPOSIT LEGISLATION IN SOUTH AUSTRALIA

The introduction (and increasing popularity) of single-trip (non-refillable) beverage containers in the 1970s meant that the new containers could not be used again and were of no further use once sold. 'Single trip' beverage containers soon became a highly visible part of the litter stream and a potential threat to the environment. Oregon, USA passed the first 'bottle bill' (also known as a deposit law) in 1971, requiring refundable deposits on all beer and soft drink containers. It was this piece of legislation that would provide the springboard for South Australia's own 'bottle bill'.

Based on the 'polluter pays' principle and reinforcing the existing return systems previously established by industry for its refillable containers, the South Australian Parliament passed the *Beverage Container Act 1975* (the Act), which commenced operation in January 1977. The Act imposed a 5 cent deposit on containers, but exempted refillable containers. A later amendment in 1986 subjected non-refillable bottles to a refund of 15 cents and refillable bottles to a refund of 4 cents. This was eventually challenged in the High Court by interstate brewers and led to the legislation being amended to equalise deposits for refillable and 'one trip' packs.

Prior to the mid-1990s, the legislation excluded milk carton packaging, with the exception of plastic bottles, until the dairy industry lobbied in the mid-1990s to have plastic bottles included in the exempt category. In return the dairy sector was asked to contribute to recycling and litter programs.

SA's CDL was extended on 1 January 2003 to include a wider range of products, which had been identified as an increasing litter issue. Containers for flavoured milk and fruit juice (less than 1 Litre) are now covered in the scheme, although liquid paperboard carton recovery rates remain lower than other container types. Wine, spirits, cordial, plain milk and fruit juice (more than 1 Litre) remain exempt. The deposit was increased from 5 cents to 10 cents in 2008.

Since the late 1980s, Commonwealth, state and territory and local governments have focused on improving municipal kerbside recycling systems and C&I recovery and recycling to reduce the disposal of recyclable materials to landfill and increase resource recovery.

Kerbside recycling collection was introduced in many urban council areas in the late 1980s and early 1990s, initially in Sydney, then other major centres and regional areas (Planet Ark 2008). This was driven by growing public interest in contributing to environmental protection through recycling and reuse (Planet Ark 2005). Kerbside recycling allowed households to separate common items for recycling such as paper, glass and aluminium, and later PET, HDPE milk containers, liquid paperboard milk and juice cartons and steel cans (Planet Ark 2008).

In 1992, Australian and New Zealand environment ministers endorsed a National Kerbside Recycling Strategy, which introduced expanded kerbside recycling access and a range of voluntary recycling targets for the packaged goods industry. Australia became one of the first countries to have a national voluntary recycling plan giving commitments at all levels of industry. From 1990 to 1993, the rate of household recycling in Australia doubled (Planet Ark 2008, 2005). Kerbside recycling is currently accessed by at least 94 per cent of Australian households (ABS 2012a).

Since 1999, all levels of government have also worked with packaging manufacturers and brand owners to reduce packaging waste and litter, specifically through the Australian Packaging Covenant (established originally as the National Packaging Covenant). More recently the focus for environment ministers has been on packaging waste arising in away-from home-locations (public places/business settings/events/hospitality) and on packaging litter.

NATIONAL REGULATORY FRAMEWORKS

Commonwealth, state and territory and local government responses to packaging waste and litter in Australia are focused through the *National Waste Policy: Less Waste, More Resources*. One of the National Waste Policy's six key directions is taking responsibility, through product stewardship, to reduce the environmental, health and safety footprint of manufactured goods during and at end of life. Strategy 1 supports this in its aim to:

> “Establish a national framework underpinned by legislation to support voluntary, co-regulatory and regulatory product stewardship and extended producer responsibility schemes to provide for the impacts of a product being responsibly managed during and at end of life.”
> (EPHC 2009, p. 9)

The *Product Stewardship Act 2011* (the PS Act) implements Strategy 1 and came into effect on 8 August 2011. Option 2 in this Decision RIS proposes several models for introducing co-regulatory product stewardship schemes for packaging, which would be implemented under the PS Act. The PS Act specifies at least twelve months’ notification must be given that a class of products is being considered for some form of accreditation or regulation. On 19 December 2011 a Product Notice was issued for packaging and subsets of packaging, such as consumer packaging or beverage packaging.

Televisions, computers and computer-related products are the first products regulated under the PS Act through the *Product Stewardship (Televisions and Computers) Regulations 2011*. These products are a priority due to growing consumption and waste generation and historically low recycling rates. The Regulations require television and computer importers and manufacturers to join and fund industry-run co-regulatory arrangements (CAs), which recycle products on their behalf to meet annual targets. Organisations wishing to establish a CA must apply to the Australian Government for approval. As of August 2013, five CAs were approved and more than 500 ongoing collection services were established across Australia, with CAs required to provide recycling services for metropolitan, regional and rural areas by the end of 2013. All liable importers and manufacturers met their obligation to join an approved CA in 2011–12 and 2012–13. The scheme has provided an instructive working model of implementing successful co-regulatory arrangements under the PS Act.

The *Mutual Recognition Act 1992* (MRA) and *Trans-Tasman Mutual Recognition Act 1997* (TTMRA) promote the free passage of goods between Australian states and territories, and between Australia and New Zealand in the case of the TTMRA. In relation to goods, the MRA and TTMRA are designed to ensure that a good that is legally saleable in one jurisdiction can be sold in any another to ensure national consistency. The requirements of the MRA and TTMRA must be adhered to under any regulatory scheme that would seek to impose requirements on saleable goods that would differ across the participating jurisdictions.

The South Australian and Northern Territory container refund schemes operate under an exemption from the MRA in order to implement their product registration and labelling requirements.

AUSTRALIAN PACKAGING COVENANT AND THE NEPM

The Australian Packaging Covenant (APC), established as the National Packaging Covenant in 1999, is a primary mechanism for implementing Strategy 3 of the National Waste Policy. The APC is an agreement between all levels of government, companies in the packaging supply chain and relevant environment and community groups to reduce the environmental impacts of packaging. The APC pursues this by funding projects to progress the following performance goals:

- Design—optimising packaging to use resources efficiently and reduce environmental impacts without compromising product quality and safety
- Recycling—efficiently collecting and recycling packaging
- Product Stewardship—demonstrating commitment by all signatories (APCC 2010).

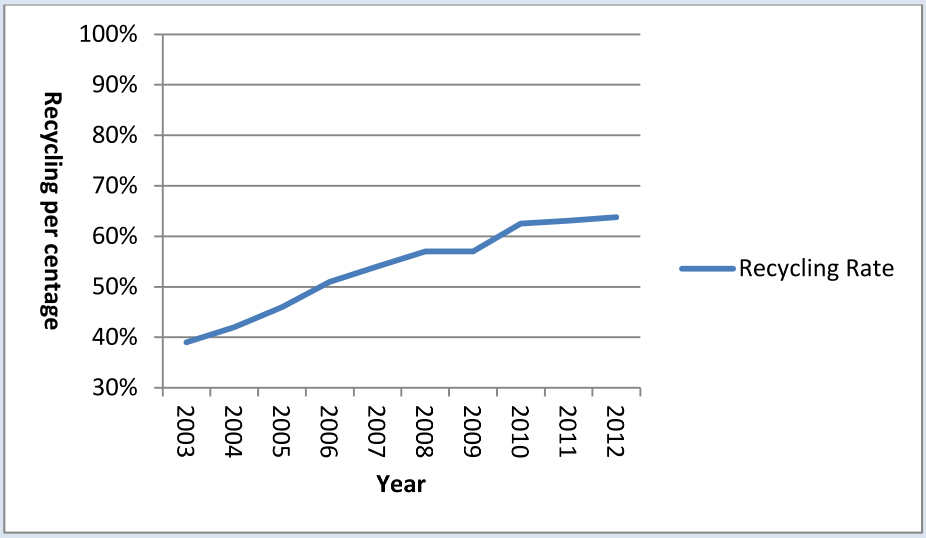
The APC pursues shared responsibility for product stewardship and environmental impacts throughout the entire packaging supply chain, including raw material suppliers, packaging manufacturers and suppliers, brand owners and retailers. As at June 2013 there were 925 APC signatories (APCC 2013b). The APC provides national consistent annual reporting of packaging recycling rates in Australia (see Box 2).

The APC is underpinned by the National Environment Protection (Used Packaging Materials) Measure (NEPM), made under the *National Environment Protection Council Act 1994* by Commonwealth, state and territory environment ministers. The NEPM provides free-rider regulation to ensure that APC signatories are not disadvantaged in the marketplace by taking action to reduce the environmental impacts of packaging. Packaging brand owners with an annual turnover greater than $5 million are required to join the APC, or under the NEPM can be part of an industry arrangement achieving equivalent outcomes. If they do not meet the APC or NEPM requirements, they are referred to state and territory jurisdictions for compliance action under the NEPM.

BOX 2: AUSTRALIAN PACKAGING CONVENANT REPORTING OF RECYCLING RATES

The APC reported an overall packaging recycling rate of 63.8 per cent in 2012, a 0.7 per cent increase on 2011 and a significant increase from the 2003 baseline of 39.2 per cent (APCC 2012b). From 2005 to 2012, the APC coordinated 141 projects with a total value of $126.1 million to increase recycling, improve packaging design and reduce litter. Industry members of the APC contributed $30.6 million towards these projects, or 24 per cent of funds. The APC estimates that these projects have contributed to 32.4 per cent of the total increase in recycled packaging tonnes from 2005 to 2012 (APCC 2013c). Figure 1 shows Australia's packaging recycling rate from 2003 to 2012.

FIGURE 1: PACKAGING RECYCLING RATES 2003 TO 2012



Source: APCC 2012b, p. 9

INTERNATIONAL CONVENTIONS AND REGIONAL AGREEMENTS

The Australian Government is a party to several international conventions and regional agreements that refer to managing waste, including litter as marine debris. The Commonwealth works with other governments and organisations to address ocean pollution and implement the London Convention 1972, the International Convention for the Prevention of Pollution from Ships 1973 (as amended by the Protocol of 1978) and the United Nations Convention on the Law of the Sea. At the 2012 Rio+20 United Nations Sustainability Conference, leaders agreed to take action to reduce the incidence and impacts of marine debris on coastal and marine environments. In 2011, the Conference of Parties to the Convention on Migratory Species adopted an Australian resolution to improve cooperation on marine debris identification and management.

In 2003 "injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris" was listed as a Key Threatening Process under the *Environment Protection and Biodiversity Conservation Act 1999*. In 2009, the Australian Government developed the *Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life* to address the Key Threatening Process and provide a framework for coordinated management of marine debris. The plan outlines actions to improve waste management practices on land and sea, raise public awareness, facilitate international cooperation, improve knowledge of marine debris origins and facilitate wildlife research and recovery actions. The Australian Government provides funding to implement on-ground activities that meet Threat Abatement Plan objectives through its natural resource management and water programmes.

STATE AND TERRITORY REGULATORY FRAMEWORKS

State, territory and local governments focus activities to address packaging waste through the *National Waste Policy: Less Waste, More Resources*. They also use a range of other approaches, including local government kerbside recycling collection, landfill levies and bans, waste and litter reduction targets and strategies, voluntary product stewardship programs and legislation allowing for the introduction of extended producer responsibility schemes.

Some states and territories have introduced regulations targeting specific environmental impacts or items of packaging. Victoria and South Australia have established landfill bans on items such as industrial waste containers (Victoria) and plastic packaging and glass that have been aggregated for resource recovery (South Australia).

South Australia (SA) and the Northern Territory (NT) have legislated container refund schemes, where consumers receive a 10 cent refund if they return a beverage container sold in these jurisdictions at an approved collection depot. South Australia's CDL aims to reduce beverage container litter and promote resource recovery, and has achieved an 80 per cent beverage container recycling rate and reduced beverage container litter and waste sent to landfill (EPA SA 2013). The NT scheme which commenced on 3 January 2012 aims to reduce beverage container litter and increase resource recovery, reuse and recycling (DLPE 2012a). During the first quarter of 2012, the container return rate was 21.9%, rising to 30.3% by the end of June 2012 (DLPE 2012b).

Prevention of marine debris from land and sea sources is also addressed through state and territory legislation governing waste management, pollution, environment protection, species conservation and litter.

3 NON-REGULATORY INITIATIVES IN AUSTRALIA

Voluntary initiatives operating to address packaging waste indicate that legislation is not the only driver to change recycling and litter behaviour. These include industry-led sustainable packaging initiatives and networks, such as the Sustainable Packaging Alliance. In addition, non-government organisations (NGOs) such as Keep Australia Beautiful, Clean Up Australia and Planet Ark undertake litter clean-up and recycling programs, community education campaigns and awards to encourage consumers and businesses to reduce waste and litter and increase recycling.

The Packaging Stewardship Forum (PSF) is a voluntary mechanism delivering recycling, litter reduction and education programs on behalf of members who are large beverage companies and their packaging suppliers. The PSF focuses on providing recycling bin infrastructure and glass reprocessing equipment.

The Plastics and Chemicals Industry Association's *Sustainability Leadership Framework for Industry* (PACIA 2008) has been promoted by Commonwealth, state and local governments to assist industry to transform practices in moving towards a 'zero waste' goal. This includes participating in international moves to reduce accidental discharges of plastic pellets (a manufacturing feedstock) from sites which contribute to marine debris.

A key driver of industry actions to reduce the environmental impacts of packaging both within Australia and internationally are associated commercial benefits that can be achieved through coordination, such as lowered manufacture, transport and supply chain costs (Consumer Goods Forum 2013, SPC 2011, Wal-Mart 2006, Green Retail Decisions, 2011). In addition, national surveys indicate a consistent, growing trend of community support for expanding recycling availability in public places and workplaces (EPHC 2010b, ABS 2009, Pollinate Green Research 2007, Ipsos Australia 2004). Stakeholder expectations of reducing packaging waste and litter and enhancing recycling were also reinforced in research undertaken for the mid-term review of the APC, which showed 60 per cent of consumers believe there is not enough emphasis on reducing the environmental impacts of packaging and 40 per cent think this is because too much packaging is used (OmniAccess 2008).

ABS statistics indicate that Australian households are strongly committed to kerbside recycling. From March 2011 to March 2012, collection from the house was the most common way for households to recycle paper, cardboard or newspapers (94 per cent), glass (94 per cent), aluminium cans (91 per cent), steel cans or tins (96 per cent) and plastic bottles or containers (93 per cent) (ABS 2012a).

Surveys about CDS schemes also find a high level of community support, especially in South Australia. A 2012 national Newspoll survey showed 82 per cent of respondents were in favour of CDL (Boomerang Alliance, 2012). A 2011 NT Newspoll survey and 2007 SA Newspoll survey showed similar results (Boomerang Alliance 2011, Clean Up Australia 2008). A 2012 study commissioned by the South Australian Government showed 99 per cent of South Australians supported their container refund scheme, and 98 per cent supported the introduction of a similar national scheme (Harrison Research 2012).

ADDITIONAL INFORMATION ON IDENTIFIED MARKET FAILURES

SPLIT INCENTIVES PROBLEM: FOR PACKAGING USERS TO RECYCLE RATHER THAN LANDFILL OR LITTER

Users of packaged products (businesses along the supply chain and individuals) have no strong financial incentive to recycle their residual packaging rather than to dispose of it in landfill or allow it to be littered. Faced with these issues, parties seeking to achieve more efficient recycling have tended to invest in infrastructure that makes the recycling choice as convenient as possible and in programs to educate and encourage users of packaged goods to make appropriate diversion choices. This has a number of dimensions, operating in both at-home and away-from-home settings.

For householders, this lack of a strong incentive has been addressed largely through the almost universal provision of convenient kerbside recycling services, paid for through general property taxes. Therefore, at the household level recycling does not involve additional costs other than some sorting of materials and hence the impact of this market failure in residential settings is reduced.

For businesses, by contrast, which use packaged goods in away-from-home settings such as commercial premises, there is a direct cost associated with providing recycling infrastructure in addition to their waste disposal arrangements. Because of the dispersed nature of arrangements in commercial settings the transaction costs are high relative to the market values that can be derived from recycling (net of transport, sorting etc). The impact of the split incentives problem is that without intervention diversion of recyclable material will not occur and recyclate value will not be captured.

In addition, there is a lack of knowledge and a level of apparent confusion amongst businesses and individuals who use/consume packaged products about what packaging can and cannot be recycled (known as information asymmetry). This is contributed to by the differing arrangements operating across Australia, so that although packaging products may be labelled as being recyclable or made of recyclable materials, they may actually not be recycled by every local council.

The lower non-paper recycling rates that are evident in commercial settings are an illustration of both these problems, as by contrast paper is more readily identifiable as recyclable and common infrastructure is widespread. Hence this market failure leads to increased cost of collection of non-paper materials for recycling, because ongoing consumer education/ encouragement and/or infrastructure investment is required. It also leads to unintended contamination of recycling systems when incorrect choices are made, which increases the costs of recycling.

This problem is unlikely to self-correct with current patterns of investment and may well grow because current packaging trends of producing lighter, more complex packaging types (such as soft pouches to replace rigid plastic bottles for detergent) are likely to continue, driven by consumer preferences, materials innovation and pressure to reduce the cost of transportation and handling. This 'light weighting' trend has been evident in reducing per capita consumption of packaging in Australia since 2003, and is predicted to continue with per capita rates forecast to fall further from 197 kilograms per person presently to around 174 kilograms per person in 2035.

In the longer term, however, waste sorting technology may evolve to the point where waste receivers can separate recyclable material out from mixed waste and deal with complex recyclables at lower net cost than current multiple-bin systems. Therefore policies to address this problem need to be flexible to future developments and not lock in current technologies and arrangements.

SPLIT INCENTIVES PROBLEM: FOR THE RECYCLABLE DESIGN OF PACKAGING

Not all packaging types are recyclable and there is huge variation in the value of different types of packaging as recyclate (see Attachment D, Table 2), depending on the material. 'Recyclable' as a concept is, itself, difficult: just because something is technically *recyclable* does not mean that it is cost effective to recycle it. For example, expanded polystyrene is *recyclable*, but in Australia rarely *recycled*[1]. This is because currently very few Australian local governments will accept it for recycling through kerbside collections, but drop-off locations are available[2]. While members of the APC are encouraged to implement Sustainable Packaging Guidelines which emphasise recyclability, these also acknowledge the tension between different environmental goals, such as the trade-off between designing packaging for efficient transport and for improved recyclability.

The producer of packaged goods does not bear the costs of disposal of the packaging once the product has been consumed, nor do they capture any potential benefits from recycling as opposed to landfilling. This means that while there may be market incentives for businesses to reduce the overall volume or weight of their packaging (such as reduced transport and storage costs), businesses which manufacture packaging have no financial incentive to use packaging which either by nature of its design or its material composition optimises the potential to capture recyclate value, to drive recycling at end of life. In many cases there is a financial/business driver for the increasing use of non-recyclable materials such as multiple composite plastic layers which enhance attractiveness and presentation or the functionality of a product, however can render the whole package non-recyclable.

This split incentives problem for the recyclable manufacture and design of packaging is evident at each point along the supply chain where packaging is used and discarded.

NEGATIVE EXTERNALITIES ASSOCIATED WITH LANDFILLING OF CERTAIN MATERIALS

When used packaging is disposed of in landfill it may have consequences beyond the immediate land-use and management costs of the landfill. Given the absence of hazardous materials in packaging, the main concern relates to greenhouse gas emissions (methane), which arise when paper and cardboard packaging eventually breaks down in landfill. Other packaging materials (for example, glass) have minimal landfill externalities.

The volume of paper/cardboard going to landfill in 2009-10 was 656,071 tonnes. Recycling paper and cardboard reduces the volume of these materials in landfill, reducing their emissions.

While a direct consequence of landfilling waste is that the value of that material is lost (not captured as a resource) and that landfill space is used up sooner, these effects have not been described as an externality market failure since their costs are borne by the packaging industry and waste managers in the form of commodity prices (which reflect scarcity) and landfill management costs respectively.

NATURAL MONOPOLIES IN RECYCLING INFRASTRUCTURE RISK PERVERSE OUTCOMES

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[1] See http://www.epsa.org.au/about-eps/eps-recycling

[2] See http://recyclingnearyou.com.au/search.cfm

The collection and recycling of packaging waste is a sector that is characterized by a significant reliance on infrastructure. To the extent that it is not efficient to duplicate this infrastructure, the recycling industry may exhibit declining marginal costs, or increasing returns to scale. To the extent that these are present in the collection and recycling sectors, these aspects of the packaging supply chain may exhibit natural monopoly characteristics.

For example, the longstanding and widespread implementation of kerbside recycling services to households has general acceptance and high participation. This means that the marginal costs of providing this service are minimised for the incumbent provider and that the barriers to entry for new collection services are high.

Policy options that rely on the development of new collection services, therefore face high marginal costs and are unlikely to be efficient. Efficient policy would therefore need to recognise the risk that new policy initiatives aimed at enhancing recycling outcomes in one area could raise costs or 'cannibalise' existing efforts in some other area.

NEGATIVE EXTERNALITIES ASSOCIATED WITH LITTER

Littered packaging harms community amenity and negatively impacts on human health (for example, broken glass) and on marine wildlife and ecosystems (for example, ingestion of plastics). Part of the cost of this harm is revealed by expenditure on public place litter clean-up activities, mostly by local government (a problem of negative externalities associated with litter).

Although national litter rates measured by the National Litter Index (NLI) show a gradual decrease, packaging remains prominent in the litter stream, particularly by volume. Beverage containers are a highly visible component of packaging litter, making up approximately 89 per cent of total litter by volume and 31 per cent of all litter by item count[3]. Most littered packaging arises as a result of the actions of individuals following public place consumption of food and beverage products[4]. In terms of environmental impacts, packaging litter pollutes both land and marine ecosystems. In particular, plastic litter entering the marine environment is known to harm marine ecosystems and wildlife, including protected species of birds, sharks, turtles and mammals, through entanglement, ingestion or carriage of contaminants (DEWHA 2009, UNEP 2011, Hardesty and Wilcox 2011).

The cost of cleaning up litter is mostly borne by governments, particularly local government, and volunteer community groups. The costs are not borne by producers of packaged goods, except to a limited extent, and producers of packaged goods do not have a direct incentive to design their packaging to minimise its impact when littered.The economic cost of litter is estimated at $501 per tonne, based on a range of observed clean-up cost estimates. The estimated total cost of litter to the Australian economy is therefore currently $38 million per annum[5].

Incentives facing consumers are mixed: with both regulatory and social sanctions operating to greater or lesser extents. Successful public litter programs tend to focus on a combination of education, infrastructure and enforcement (Attachment K, p. 34). The problem of littering is unlikely to self-correct. The trend of increasing take-away consumption of food and beverages will provide greater

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[3] Based on NLI 2011–12 data. Calculated from McGregor Tan Research 2012 pp. 160–162, PwC, WCS 2011 p. 14

[4] See MJA 2013b, Attachment K, section 3.3.3.

[5] Calculated from MJA 2013a, Attachment K, pp. 39, 93.

opportunities for littering to occur. In addition, while the trend of lighter-weighted packaging is projected to continue to reduce the *weight* of packaging (and hence the amount going to landfill) it will not necessarily have a similar effect on the volume of packaging, which largely drives the visual and environmental impacts of litter. Indeed, lighter packaging may be more mobile (wind and water), leading to a wider dispersion of litter beyond the points where it is initially littered.

CONSULTATION PROCESS AND ADDITIONAL FEEDBACK

1 DEVELOPMENT OF THE CONSULTATION RIS

Engagement with key stakeholders began directly following the July 2010 decision by environment ministers to develop a Consultation RIS. In August 2010, the Australian Packaging Covenant Council (APCC) was informed of the RIS development process and has received regular updates at meetings held quarterly.

Initial one-on-one consultation sessions took place between September and November 2010 with the Australian Council of Recycling, Boomerang Alliance, Coca-Cola Amatil, Fosters Group, Keep Australia Beautiful, Lion Nathan Limited, Visy and Westfield Group. There were differing views on whether the RIS should only consider beverage containers or whether, consistent with the EPHC position, it should consider a broader packaging scope. This reflected strong views for and against CDS and the RIS process being seen as a means to determine the costs and benefits of implementing a national CDS. In November 2010, environment ministers noted that they were pleased that a number of stakeholders had been engaged in preliminary discussions on the potential scope of the RIS. Ministers also agreed that "consistent with Ministers' July 2010 decision, the focus of the RIS should not be solely on beverage containers but more broadly about litter reduction and resource recovery" (EPHC 2010c).

A stakeholder workshop in Sydney on 2 December 2010 ensured broad input at an early stage, with around 50 representatives from industry, government and environment groups attending. The workshop sought further data on packaging waste and its impacts, and input on related market failures to inform the draft problem statement. A key finding was that there is limited data on packaging waste in Australia and the sources of packaging related market failures are not all identified, although knowledge of environmental impacts and feasible options to address those impacts is sound. Little additional data was received.

Some stakeholders provided further written feedback: the Australian Packaging Covenant, Local Government and Shires Association of New South Wales, National Association of Retail Grocers of Australia, National Packaging Covenant Industry Association, Revive Recycling and Total Environment Centre (also a member of Boomerang Alliance).

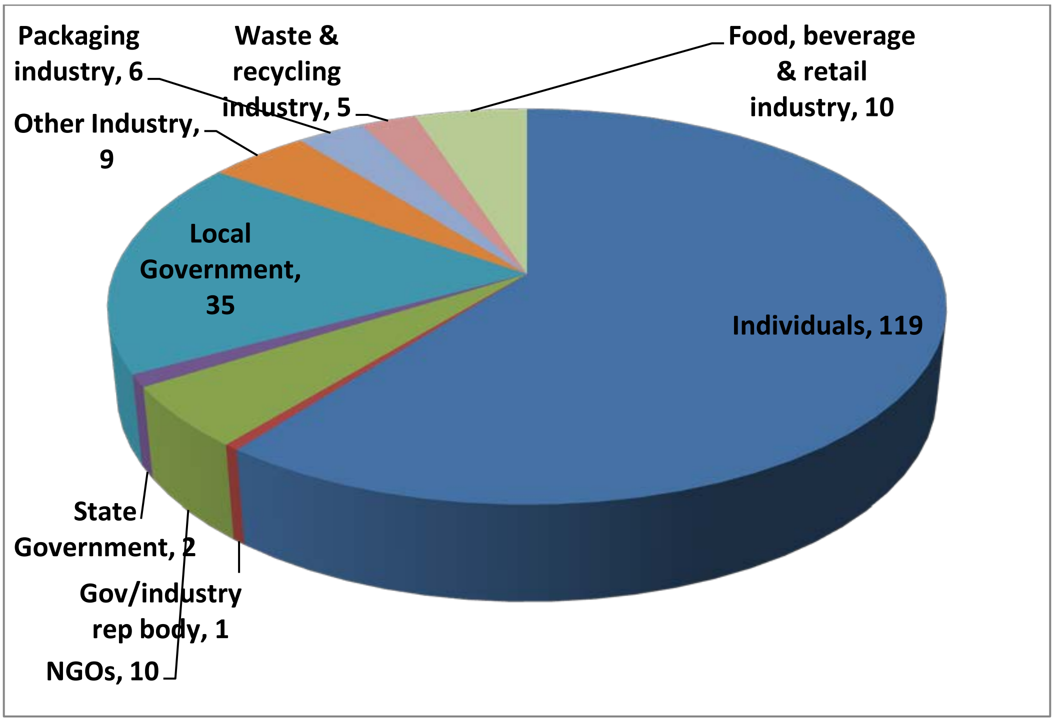
A second stakeholder workshop in Melbourne on 18 July 2011, with around 40 representatives from industry, government and environment groups, refined and scoped the regulatory options for consideration. Stakeholders were invited to submit detailed proposals of options for inclusion in the RIS. The Boomerang Alliance, in their development of option 4a (Boomerang Alliance Container Deposit Model), and the Packaging Stewardship Forum (in partnership with Keep Australia Beautiful) in their development of option 2b (Industry Packaging Stewardship), worked closely with officials and the consultants. Further consultation also took place with the Australian Packaging Covenant, Clean Up Australia (also a member of Boomerang Alliance), the Local Government and Shires Association of New South Wales and the National Packaging Covenant Industry Association.

FORMAL STAKEHOLDER CONSULTATION PERIOD

The Consultation RIS was released on the SCEW website on 7 December 2011 for a four month period. Eleven public consultation sessions were held in capital cities and three regional centres during February and March 2012. In total around 250 people attended the sessions. Each session consisted of a two hour public forum, including a presentation on the economic analysis, followed by 30 minute bilateral meetings with interested stakeholders.

The closing date for stakeholder submissions was 30 March 2012. A total of 197 substantive submissions were received, including eight confidential submissions and four late submissions. Submissions were received from a diverse range of stakeholders (see Figure 1). A list of stakeholders who provided non-confidential submissions and a Consultation Summary Report is available on the SCEW website (see Attachment J)[1]. The majority of substantive submissions (94 per cent) did not discuss the details of specific options in the Consultation RIS, instead stating overall positions and preferences (Attachment J, p. 4). In addition, around 3,000 campaign submissions were received, which comprised a pro forma email generated online and expressed support for a national CDS.

FIGURE 1: COMPOSITION OF SUBSTANTIVE SUBMISSIONS BY STAKEHOLDER TYPE



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Source: Consultation RIS Consultation Summary Report, Attachment J.

2 DECISION RIS CONSULTATION

On 24 August 2012, environment ministers agreed to develop a Decision RIS to undertake a more detailed analysis of the options, including regional and other distributional impacts. Stakeholder feedback on the Consultation RIS also led to environment ministers agreeing to the inclusion of three new options in the Decision RIS:

- Option 2d: Beverage Container Stewardship—reflecting interest in a non-CDL approach to beverage sector product stewardship
- Option 2e: Extended Australian Packaging Covenant—reflecting strong industry support for the current APC co-regulatory model
- Option 4c: South Australian Container Refund Model—reflecting strong support for the SA model of CDS.

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[1] See: http://www.scew.gov.au/consultation/packaging-impacts-consultation-regulation-impact-statement-ris.

Environment ministers stressed the importance of senior officials consulting with key stakeholders on the design elements of new options and modelling assumptions (SCEW 2012b, p. 1). Two stages of consultation were subsequently conducted during development of the Decision RIS.

STAGE 1

Meetings with key stakeholders in November and December 2012 refined and confirmed design details of the stakeholder options (2b—Industry Packaging Stewardship and 4a—Boomerang Alliance CDS) and informed the development of new options (2d, 2e and 4c). Stakeholders consulted during Stage 1 were:

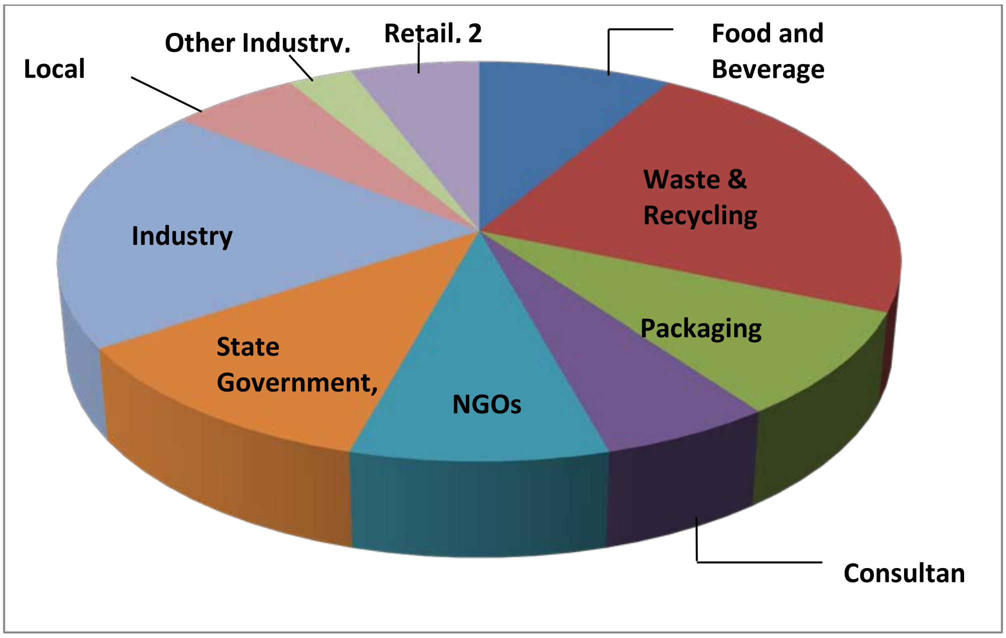
- Australian Beverages Council
- Australian Food and Grocery Council
- Australian Local Government Association
- Australian National Retailers Association
- Boomerang Alliance
- Keep Australia Beautiful
- National Packaging Covenant Industry Association
- Packaging Council of Australia
- Packaging Stewardship Forum.

Additional written feedback was received from the Australian Food and Grocery Council/Packaging Stewardship Forum, Boomerang Alliance, Keep Australia Beautiful, and the National Packaging Covenant Industry Association.

STAGE 2

A stakeholder workshop on 14 March 2013 in Sydney discussed distributional impacts and key modelling assumptions for all Decision RIS options and the base case. In total, 40 stakeholders attended the workshop and a broad range of stakeholder groups were represented (see Figure 2).

FIGURE 2: COMPOSITION OF STAKEHOLDER ATTENDANCE AT DECISION RIS WORKSHOP



Source: Decision RIS workshop attendance records.

Marsden Jacob Associates (MJA) (working with Warnken ISE) provided an overview of the proposed modelling approach for the CBA and received stakeholder feedback on key assumptions.

Additional submissions from the Boomerang Alliance, National Packaging Covenant Industry Association, Vinyl Council of Australia, Western Australian Local Government Association and two confidential submissions were passed to MJA for use in finalising the assumptions for the CBA.

3 ADDITIONAL DECISION RIS FEEDBACK

Some submissions identified the need to issues in the current kerbside system, through investment in updated sorting and processing technology to improve recycling rates and glass recovery from co-mingled recyclables. While the Decision RIS recognises that improvements can be made in both municipal and commercial/public place settings, the strong public place consumption driver of litter and identified barriers to recycling in the C&I sector in particular indicate the impacts are greatest in the away-from-home sector.

A submission from the tobacco industry noted the importance of nationally consistent anti-littering enforcement to underpin education and infrastructure efforts. The options modelled in the DRIS do not include specific national anti-littering regulations, however under all the options it is expected that a national approach to litter reduction would be strengthened.

CONTAINER DEPOSIT SCHEMES

A number of individuals who favoured CDS indicated that packaging producers and brand owners, rather than consumers, should bear the costs of such a scheme.

Submissions from local government were mixed in relation to CDS. One third of state/local government submissions (including local government representative organisations) supported at least one of the CDS options (SCEW 2012a, p. 10), albeit with many noting that the costs of a CDS should be borne by the packaging industry rather than ratepayers. The Local Government Association of Queensland submission put a contrary view, based on a detailed CBA of the potential impacts of CDS on Queensland councils, which would bear higher costs than estimated in the Consultation RIS (LGAQ 2012). Local government attendees at the Albury and Darwin public forums also expressed concerns about the potential negative impacts of a CDS on councils in relation to existing waste services contracts.

The majority of industry submissions did not support CDS options, considering them expensive and leading to increased regulatory burden on the beverage industry. Submissions also suggested that the costs associated with a CDS would result in higher consumer costs, which would ultimately impact employment in the beverage and grocery supply chain. As mentioned in Chapter 5, the Decision RIS modelling has accounted for the cost impacts of CDS options raised by stakeholders, based on observable evidence, but has not analysed claims of net job creation or loss under the options.

One waste and recycling industry submission commented that CDS options would require new infrastructure that competes with existing kerbside and MRF infrastructure and stated a preference for policies that promote investment in new infrastructure which builds upon existing assets.

A submission from the NT Government supported CDS and said that costs would be lower for CDS options if they were modelled on the industry-based models applied in SA and the NT. However, a confidential submission noted that the introduction of the NT CDS has resulted in fewer recycling materials being collected from some remote communities due to existing free back loading arrangements being replaced with commercial arrangements.

A submission from the SA Government identified benefits of its CDS, including high beverage container recycling, reduced beverage container litter, co-benefits of increased recycling of other products and providing income to disadvantaged people and community groups. It noted that it is unlikely that the other options presented in the Consultation RIS could match the beverage container recycling rate that can be achieved with a CDS. This assumption was accepted based on evidence of SA scheme performance, albeit with the associated assumption that other options achieve recycling outcomes across a broader range of packaging materials. One confidential submission from the recycling industry described the SA CDS as unnecessarily complex and said there are high costs associated with the scheme as a result.

KEY CBA ASSUMPTIONS

The Packaging Impacts Consultation RIS presented an initial Cost Benefit Analysis (CBA) and questions for stakeholder consultation as a starting point for discussing the impacts of regulatory options. Feedback received has informed the Decision RIS.

MJA undertook a review of the data assumptions in the Consultation RIS, a review of relevant literature and attended stakeholder consultations. Some data assumptions for the Decision RIS were revised as a result. The Decision RIS uses revised assumptions only where a clear case has been established for doing so. Similarly, additional assumptions have been developed for issues that were not fully addressed in the Consultation RIS. The revisions of most impact to the analysis are highlighted here and are also presented in more detail in MJA's Data Assumptions report (Attachment K). In particular a summary of key changes from the Consultation RIS is provided in Table 1 in that report.

1 KEY CBA ASSUMPTIONS

The base year for analysis has moved forward two years from 2011 to 2013 as revenue and costs will not start to accrue until 2014 (depending on the option). A standard discount rate of 7 per cent has been used as approved by the Department of Finance. In addition, sensitivity analysis rates of 3 and 10 per cent have been used.

CONSUMPTION, RECYCLING, LITTER AND LANDFILL PROJECTIONS

CONSUMPTION

The total packaging consumption estimates for the base year and subsequent years have been retained from the Consultation RIS for the Decision RIS. For the first five years of analysis (2013–2015) packaging consumption is assumed to increase by 0.75 per cent per annum. This will gradually reduce throughout the assessment period to 0.54 per cent per annum in the final five years of analysis (2030–2035). This assumption reflects a rise in total packaging consumption in absolute terms (tonnes) during the assessment period and falling consumption per person, due to a higher rate of population growth and light weighting of packaging materials.

The consultants adjusted the material split for packaging consumption, drawing on recent packaging consumption and recycling data from primary sources which suggests that the beverage container component was likely understated in the Consultation RIS (Industry Edge, Equilibrium 2011). Accordingly, the proportion of beverage containers to other packaging has been increased by 5 percentage points (30 per cent of packaging), and flexible packaging decreased by 5 percentage points (62 per cent of packaging). The increased estimate of the proportion of beverage containers consumed increases the cost of the CDS options as it will translate into increased units flowing through the CDS system, in which costs are unit based.

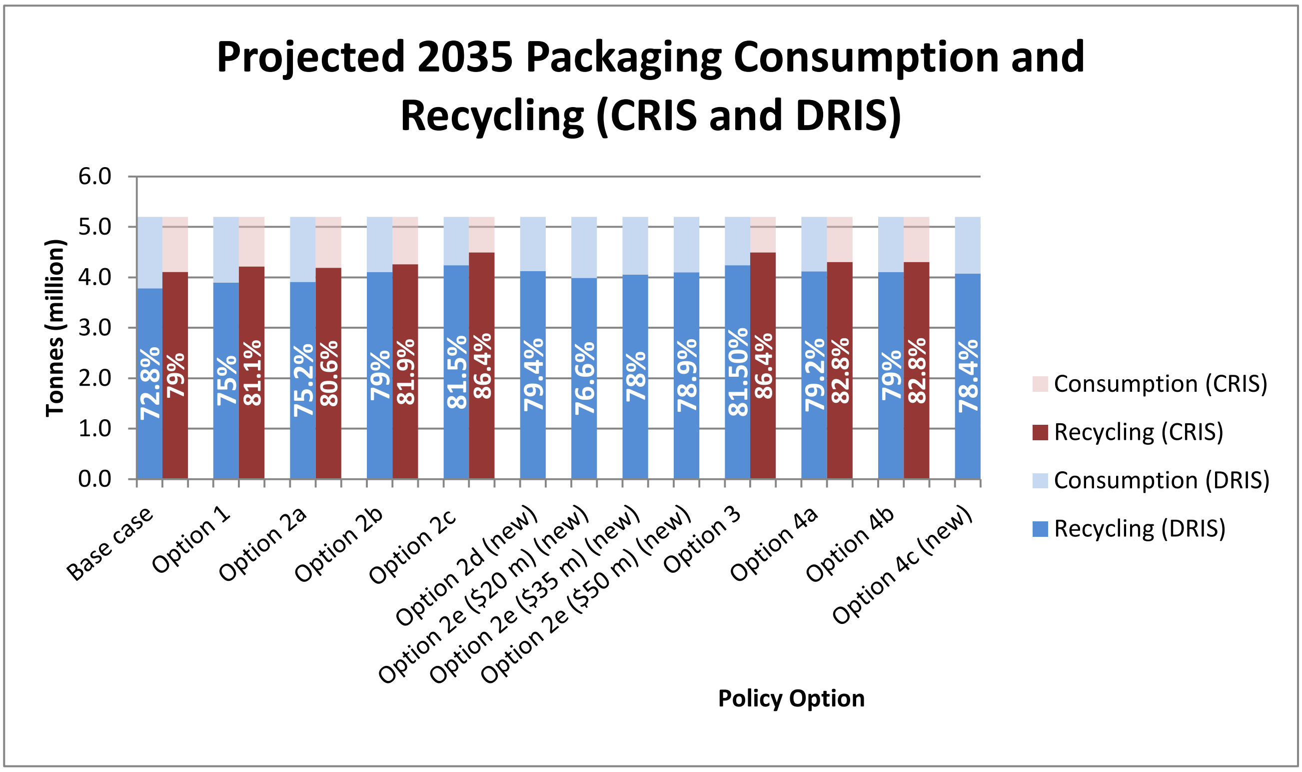
RECYCLING

The projected recycling performance of the base case and each policy option at maturity across both all packaging and beverage containers is detailed in Figures 1 and 2. These projections are based on a packaging material flows analysis (MFA) conducted by the consultants to understand the impacts on the recycling market of different policy options.

Under the base case, it is assumed that investments in recycling infrastructure are adopted where it is financially viable to do so. If recycling rates above the base case are desired, this requires an additional financial outlay from industry, which may be achieved through either financial incentives (such as grants or subsidies) or mandates (such as targets under the *Product Stewardship Act 2011*). Consistent with economic theory (the law of diminishing returns), the greater the volume of recycling recovered, the greater the marginal cost of achieving additional recycling. These marginal costs increase as the recycling target is approached, as the easiest and most cost-effective options for increasing recycling are implemented first, followed by more costly options (see Attachment K, p. 69).

This is demonstrated in Figure 1, where options requiring the most financial outlay (option 2c and option 3) achieve the greatest recycling rate. Options that focus on beverage containers (option 2d and options 4) achieve a higher beverage container recycling rate, but marginally lower total recycling overall (Figure 2). These options, as with all options, are additional to broader recycling activities undertaken by other parties as part of the base case. Option 4c has a lower recycling rate than other CDS options because the scope of liable products is narrower, based on the current coverage of the South Australian scheme.

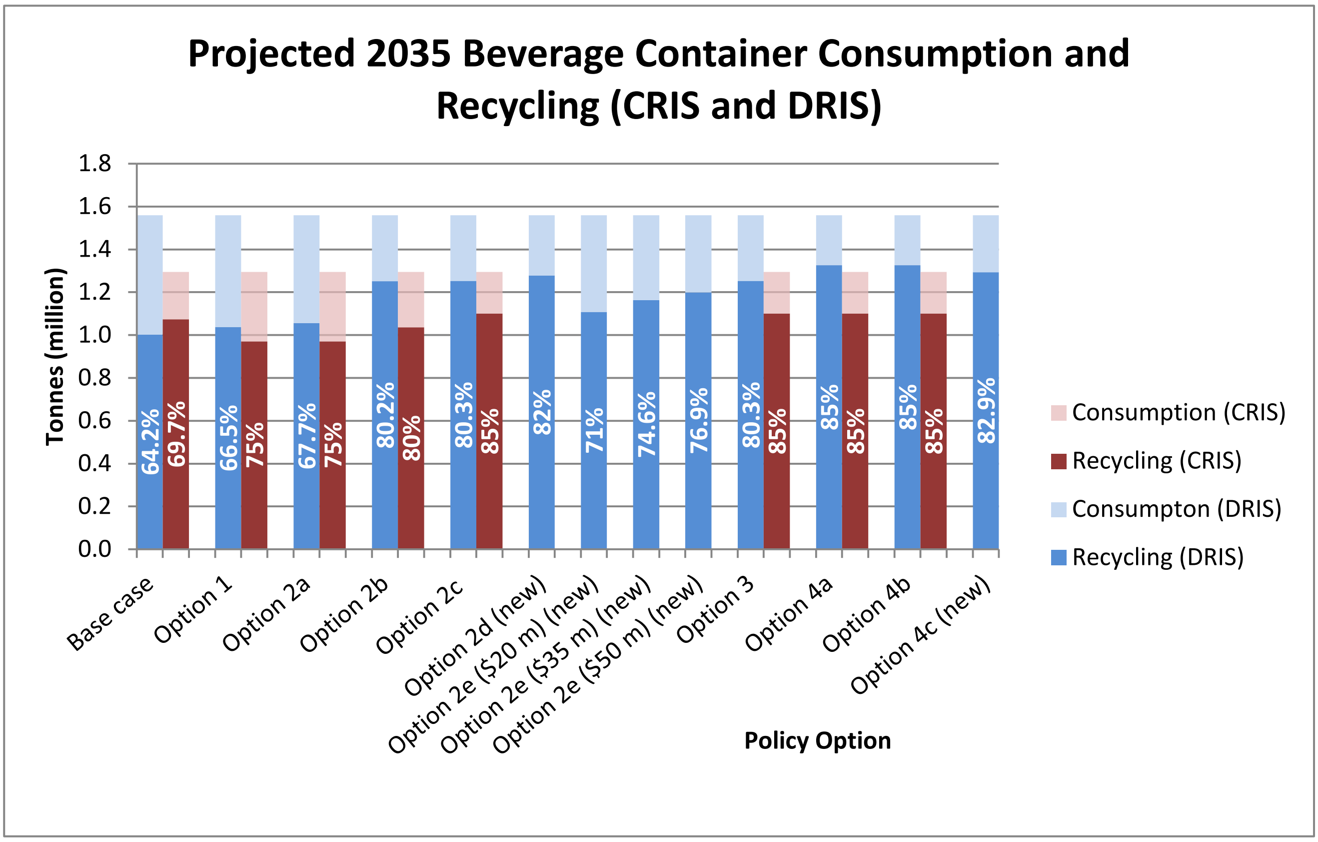
FIGURE 1: PROJECTED 2035 PACKAGING CONSUMPTION AND RECYCLING—ALL PACKAGING MATERIALS (CRIS AND DRIS)



Source: MJA 2013a (Attachment K)

Risk premium for options that do not involve a direct financial incentive: A risk premium has been applied to options 2 and 3 as these do not contain provisions to drive a direct financial incentive for consumers to recycle. There is a higher risk of options 2b, 2c, 2d and 3 not achieving their recycling and litter outcomes as they entail high beverage container recycling rates that approach practical upper limits for co-mingled recycling systems and do not involve direct price incentives. To mitigate this risk and ensure it could be appropriately reflected in the CBA results, a higher 'risk premium' cost has been applied to these options than to Option 2a and 2e. The risk premium rate reflects the need for options to fund comprehensive, ongoing and well-targeted information and education programs to encourage businesses and households to participate in recycling initiatives and infrastructure at levels sufficient to support the projected outcomes. While this approach provides some balance to ensure relevant risks of not meeting recycling targets are considered, it is unclear to what extent it fully mirrors the impact of a direct incentive such as under a CDS.

FIGURE 2: PROJECTED 2035 BEVERAGE CONTAINER CONSUMPTION AND RECYCLING (CRIS AND DRIS)



Source: MJA 2013a (Attachment K)

LITTER

Litter incidence and distribution is difficult to quantify, although it was a key area of stakeholder concern in response to the Consultation RIS. The Decision RIS approach to analysing litter differs from that in the Consultation RIS. The Consultation RIS assumed a 6 per cent litter rate from packaging available to be littered (calculated as packaging consumption minus packaging recycled and distribution packaging). The Consultation RIS assessed how each option reduced the 6 per cent litter rate.

The Decision RIS approach is based on feedback from stakeholders that litter is a function of public place consumption of packaging, rather than total packaging consumption minus recycling and distribution packaging. The total amount of public place packaging available to be littered is based on public place consumption, while also accounting for other sources of litter such as paper and cardboard from the C&I sector. This determines an overall propensity to litter of 27 per cent of public place consumption. Despite some gaps and inconsistencies in Australian litter data, this new methodology provides a robust assessment of current litter levels and the potential for litter reduction under the options.

LANDFILL

As in the Consultation RIS, MRF rejection rates and landfill residual costs have been factored into MRF processing costs. However, the consultants have reviewed jurisdictional evidence and utilised the material flows analysis to determine different rates for different regions in the Decision RIS CBA in more detail.

KEY COST ASSUMPTIONS

A number of cost assumptions have been revised in the Decision RIS following reviews of data and literature and stakeholder feedback. Key changes are summarised below.

Household participation costs have been revised as follows (all other Consultation RIS assumptions have been retained):

- **Accumulation time:** The value of time for householders to transfer packaging to accumulation points such as kerbside recycling bins or container redemption points has been revised to be zero for all options. Substantial evidence was provided by stakeholders that the accumulation time associated with each option would be no greater than current recycling practices and it remains uncertain whether this participation results in a private cost to many community members given the offsetting use-value[1] or benefits of recycling (Attachment K, p. 49).

- **Vehicle operating costs and travel time**, which relate to the number of trips made to transport packaging to collection points and the proportion of those trips that are specific to the purpose of recycling packaging, have been revised for options 4a, 4b and 4c to reflect the different types of CDS collection infrastructure and household interactions with them. There is evidence that trips to automated reverse vending machines (RVMs) are much more frequent, but that the majority of such trips are not purpose specific to only recycling packaging. Conversely,

[1] Use-value is distinct from Willingness to Pay. Use-value refers to the emotional or social payoff associated with incurring cost or inconvenience in order to perform recycling actions. Willingness to Pay refers to the intrinsic value of knowing that other people are recycling.

most households visit non-RVM infrastructure such as depots more rarely, as is assumed in the Consultation RIS, but it is more likely that such trips will be purpose specific.

- **Container deposit/refund redemption time**, which relates to walk time to redemption points and transaction time involved in redeeming beverage containers, has been revised to reflect the changes to the number of trips and proportion of purpose-specific trips above. Redemption time has also been reduced very slightly for RVMs and increased for depots to reflect recent data on depot queuing times (Harrison Research 2012).

Business participation costs have been benchmarked against standard cleaning costs and business accumulation time has also been costed at zero, on the same basis as for household accumulation time. All other business cost assumptions in the Consultation RIS (such as value of time) have been retained.

Local government kerbside collection costs have been revised to break down the costs of collecting recyclables and garbage in metro and non-metro areas, based on the Sustainability Victoria Annual Local Government Survey 2011. The truck capacity for kerbside collection has been revised downwards after consultation with the waste disposal industry. The average return trip (1.5 hours) and vehicle operating costs ($120/hour) have been retained from the Consultation RIS.

Recycling infrastructure costs of CDS options have been revised based on changes made by the Boomerang Alliance to their option (4a). The Consultation RIS assumed that option 4a would have a mix of hubs, collection depots, RVMs and rural collection points. Option 4a is now based on the use of RVMs by most consumers (1400) with some hubs for the C&I sector (165) and remote collection centres (100). Consequently, the collection structure of Option 4b has also changed to reflect the likely role of RVMs where cost-effective and to achieve redemption rates equal to Option 4a, as these options have the same scope of liable products. Option 4b retains a mix of depots (600), RVMs (800) and remote collection points (100) for consumer use and consolidation depots (165) for the C&I sector. Option 4c anticipates rolling out the existing South Australian scheme nationally, which predominantly uses depots (1200) with a small amount of RVMs (365) and remote depots (100).

Comparing the same number of total collection points allows a standardised comparison of the impacts of different infrastructure configurations on operating and household participation costs. The differing costs of CDS infrastructure in metro and non-metro locations have also been factored in. A summary of the infrastructure cost assumptions used for all CDS options is detailed in Table 1.

TABLE 1: DECISION RIS CDS INFRASTRUCTURE COST ASSUMPTIONS (CENTS PER CONTAINER)

Infrastructure Type	Capital and Operating Infrastructure Cost	Transport Cost	Baling Cost	Total
RVM (metro)	3.9	0.5	0.3	**4.7**
RVM (non-metro)	4.5	0.7	0.3	**5.5**
Depot (metro)	4.5	0.5	0.3	**5.3**
Depot (non-metro)	5	0.7	0.3	**6**
Depot (remote)	6	0.9	0.3	**7.2**
Hubs (metro)	4	n/a	n/a	**4**
Hubs (non-metro)	4.2	n/a	n/a	**4.2**
Super Collector	0.5	n/a	n/a	**0.5**

Source: Derived from MJA 2013a (Attachment K), p. 72

Industry costs: The Decision RIS estimates the potential impact on packaged goods industry sectors from lower consumer sales associated with the price impacts of the options. This has been assessed as an estimated loss of producer surplus (See Box A) in both the CBA and distributional impact analysis, which is able to be most precisely calculated for the CDS options due to the specific product categories affected but has also been applied to all options.

BOX A: LOSS OF PRODUCER SURPLUS

Loss of producer surplus for beverage container manufacturers is assumed to result from the price impacts of implementing a national CDS, which involves direct price incentives in the form of a deposit and refund on beverage containers. The consultants assessed the proportion of containers subject to a container deposit/refund that will not be redeemed by the purchasing consumer and estimated the price impact of the unredeemed deposit/refund relative to the average price of each product category.

The demand/supply response based on the change in price and resulting loss of profit was then assessed for the following industry sectors: beer, bottled water, milk, soft drink, spirits, fruit juice (options 4a and 4b only), and wine (options 4a and 4b only). This analysis does not estimate possible changes in levels of beverage industry investment and employment as this is beyond the scope of this RIS.

Additional recycling costs: The total cost of meeting a given recycling target has been estimated using a marginal cost curve reflecting the rising costs of additional recycling (see Box B). This contrasts with the approach used in the Consultation RIS, which assumed a flat rate for the cost of additional recycling.

BOX B: MARGINAL COST CURVE FOR ADDITIONAL RECYCLING

To estimate the costs of additional recycling under each option, the consultants developed a marginal recycling cost curve (MRCC). This was based on analysing data on costs and recycling outcomes from projects conducted by the APC and Packaging Stewardship Forum.

This data was then extrapolated to provide a list of potential projects nationwide, including C&I, public place (LGA or commercial), kerbside and mixed projects. The results stemming from the MRCC have elements of uncertainty, as they are based on existing patterns of investment and there are limitations to forecasting investment activity into the future. However to mitigate this uncertainty, the recycling project infrastructure costs for all options 2 and option 3 have undergone sensitivity analysis to test the impact of assumptions on the outcomes of the analysis. For more details see Attachment K, p. 69.

Option 2e investment profiles: Option 2e envisages a substantial increase in industry funding through an agreement in the style of the APC for projects to increase recycling and reduce litter. In the Decision RIS the increased industry contribution has been modelled at lower, middle and upper values, which were expressed in the option description (Attachment I) as $20 million, $35 million and $50 million per annum (in 2011 dollars).

The actual levels of industry contribution were modelled under three variants of option 2e:

- Option 2e ($20 million) was designed as a commitment of $20 million per year for 5 years which, over the full 20 years of the analysis, results in an average industry investment of $14.1 million annually (in 2011 dollars, excluding administration costs). This represents a total APC infrastructure investment in real terms of PV $115 million (or an undiscounted sum of $281 million).

- Option 2e ($35 million) was designed as a commitment of $35 million per year for 5 years which, over the full 20 years of the analysis, results in an average industry investment of $21.5 million annually (in 2011 dollars, excluding administration costs). This represents a total APC infrastructure investment in real terms of PV $174 million (or an undiscounted sum of $431 million).

- Option 2e ($50 million) was designed as a commitment of $50 million per year for 5 years which, over the full 20 years of the analysis, results in an average industry investment of $27.7 million annually (in 2011 dollars, excluding administration costs). This represents a total APC infrastructure and education investment in real terms of PV $222 million (or an undiscounted sum of $554 million).

For modelling purposes the Decision RIS assumes that the amount invested by industry will gradually ramp up as appropriate capital investment opportunities are identified and to address increasing marginal costs of recycling as tonnages increase (Attachment M, p.15 and p.71-77, Attachment K, pp.63–65). However, a different profile of investment would also achieve the packaging recycling outcomes of 76.7 per cent, 77.7 per cent and 78.5 per cent in 2035 respectively, as long as the investment levels and timing have an equivalent present value to the profile modelled.

KEY BENEFIT ASSUMPTIONS

Material values: A key benefit assumption, particularly for CDS options, is the market value of the material collected for recycling. Better quality material streams (for example, as a result of CDS sorting) can attract a higher value in material markets. This is represented by the CDS Premium column in Table 2. Conversely, materials with specific requirements affecting reprocessing (such as glass fragment sizes and colours) can attract a range of values. The market values for materials have been revised for the Decision RIS based on research and information on current market values provided by stakeholders. The consultants have adopted glass values based on recycling industry sources, specifically relating to material not yet pre-processed, which represents a large proportion of the market. These figures have been verified against prices received by suppliers of that material.

TABLE 2: MATERIAL VALUE ASSUMPTIONS (CRIS AND DRIS)

Material Type	CRIS Assumption ($/tonne)		DRIS Assumption ($/tonne)	
	Market Value	CDS Premium	Market Value	CDS Premium
Glass	30	100	0	40
Aluminium	1,560	0	1,418	142
Paper/Cardboard	181	0	181	0
Plastics (Beverage)	560	100 for PET and HDPE	676	100
Plastics (Non-beverage)	560	100 for PET and HDPE	349	n/a
Steel cans	280	0	280	0
Liquid Paperboard	150	0	150	70

Source: MJA 2013a (Attachment K)

Avoided landfill costs in the Consultation RIS were cited from the 2010 BDA/WCS report, which estimated operating costs for small, medium, and large landfills based on best practice controls and poor controls. For the Decision RIS, the average cost of landfill is provided by state/territory and by metro/non-metro areas.

Avoided costs of litter clean-up were used in the Consultation RIS as a focus for an estimate of the benefits of reducing litter. Costs that stakeholders associated with littering in the Consultation RIS ranged from clean-up costs through to negative externalities such as amenity, health and ecological impacts. The Decision RIS consultants extended this approach to include a broader range of litter clean-up activities undertaken by local councils and the broader community. The consultants used this information to provide a shadow price for the economic cost of packaging litter.

Reduced frequency of local government kerbside collections was cited as a benefit of introducing a CDS in the Consultation RIS. This proposition was tested for the Decision RIS by estimating the impact of a CDS on the yield of recyclate through the kerbside system, compared to the base case and on a per household basis relative to the base year (2013). The estimates indicate that although a CDS would reduce the throughput of recyclate through the kerbside system , the change is unlikely to be substantial enough for councils to reduce the frequency of the kerbside collection service in a practical and cost effective manner (Attachment K, p. 57). However, reduced volumes going through kerbside could delay moves to larger recycling bins, providing short-term benefits.

Environmental benefits: Some environmental benefits or avoided externalities were not considered in the analysis as they were not quantifiable from observed market prices. The analysis estimated the avoided environmental and social externalities arising from reduced landfill and the avoided environmental and social externalities arising from reduced litter. Environmental benefits that were not valued due to their inherent uncertainty and the consequent difficulty quantifying them were reduced resource depletion and avoided environmental externalities associated with resource extraction activities. Non-market benefits have been addressed by a sensitivity test using estimates of the community's Willingness to Pay for non-market benefits (see Section 2).

The Decision RIS retains the avoided regulatory cost assumptions used in the Consultation RIS.

DISTRIBUTIONAL IMPACT ANALYSIS

The Decision RIS includes the first distributional impact analysis of the options (Attachment M, p. 37). All options require additional expenditure in order to fund recycling and litter outcomes. In each case the sectoral group benefiting from that outcome may differ from the sectoral group that initially bears the cost. The distributional analysis examines the incidence of costs and benefits to different sectors and groups in society, based on the material flows analysis of packaging. These groups are categorised as:

- household consumers of packaged goods (consumers)
- C&I consumers of packaged goods
- manufacturers and distributors of packaged goods (packaged goods industry)
- local government
- state and federal governments (government)
- the environment and broader community (environment).

There is also a separate benefit category of co-benefits (recycling of materials other than packaging) measured outside the packaging material flows analysis, which have not been allocated across any of the above sectors. The analysis includes financial transfers between sectors, such as payment of deposits under the CDS options, but does not include certain impacts such as second order economic effects and the impacts of changes to taxes and levies (such as a landfill levy). Thus the analysis is a bounded rather than a full distributional analysis. The analysis also determines financial impacts of the options across regions, by jurisdiction (state and territory) and region (metro and non-metro areas).

CO-BENEFITS FOR RECYCLING OF OTHER MATERIALS

Stakeholders have identified potential co-benefits that could arise as a consequence of all options, and particularly the CDS options. Suggested co-benefits of a CDS include increased recycling of other materials at drop-off points, reduced litter generally (not just packaging litter), increased employment and reduced energy and water use. Some of these co-benefits, such as water and energy use associated with the manufacture of packaging from virgin materials, are upstream impacts. These may or may not result from waste policy options and are therefore too uncertain to be included in the CBA. Other co-benefits, including downstream environmental impacts such as reduced greenhouse gas emissions, are captured in the market values of collected materials in the CBA (Attachment K).

Another source of co-benefit is the increased collection of other recyclable materials at CDS depots on a voluntary basis, which would involve CDS collection depots (in the case of Options 4b and 4c) or hubs (in the case of Option 4a) providing a drop-off service for non-CDS materials. Such collection could also take place under non-CDS options, including collection of other recyclable materials by new recycling systems targeting packaging (such as new kerbside bins and mixed collection systems).

Co-benefits are included within the main CBA, with the appropriate sensitivity tests applied to ensure accuracy of results.

SENSITIVITY ANALYSIS

Where modelling assumptions have potential to significantly affect outcomes of the analysis such as the NPV, a range of sensitivity tests were undertaken to test levels of certainty in the results based on optimistic, central and pessimistic scenarios. The consultants used a threshold analysis to understand how changes to key cost and benefit assumptions would affect fundamental outcomes of the analysis in terms of the final NPV, BCR and comparative ranking of options.

To facilitate the sensitivity analysis, uncertainties in estimates and stakeholder consultation feedback were noted during the process of capturing assumptions and, where possible, a range of likely values (lower bound to upper bound) were captured. The core variables tested through sensitivity analysis for all options (unless otherwise specified) were:

- infrastructure and operating costs
- government and product stewardship organisation (PSO) administration costs
- household participation costs (CDS options)
- business participation costs
- transport and collection costs
- market values of materials
- landfill externalities
- litter shadow price.

In addition, the discount rate used in a CBA affects NPV results as it varies the relative contribution of costs or benefits further in the future compared with those nearer to today. The greater the discount rate, the lower the relative contribution of costs and benefits further in the future to the NPV. Sensitivity testing was also performed on the discount rate of 7 per cent using 3 per cent and 10 per cent rates to ascertain if the changed rates affected the temporal distribution of costs and benefits of the options. The sensitivity analysis results are discussed in Chapter 7 and in Attachment M (p. 25).

2 OTHER ANALYSIS APPROACHES

NON-MARKET BENEFITS

It is likely that the community places non-market values on increasing recycling and decreasing litter, such as a sense of civic duty, appreciation of positive amenity in public places and pride in contributing to outcomes that are perceived to be good for the environment. In 2010 a study by PwC on households' willingness to pay (WTP) for increased packaging recycling was commissioned by the EPHC. Due to difficulties with disaggregating the market and non-market components, the study estimates were not included in the calculation of core results of the Consultation RIS CBA, but reported alongside these to avoid double counting of certain benefits. This approach is also adopted for the Decision RIS.

In addition, the Decision RIS consultants conducted a sensitivity and threshold analysis of the CBA results to determine how significant non-market benefits would need to be in order to fundamentally change the outcomes of the analysis. A fundamental change would include providing a positive rather than a negative NPV, or a BCR above or below 1, estimate for a particular option, or vice versa. The results of this testing are discussed in Attachment E and Attachment M (p. 31).

3 UNCERTAINTIES

All regulatory options in this Decision RIS are subject to uncertainty due to the inherent difficulty of projecting any variable over a 22 year study period. The impacts of the following may be subject to change in the future:

- recycling levels and decisions of various parties including local government, households and businesses in the absence of additional regulation, also influenced by the use-value of recycling
- the number of liable businesses facing regulated obligations
- packaging consumption trends, affected by factors such as technology, logistical innovations, trade agreements and food and beverage prices
- the value of the Australian dollar
- the general inflation rate, which particularly affects CDSs with a fixed refund amount
- unknown future impacts that may affect the ability of the options to achieve the outcomes specified
- unintended consequences arising from regulatory intervention and incentives, based on human and market responses that are not always predictable.

NON-MARKET BENEFITS

The community places a value on recycling and litter reduction that includes a range of market and non-market values. Market values have been fully captured in the CBA, along with some non-market benefits such as avoidance of environmental externalities associated with reduced landfill and litter. Other non-market benefits, such as reduced resource depletion and associated environmental externalities and a sense of civic duty associated with recycling and litter reduction, have not been included due to difficulty in valuing and quantifying these benefits. However, it is acknowledged that households likely place values on these non-market benefits and may be willing to pay for them to an extent.

The consultants conducted additional sensitivity tests to estimate the effect of assumptions about the community's willingness to pay (WTP) for higher recycling and litter reduction on the outcomes of the economic analysis. The sensitivity tests used a lower estimate of WTP for recycling ($154 per tonne) and an upper estimate ($702 per tonne) based on research to test a range of possible changes in assumptions. For further details of the methodology used, refer to MJA's Regulation Impacts Report at Attachment M.

The results show that heightened WTP values for recycling and litter promote the ranking of the non-CDS options that achieve the highest recycling and litter outcomes (options 3 and 2c). These tests also show that CDS options still do not show net benefits even with higher WTP values, due to the scale of their high net costs. The NPV results for both CDS and non-CDS options following the WTP sensitivity testing are shown in Table 1.

TABLE 1: RECYCLING AND LITTER WTP SENSITIVITY ANALYSIS FOR OPTIONS ($MILLION NPV)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e ($35m)	Option 2e ($50m)	Option 3	Option 4a	Option 4b	Option 4c
Central case	$74	$48	-$75	$119	-$107	$79	$98	$152	$130	-$3,784	-$3,857	-$4,539
WTP (lower estimate)	$238	$330	$435.2	$828	$349	$409	$499	$612	$831	-$3,204	-$3,271	-$3,974
WTP (upper estimate)	$730	$1,119	$1,825.3	$2,935	$1,554	$1,339	$1,670	$1,999	$2,939	-$1,824	-$1,862	-$2,614

Source: Calculated from MJA 2013c (Attachment M) p. 32

DETAILED CBA AND DISTRIBUTIONAL IMPACTS RESULTS

1 DISTRIBUTIONAL IMPACTS

While all of the options require additional expenditure to support recycling and litter actions, the source of the extra funds differs depending on the option. In addition, the stakeholder group or sector accruing the benefits may differ from the one bearing the cost. The six sectors analysed for distributional impacts are: consumers, local government, the commercial and industrial (C&I) sector, the packaged goods industry, the environment, and government. Refer to Table 1.

All options will see a transfer of benefits from government (by organising and funding coordination and regulatory oversight), the packaged goods industry (by funding recycling and litter initiatives) and consumers (by funding costs passed on by industry) to local government and the C&I sector as recyclate providers—entities that collect and dispose of valuable recyclable material—and the environment (by reducing landfill and litter externalities).

TABLE 1: SUMMARY OF DISTRIBUTIONAL IMPACTS OF OPTIONS (PRESENT VALUE, $ MILLION)

	Consumer	Local Government	C&I	Environment	Packaged Goods Industry	Government	Co-benefits (unallocated)
Option 1	0.0	12.3	69.1	34.4	0.0	-88.0	46.2
Option 2a	-88.3	23.6	78.9	67.0	-54.6	-24.6	46.2
Option 2b	-401.6	72.4	207.3	122.9	-70.6	-32.0	26.0
Option 2c	-534.8	79.6	385.0	149.7	-82.1	-39.4	161.3
Option 2d	-388.9	67.1	159.2	113.0	-34.3	-22.7	0.0
Option 2e ($20m)	-114.7	29.6	88.1	74.3	-34.7	-17.0	53.8
Option 2e ($35m)	-174.2	35.4	128.2	84.4	-36.1	-17.0	77.3
Option 2e ($50m)	-222.2	37.5	184.0	93.0	-37.3	-17.0	114.0
Option 3	-534.8	79.6	385.0	149.7	-32.7	-85.5	161.3
Option 4a	-7,196.4	1,083.1	2,549.2	175.7	-162.6	-357.9	12.1
Option 4b	-6,150.9	568.7	1,998.2	173.9	-228.8	-275.8	56.3
Option 4c	-7,984.1	1,022.4	2,487.7	166.0	-454.5	-97.9	98.7

Source: MJA 2013c (Attachment M)

JURISDICTIONAL IMPACTS

Regional impacts between states and territories and metro and non-metro regions have also been modelled. A summary of the impact of options to states and territories is provided in Table 2.

TABLE 2: SUMMARY OF IMPACTS TO JURISDICTIONS OF OPTIONS (PV, $ MILLION)

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Unallocated
Option 1	32.3	27.6	33.5	4.8	14.9	0.8	1.6	0.3	-41.8
Option 2a	53.2	41.2	44.0	5.7	20.2	1.7	2.8	0.5	-121.3
Option 2b	163.7	106.2	79.1	5.2	36.8	2.2	8.8	0.5	-478.1
Option 2c	182.4	139.5	172.8	17.8	88.9	3.1	8.8	0.9	-495.0
Option 2d	133.3	91.9	69.0	3.1	32.8	2.2	6.7	0.4	-446.0
Option 2e ($20m)	69.8	43.2	46.1	4.9	21.1	1.8	4.5	0.5	-112.6
Option 2e ($35m)	85.6	55.3	63.5	7.5	28.6	2.1	4.8	0.6	-150.0
Option 2e ($50m)	92.6	70.7	90.5	12.8	40.2	2.2	4.8	0.7	-162.5
Option 3	182.4	139.5	172.8	17.8	88.9	3.1	8.8	0.9	-483.9
Option 4a	-1,204.2	-938.0	-675.0	2.9	-349.4	-67.0	-45.8	1.3	-508.3
Option 4b	-1,250.8	-974.9	-701.4	0.5	-364.9	-69.9	-48.6	1.1	-448.3
Option 4c	-1,491.7	-1,158.6	-848.9	4.0	-442.4	87.0	-60.9	0.7	-453.7

Source: MJA 2013c (Attachment M) p. 52

As a general rule, states and territories benefit in proportion to their waste production; that is, if a state or territory produces more waste, it will receive more benefits. This is why New South Wales receives the most benefits of any state.

Table 2 also shows that the more recycling generated by an option, the more beneficial it will be to jurisdictions. This is because jurisdictional benefits derive from the diversion of waste to recyclate resulting in revenue for both the C&I sector and local governments which can be localised within a jurisdiction. However, options which have a mandated beverage container target (options 2b, 2c, and 2d) are expected to provide South Australia and Northern Territory with minimal benefits (compared to other states), since beverage container recycling is already addressed via their existing CDSs. Benefits of waste diversion also accrue through avoided landfill costs and litter and associated environmental externalities.

It should be noted that these results are qualified by the unallocated costs which cannot be apportioned to a particular region. These include costs borne by both federal and state government (administration), and the packaging industry (administration and compliance, recycling and litter infrastructure, and loss of producer surplus), and also co-benefits.

In the apportionment of costs and benefits of CDS options to jurisdictions, CDS infrastructure costs have been assigned to individual jurisdictions in proportion to the amount of material consumed in each jurisdiction (see Table 2). This is appropriate given CDS infrastructure costs are unit-based and paid by consumers, and consumption and waste are strongly correlated (in that the more consumed, the more there is to waste).

Since consumers ultimately bear the costs of CDS infrastructure and redemption rates are assumed to be similar across all jurisdictions, net costs are assumed to be borne by regions in proportion to their beverage consumption. However, this simplification may not be the case in reality where redemption rates are likely to differ by region based on consumer behaviour, the availability and convenience of CDS infrastructure.

As both South Australia and Northern Territory already have a CDS it is expected that these jurisdictions would benefit should a CDS be implemented nationally, because it allows them to avoid the cost of operating their current CDS legislation as a stand-alone jurisdiction. Such costs then shift to the 'unallocated' sector, as a national (non-graphic) cost.

2 METRO / NON-METRO IMPACTS

Table 3 details the distributional impacts between metro and non-metro areas. Both metro and non-metro areas are expected to benefit under all non-CDS options due to the increase of recyclate captured by local government and the C&I sector. Again, the options which generate more recycling will produce greater benefits than those that generate less. While this is largely calculated based on a population and consumption split between metro and non-metro areas, there are additional transport and collection costs incurred in the non-metro areas due to larger distances between collection points and processing.

Impacts of CDS between metro and non-metro areas are distributed in the same manner as CDS costs across jurisdictions, as are the unallocated costs. That is, the infrastructure costs of CDS are assumed to match the consumption patterns for metro, non-metro and remote areas.

TABLE 3: SUMMARY OF IMPACTS TO METRO AND NON-METRO AREAS OF OPTIONS (PV, $ MILLION)

	Metro	Non-metro	Unallocated
Option 1	74.7	41.1	-41.8
Option 2a	112.4	57.1	-121.3
Option 2b	271.8	130.9	-478.1
Option 2c	398.5	215.8	-495.0
Option 2d	230.6	108.7	-446.0
Option 2e ($20m)	128.0	63.9	-112.6
Option 2e ($35m)	163.3	84.7	-150.0
Option 2e ($50m)	203.7	110.9	-162.5
Option 3	398.5	215.8	-483.9
Option 4a	-2,175.9	-1,099.3	-508.3
Option 4b	-2,277.0	-1,131.9	-448.3
Option 4c	-2,747.1	-1,337.8	-453.7

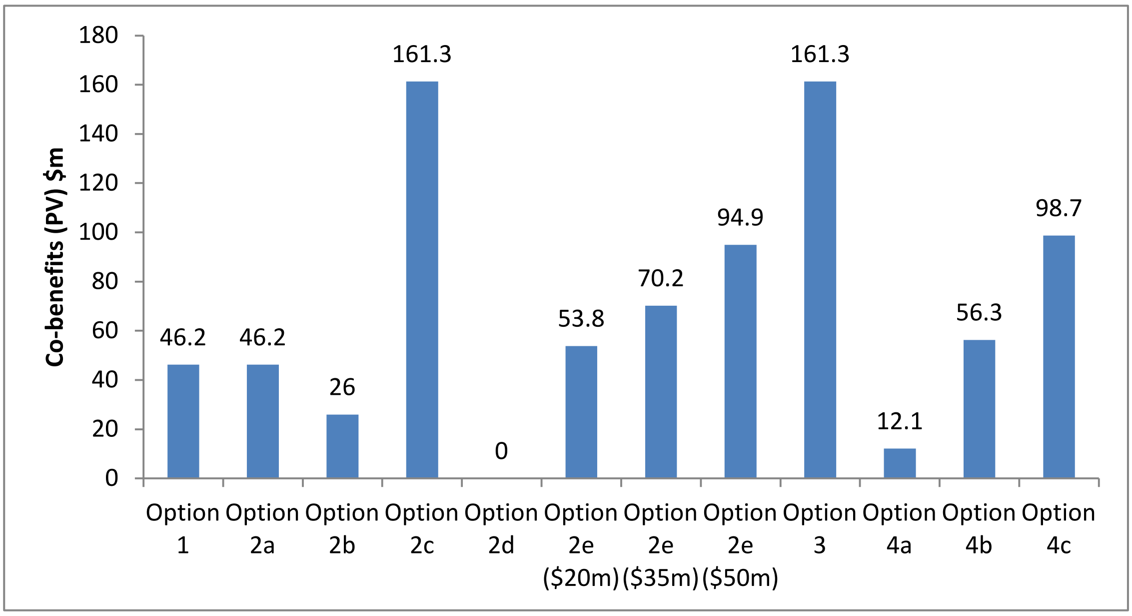
Source: MJA 2013c (Attachment M) p. 50

3 CO-BENEFITS RESULTS

The waste and recycling and packaging industries will be driven to pursue co-benefits to achieve outcomes at least cost, for example offsetting the cost of recycling cardboard by collecting high value office paper as well. Co-benefits have also been regularly cited by stakeholders involved in CDS campaigns as a key criterion to consider when assessing the value provided by a CDS.

The results demonstrate that options 2c and 3 achieve the highest co-benefits as they mandate significant investment in recycling to meet targets. This is followed by option 4c, which enables consumers to deliver other types of recyclable materials to depots at the same time as beverage containers, and option 2e, which also seeks significant voluntary industry investment in recycling projects to meet investment targets.

FIGURE 1: CO-BENEFITS ACHIEVED UNDER EACH OPTION ($ MILLIONS, PRESENT VALUE).



Source: MJA 2013c (Attachment M) p. 9

Options 2c and 3 deliver substantially higher levels of co-benefits than the other options. This is because the ambitious regulated recycling target for option 2c, will encourage action to seek out packaging recycling opportunities where there is also scope to easily collect other high-value recyclable material , such as office paper. Option 3 was modelled similarly to option 2c as it is anticipated that option 3 will collect revenue roughly equivalent to the funds spent on recycling infrastructure by CAs in option 2c.

Conversely, options 2b and 2d have a regulated beverage container target, which prevents them from seeking out recycling opportunities where co-benefits may exist. This is why option 2a (which has a broad all-packaging recycling target) generates greater co-benefits than either option 2b or 2d, despite having a lower overall packaging recycling target.

Option 1 and 2e achieve substantial co-benefits for their comparatively lower expenditure. This is achieved because these options do not involve regulated recycling targets. Rather, these options allow governments and industry respectively to seek out and invest in recycling opportunities which are likely to provide the greatest return, and which will also include non-packaging material.

Of the CDS options, option 4c generates a high level of co-benefits due to the design of drop-off collection depots as its primary collection point. The experience from South Australia shows that such depots are capable of taking a wide range of recyclable materials in addition to beverage containers, such as e-waste, and that consumers utilise this facility and drop off other materials on their container redemption trips. However, the other CDS models, with their greater reliance on shop front RVMs have reduced scope to accept other recyclable materials, and consequently generate lower co-benefits. Co-benefits are generated mainly through C&I collection hubs. This is particularly the case for option 4a where domestic redemption is primarily through RVMs. As option 4b utilises a mix of depots and RVMs, its co-benefits achievements sit between those of option 4a and 4c.

4 ANALYSIS OF EACH OPTION

All costs and benefits discussed in this section relate to the Present Value (PV) of costs and benefits, which are borne collectively by the identified stakeholder or sector groups over the total RIS analysis period up to 2035. Benefits allocated to the 'environment' refer to reductions in negative environmental externalities that have been valued in the CBA, such as avoided greenhouse gas and other air emissions from landfill, avoided use of landfill space and avoided litter.

OPTION 1: NATIONAL PACKAGING WASTE AND LITTER STRATEGY

TABLE 4: KEY IMPACTS OF OPTION 1

• KEY IMPACTS	
Cost (PV, $ million)	**247.7**
Policy and Regulatory	10.0
Infrastructure and Operating[1]	198.6
Industry Impacts[2]	0.0
Participation[3]	39.1
Benefits (PV, $m)	**321.7**
Avoided landfill	132.9
Avoided litter	27.8
Recyclate value	114.8
Co-benefits	46.2
NPV ($m)	**74.0**
BCR	1.3
Additional packaging recycling (tonnes)	1,944,400
Additional litter reduction (tonnes)	142,900

Source: MJA 2013c (Attachment M) p. 9, p. 23, MJA 2013a (Attachment K) p. 22

Option 1 is a non-regulatory option involving improved coordination among Commonwealth and state and territory jurisdictions and a modest amount of investment to enhance recycling infrastructure use,

[1] This refers to the cost borne by governments as a result of the option, however, some of these costs may be passed through to consumers as well
[2] This refers to loss of producer surplus incurred by packaged goods manufacturers as a result of the option
[3] This refers to household and business participation costs

boost litter education campaigns and initiatives and address basic market impediments. The strategic costs associated with option 1 would be borne by governments and would total (PV) $77.9 million up to 2035. As option 1 does not have any mandated recycling targets it allows investment in recycling opportunities that provide relatively high pay-offs for the amount invested, despite the lower total level of investment. Option 1 also generates (PV) $46.2 million of co-benefits.

Although option 1 delivers the highest BCR of all options (1.3), due to the relatively low investment it achieves the lowest additional recycling (1,944,400 tonnes) and lowest litter reduction (142,900 tonnes) relative to the base case of all the options. Despite the low gains, option 1 generates a positive NPV ($74 million) and provides a net benefit to the community. Option 1 is also the most robust to sensitivity analysis, as it is one of only two options which retain a positive NPV in the pessimistic scenario. This is due to the lower levels of investment building on current arrangements, which limits exposure to fluctuating costs of recycling and recyclate value.

Local Government and the C&I sector would incur transport and collection costs of (PV) $120.7 million throughout the analysis period (see Attachment M, Table 17). However, this would be offset by the value of recyclate (PV $114.8m), avoided costs and externalities of landfill (PV $132.9m), avoided litter costs (PV $27.8m), and co-benefits (PV $46.2m). It is expected that businesses generally would incur a participation cost of (PV) $39.1 million in time spent to sort recyclables. However, since industry is not required to commit additional funding under this option there is not expected to be any negative impact to producer surplus.

DISTRIBUTIONAL IMPACTS

Option 1 will create a transfer from government to the C&I sector and local government. This is because governments will invest in coordination and initiatives to improve the use of current recycling and litter infrastructure, which the C&I sector and local government will benefit from via an increase in the amount of their recyclate that generates recyclate income and reduces landfill costs. Consequently, it is expected that governments will incur an impact of approximately (PV) $88 million in costs, which will transfer to benefit the C&I sector by approximately (PV) $69.1 million and local government by approximately (PV) $12.3 million. Due to the increase in recycling and reduction in litter, it is expected that the environment will benefit (PV) $34.4 million through reduced externalities. It is not expected that option 1 will impact the packaged goods industry and the consumer since government is the investor in this option.

TABLE 5: DISTRIBUTIONAL IMPACTS ON STAKEHOLDERS OF OPTION 1 ($PV MILLIONS)

	Consumer	Local Government	C&I	Environment	Packaged Goods Industry	Government	Co-benefits (unallocated)
Option 1	0.0	12.3	69.1	34.4	0.0	-88.0	46.2

Source: MJA 2013c (Attachment M) p. 40

OPTION 2: CO-REGULATORY PACKAGING STEWARDSHIP

Five variants of co-regulatory product stewardship have been considered and modelled under option 2—options 2a, 2b, 2c and 2d which would require regulation under the PS Act, and option 2e ($20 million, $35 million and $50 million) which would be an agreement in the style of the current Australian Packaging Covenant (APC) arrangements. The different regulatory arrangements have an impact on costs for these options.

TABLE 6: KEY IMPACTS OF OPTION 2—PS ACT OPTIONS

•	• Sub-option			
	2a	**2b**	**2c**	**2d**
Cost (PV, $m)	**426.9**	**999.9**	**1,382.7**	**879.0**
Policy and Regulatory	24.6	32.0	39.4	22.7
Infrastructure and Operating	294.0	789.3	1,069.6	753.3
Industry Impacts	54.6	70.6	82.1	34.3
Participation	53.8	108.0	191.6	86.6
Benefits (PV, $m)	**475.1**	**924.4**	**1,502.0**	**772.4**
Avoided landfill	218.8	407.7	584.0	359.8
Avoided litter	59.6	113.5	124.0	107.2
Recyclate value	150.5	377.2	632.6	305.5
Co-benefits	46.2	26.0	161.3	0.0
NPV ($m)	**48.2**	**-75.5**	**119.3**	**-106.6**
BCR	1.1	0.9	1.1	0.9
Additional packaging recycling (tonnes)	3,021,200	6,147,600	8,397,200	5,841,300
Additional litter reduction (tonnes)	284,200	577,400	628,400	576,000

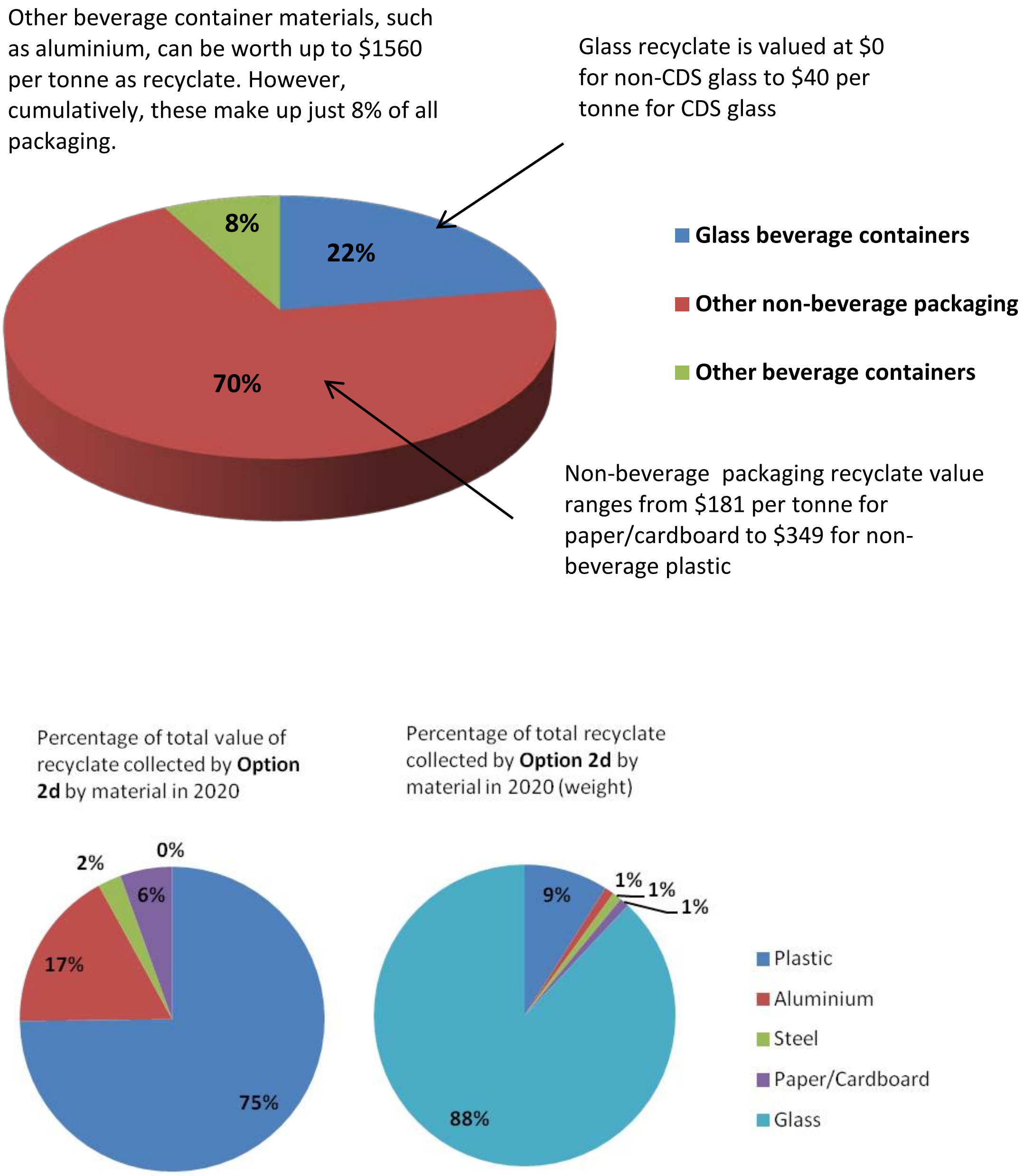
Source: MJA 2013c (Attachment M) p. 9, p. 23, MJA 2013a (Attachment K) p. 22

As Table 6 shows, of the options involving the co-regulatory provisions of the PS Act, option 2c achieves the greatest outcomes as it generates the highest NPV and the biggest increase in recycling and reduction in litter. This is due to the higher recycling target placed on CAs, which requires them to recycle large volumes of non-beverage container packaging, which has a relatively high value. While the targets of option 2c are ambitious and may push the limits of recycling rates in some locations, regions or sectors, this has been taken into account by including the costs of a 'risk premium' in the form of additional funding specifically earmarked for a substantial and ongoing information and education program for both businesses and households.

In order to meet mandated targets while remaining cost-effective, CAs must also seek out opportunities for non-packaging recycling that include high value co-benefits, such as workplace recycling which would collect large amounts of office paper. This is reflected in Table 6, which shows that option 2c generates the highest amount of co-benefits at (PV) $161.3 million (four times higher than the next highest, option 2a). Comparatively, under option 2a CAs will seek out the 'low hanging fruit' opportunities; low cost recycling projects which offer returns capable of meeting the CA's target. This explains why option 2a has both the lowest cost and the lowest benefit of the co-regulatory options that provide a net benefit to the community. Option 2a represents a lower cost, lower risk opportunity to modestly improve packaging recycling in Australia by approximately 1.6 million tonnes above the base case up to 2035.

The negative NPVs of options 2b and 2d mainly reflect the impact of the constraint of a mandated beverage container recycling sub-target. By weight, glass makes up approximately 74 per cent of total beverage containers brought to market in Australia (Industry Edge, Equilibrium 2013). Glass has little to no value as recyclate (MJA 2013a) and presents little benefit as an avoided landfill externality as it does not emit greenhouse gases nor leachate in landfill. By comparison, plastic beverage containers (PET and HDPE) represent 19 per cent by weight of containers brought to market (Industry Edge, Equilibrium 2013). Options 2b and 2d require CAs to seek and invest in beverage container recycling opportunities. Given the relative proportions on the market, this will ultimately involve mostly glass recycling and provide minimal market or environmental return (see Figure 2). The beverage container targets also limit the CA's opportunity to invest in recycling projects which provide co-benefits, since their recycling tonnage target is likely to be met through the beverage container quota before recycling of other packaging materials with higher co-benefits is needed. Table 6 shows that option 2b generates a small amount of co-benefits and option 2d does not generate any.

FIGURE 2: BREAKDOWN OF PACKAGING MATERIAL TYPE (BY WEIGHT) AND ASSOCIATED VALUE AS RECYCLATE



Source: MJA 2013a (Attachment K), p. 86, MJA 2013c (Attachment M), p. 14, Industry Edge 2013 p. 3

All of the co-regulatory options under the PS Act have been modelled to require CAs to develop a plan for sustainable packaging design and litter reduction. A minimum level of litter investment of $5 million per annum has been modelled for each option. However, while it assumed that each option will invest a flat $5 million per annum on litter initiatives, it is expected that varying levels of litter reduction will be achieved. Options that achieve higher recycling rates are assumed to reduce the volumes available to be littered.

- **Option 2e:** Extended Australian Packaging Covenant

Option 2e is also a co-regulatory option but is not implemented under the PS Act. Option 2e would utilise the existing free-rider co-regulation arrangements made under the *National Environmental Protection Council Act 1994*, with any necessary amendments. This option maintains an industry-government agreement similar to the existing APC arrangement, but with increased industry financial contributions negotiated. As discussed in Attachment I, Option 2e has been modelled at three investment levels described as $20 million, $35 million and $50 million, which are equivalent to an average annual investment over the entire 20 year modelling period of approximately $14.1 million, $21.5 million and $27.7 million respectively (in 2011 dollars). These investment levels are estimated to achieve 2035 recycling rates of 76.7, 77.7 and 78.5 per cent respectively. Like the co-regulatory options under the PS Act, all levels of investment for option 2e assume a uniform $5 million spent per annum on litter initiatives.

TABLE 7: KEY IMPACTS OF OPTION 2E

	Option 2e (investment value)		
	$20m	$35m	$50m
Cost (PV, $m)	**470.0**	**611.2**	**732.7**
Policy and Regulatory	17.0	17.0	17.0
Infrastructure and Operating	357.3	476.1	570.2
Industry Impacts	34.7	36.1	37.3
Participation	57.1	76.6	94.2
Benefits (PV, $m)	**549.4**	**709.1**	**884.7**
Avoided landfill	258.8	327.0	382.9
Avoided litter	63.2	72.1	74.2
Recyclate value	170.4	232.1	312.0
Co-benefits	53.8	70.2	94.9
NPV ($m)	**79.4**	**98.0**	**152.1**
BCR	1.2	1.2	1.2
Additional packaging recycling (tonnes)	3,844,700	4,774,500	5,491,900
Additional litter reduction (tonnes)	330,100	361,800	• 377,800

Source: MJA 2013c (Attachment M) p. 9, p. 23, MJA 2013a (Attachment K) p. 22

Option 2e at its highest investment threshold achieves the highest NPV of all options under analysis. Each level of investment modelled for option 2e also achieves greater outcomes than the PS Act co-regulatory options, with the exception of option 2c which generates a higher NPV than option 2e at the lower and middle investment values.

These results for option 2e reflect the more efficient nature of allowing a product stewardship organisation, such as the APC, to select recycling opportunities based on which will yield the greatest amount of recycling for the least cost as opposed to pursuing a mandated target focused on a subset of recyclable materials.

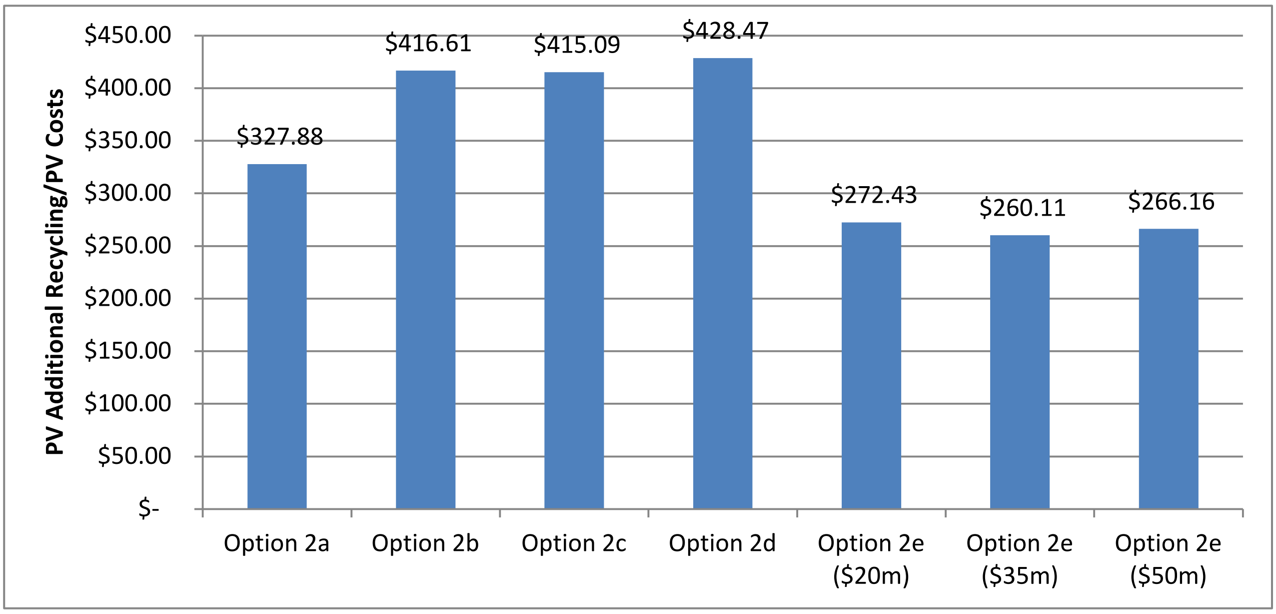
Option 2e at the highest level of investment still has overall lower costs than each of the options under the co-regulatory provisions of the PS Act (with the exception of option 2a). This is because:

- Option 2e utilises the existing NEPM co-regulatory underpinning, with any necessary amendments to support the new agreement. Other co-regulatory options will require new regulation to be drafted under the PS Act and ongoing resourcing from a Commonwealth regulatory agency. These costs range from (PV) $22.7 to $39.4 million for co-regulatory PS Act options over the analysis period. Under the NEPM, both state environment agencies, who are responsible for compliance, and most industry parties are already complying with NEPM requirements. The (PV) $17 million over the analysis period for policy and regulatory costs associated with option 2e reflects an enhanced resourcing of this enforcement function by state and territory agencies.

- The infrastructure and operating costs of option 2e at its highest investment value are approximately 75 per cent of the infrastructure and operational costs associated with options 2b and 2d, and 53 per cent of the costs associated with option 2c. Option 2e operates at lower operational costs because the APC is not required to invest in specified recycling opportunities in order to reach a mandated target. Rather, industry invests a set amount each year, and the industry-government board of the APC selects recycling opportunities and other initiatives which present the best value for money in terms of cost per tonne of additional recycling and litter reduction and sustainable design outcomes.

Figure 3 shows that at all levels of investment for option 2e, the average cost per additional tonne of recycling is lower than the PS Act options 2a to 2d. It should be noted that this figure should not be compared to the cost effectiveness per tonne shown in Table 3 in Chapter 7. Figure 3 shows the total cost associated with sub-options modelled under option 2, including the cost to government for regulatory compliance activities, for additional tonnes achieved over the base case. Table 3 in Chapter 7 displays the supply chain cost effectiveness of recycling, that is, only the cost of recycling infrastructure for the total recycling tonnage achieved. Since regulatory activities are key component of option 2, it is appropriate to include these costs to reflect the full costs of the option.

FIGURE 3: TOTAL COST PER TONNE OF ADDITIONAL RECYCLING FOR OPTION 2



Source: MJA 2013c (Attachment M) p. 9, MJA 2013a (Attachment K) p. 22

DISTRIBUTIONAL IMPACTS

The distributional impacts on stakeholder groups for option 2 appear in Table 8.

TABLE 8: DISTRIBUTIONAL IMPACTS ON STAKEHOLDERS OF CO-REGULATORY OPTIONS 2 ($PV MILLIONS)

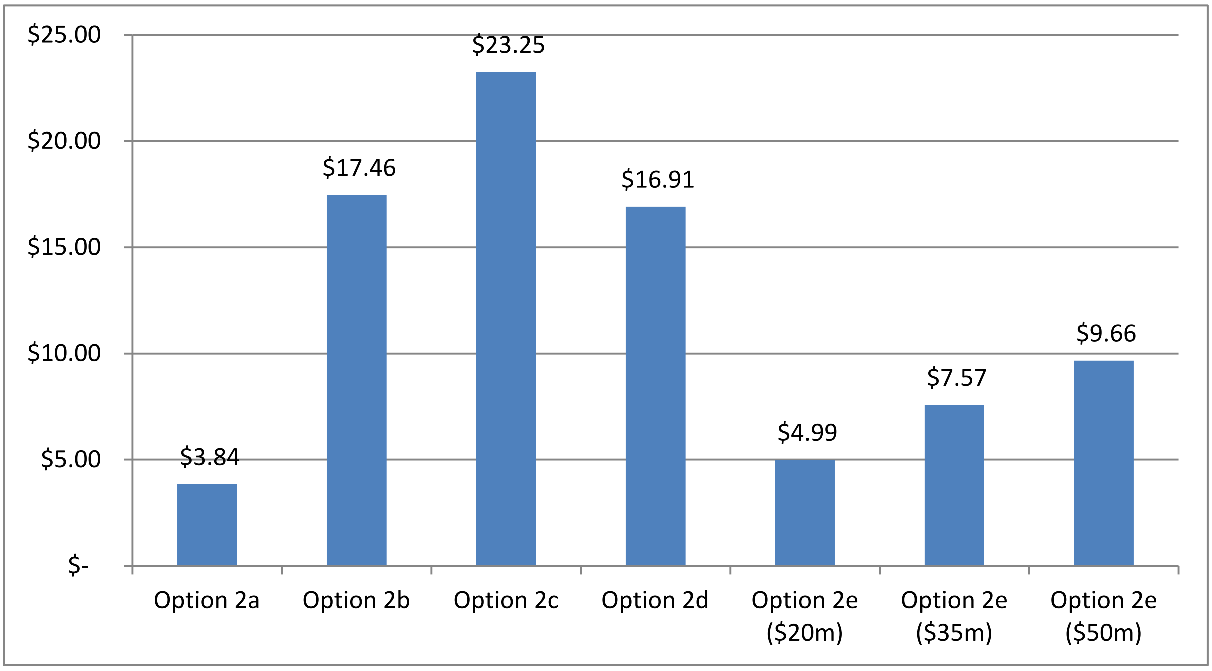
	Consumer	Local Government	C&I	Environment	Packaged Goods Industry	Government	Co-benefits (unallocated)
Option 2a	-88.3	23.6	78.9	67.0	-54.6	-24.6	46.2
Option 2b	-401.6	72.4	207.3	122.9	-70.6	-32.0	26.0
Option 2c	-534.8	79.6	385.0	149.7	-82.1	-39.4	161.3
Option 2d	-388.9	67.1	159.2	113.0	-34.3	-22.7	0.0
Option 2e ($20m)	-114.7	29.6	88.1	74.3	-34.7	-17.0	53.8
Option 2e ($35m)	-174.2	35.4	128.2	84.4	-36.1	-17.0	77.3
Option 2e ($50m)	-222.2	37.5	184.0	93.0	-37.3	-17.0	114.0

Source: MJA 2013c (Attachment M) p. 40

Each of the option 2 sub-options require expenditure from the **packaged goods industry** (a cost that is assumed to be passed on to consumers) to fund initiatives that will increase packaging recycling and reduce litter. The increase in recycling results in benefits for producers of recyclate (**local government** and the **C&I sector**), and also the environment via reduced landfill and litter externalities. The resulting reduction in litter also benefits **local government** via reduced cleanup costs. **Governments** are required to fund policy and regulatory activities to ensure that liable parties comply with their responsibilities. The unallocated co-benefits shown in Table 8 are benefits that cannot be attributed to any of the stakeholder groups, but exist as an unintended side-effect of the policy, such as recycling of non-packaging material.

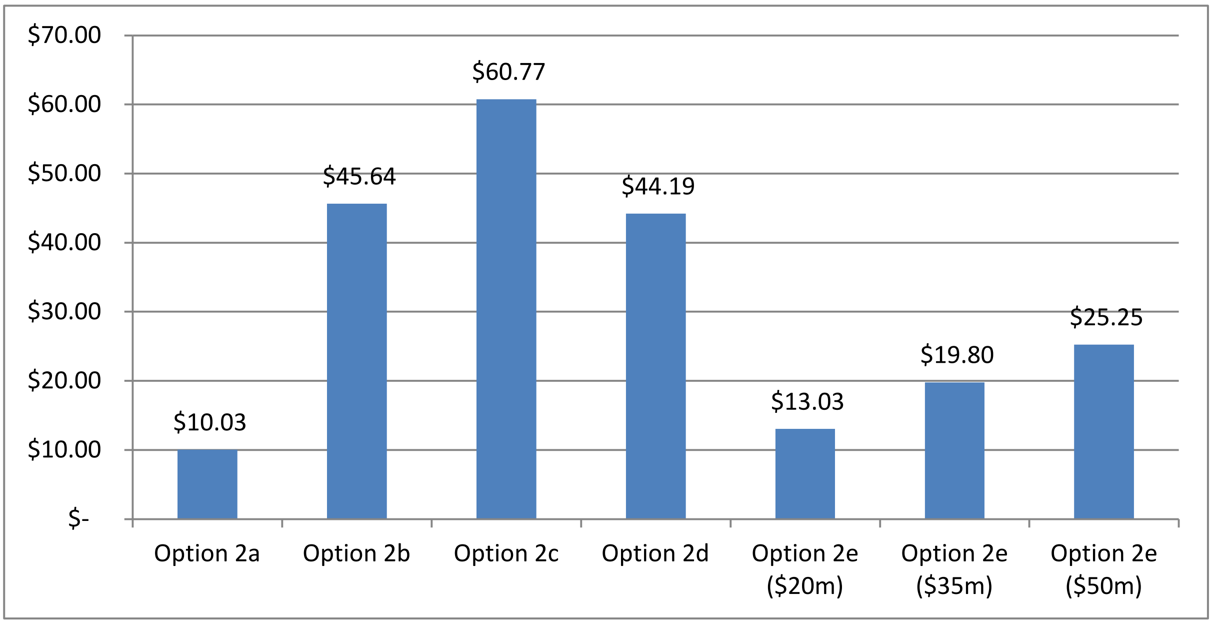
An analysis of the impact to consumers is provided in Figure 4, showing the per-person impact if the present value of the net consumer costs incurred over the 20 year analysis period were borne by today's consumers. Option 2c has the highest impact on consumers at approximately (PV) $23.25 per person of today's population) over the 20 year analysis period. Comparatively, option 2e ranges from PV $4.99 to $9.66 per person of today's population over the 20 year analysis period. Option 2c incurs a higher cost to consumers as it requires the packaged goods industry to invest more funds than any other option in order to reach the ambitious mandated recycling target. Figure 5 shows the same data divided by the number of current households.

FIGURE 4: COST PER PERSON OF 2013 POPULATION FOR CO-REGULATORY OPTIONS OVER THE 20 YEAR ANALYSIS PERIOD ($ PV PER PERSON)



Source: MJA 2013c (Attachment M), Population sourced from ABS Cat 3222.0

FIGURE 5: COST PER HOUSEHOLD (2013) FOR CO-REGULATORY OPTIONS OVER THE 20 YEAR ANALYSIS PERIOD ($ PV PER HOUSEHOLD)



Source: MJA 2013c (Attachment M), Households sourced from ABS Cat 3236.0

CO-BENEFITS

It is expected that all co-regulatory options generate co-benefits, with the exception of option 2d. The consultants assessed that the specificity of collecting beverage containers under option 2d does not lead to co-benefits in the recycling of other materials. Co-benefits are expected to stem from:

- increased public place recycling opportunities (such as the National Bin Network), which are likely to increase recycling rates of non-packaging materials away from home
- improved kerbside recycling through investments in collection and sorting assets, which will benefit non-packaging products (such as newspapers) that are also accepted as part of the service
- recycling campaigns and education programs, which are assumed to increase consumer awareness of the benefits of recycling more generally to create further engagement.

A breakdown of co-benefits is shown in Figure 6. Option 2c generates the highest co-benefits due to the larger levels of investment required to reach the higher mandated target and the incentive to harness high-value co-benefit opportunities to offset these costs. However, option 2e (at all levels of investment) achieves comparable co-benefits for the smaller amount of money invested. As shown in Table 7, option 2e provides a slightly higher return (16.6 per cent) on investment than option 2c (15.1 per cent) in terms of co-benefits (return is calculated by dividing co-benefits generated by infrastructure investment).

FIGURE 6: SUMMARY OF CO-BENEFITS ACHIEVED RELATIVE TO INFRASTRUCTURE INVESTMENT FOR OPTION 2

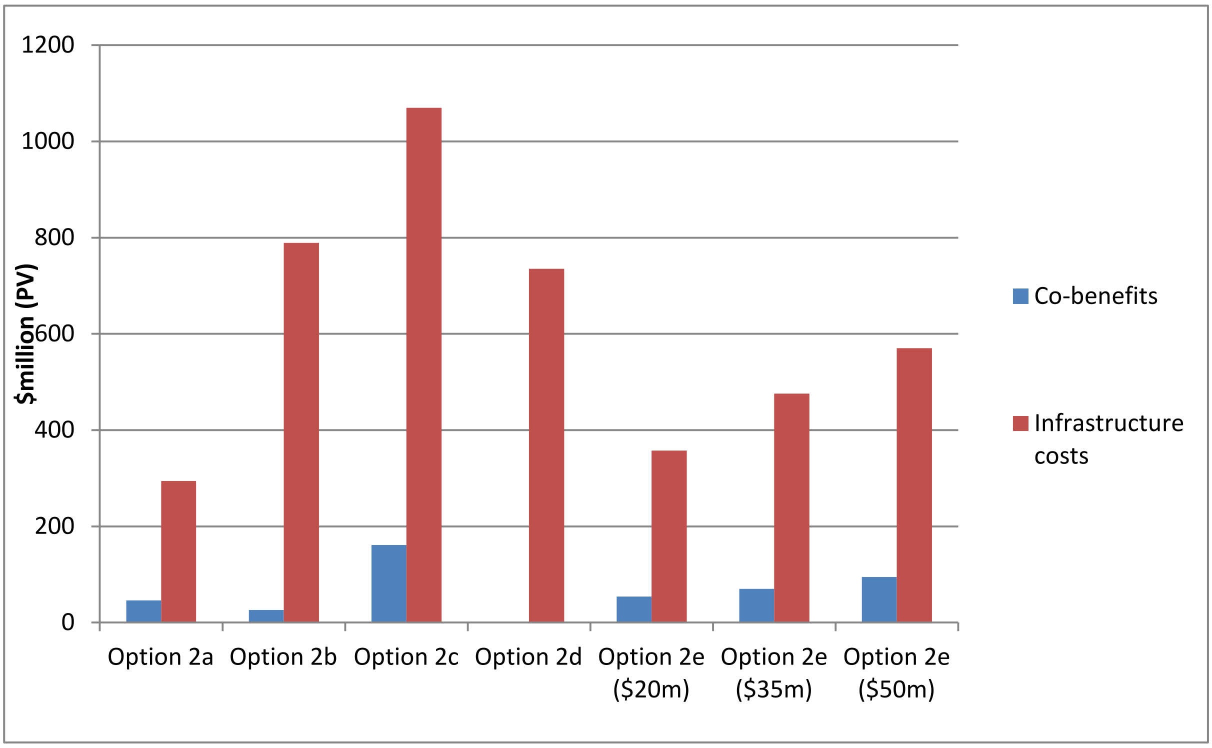


TABLE 9: SUMMARY OF RETURN ON INVESTMENT IN TERMS OF CO-BENEFITS FOR OPTION 2

	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e ($35m)	Option 2e ($50m)
Co-benefit return on recycling infrastructure investment	**15.7%**	**3.3%**	**15.1%**	**0.0%**	**15.1%**	**14.7%**	**16.6%**

Source: MJA 2013c (Attachment M) p. 9

OPTION 3: MANDATORY ADVANCE DISPOSAL FEE

TABLE 10: KEY IMPACTS OF OPTION 3

• KEY IMPACTS	
Cost (PV, $m)	**1,379.4**
Policy and Regulatory	85.5
Infrastructure and Operating	1,069.6
Industry Impacts	32.7
Participation	191.6
Benefits (PV, $m)	**1,502.0**
Avoided landfill	584.0
Avoided litter	124.0
Recyclate value	632.6
Co-benefits	161.3
NPV ($m)	**122.6**
BCR	1.1
Additional packaging recycling (tonnes)	8,397,200
Additional litter reduction (tonnes)	628,400

Source: MJA 2013c (Attachment M) p. 9, p. 23, MJA 2013a (Attachment K) p. 22

Option 3 introduces a disposal fee on all packaged goods brought to market, which is likely to be passed through to consumers. Proceeds from the disposal fee are then used by government to invest in recycling and litter initiatives, the scale of which is assumed to be equivalent to the level of investment and outcomes of option 2c. As option 3 is modelled similarly to option 2c it generates a similar result, with an expected net benefit to the community of (PV) $122.6 million over the analysis period.

Option 3 captures the same recycling opportunities as option 2c, as both have a modelled infrastructure and litter investment of PV $1070 million over the analysis period. However, option 3 has slightly lower associated costs. Although government regulation costs for Option 3 are expected to be (PV) $85.5 million throughout the analysis period compared with PV $39.4 million for option 2c, option 3 has lower administration and compliance costs for industry (PV $19.5 million compared with PV $68.8 million for option 2c). This small difference is why option 3 has a slightly higher NPV than option 2c.

Along with option 2c, option 3 is modelled to apply a fee that generates investment levels that achieve the highest tonnes of additional recycling and litter reduction during the analysis period. However, whilst option 3 generates significant benefits there are also significant costs involved, which are reflected in the BCR of 1.1. This is the lowest BCR of the options which generate a positive NPV. Consequently, option 3 is vulnerable to sensitivity testing of assumptions; in the optimistic scenario option 3 generates the highest NPV, but generates one of the lowest in the pessimistic scenario. Thus, option 3 presents a greater risk of altered assumptions leading to altered outcomes in implementation than options 1 and 2e.

As option 3 captures the same recycling opportunities as option 2c it generates the same amount of co-benefits, which are expected to be $PV 161.3 million.

DISTRIBUTIONAL IMPACTS

It is expected that **consumers** will bear most of the costs associated with option 3, as it is likely that **packaged goods producers** will pass on the disposal fee in the form of higher prices. The impact on **consumers** is expected to be PV$534.8 million dollars over the analysis period (which equates to approximately PV$23.25 per person[4]). The **packaged goods industry** is expected to bear costs of PV$32.7 million during the analysis period. Costs will transfer to producers of recyclate (**local government** and the **C&I sector**) who are expected to benefit by PV $79.6 million and PV $385 million respectively. Again, the **environment** is expected to benefit by PV $149.7 million via reduced landfill and litter externalities. As a result of the government administration costs associated with taxation, **government** is expected to bear costs of PV $85.5 million throughout the analysis period.

TABLE 11: DISTRIBUTIONAL IMPACTS ON STAKEHOLDERS OF OPTION 3 ($PV MILLIONS)

	Consumer	Local Government	C&I	Environment	Packaged Goods Industry	Government	Co-benefits (unallocated)
Option 3	-534.8	79.6	385.0	149.7	-32.7	-85.5	161.3

Source: MJA 2013c (Attachment M) p. 40

INCENTIVES AND LONG TERM IMPACTS

If the advance disposal fee is charged based on weight of packaging brought to market, the packaged goods industry could switch to using lighter packaging and/or lightweight existing packaging to reduce their amount payable. This could potentially affect overall packaging recycling rates, as evidence suggests that lighter-weight packaging such as flexible and composite plastics are not currently recyclable in many Australian systems (this is also discussed in Chapter 2). Consideration would need to be given to the interaction of an advance disposal fee on all packaging which is brought to market and which would raise capital for recycling investment opportunities, with the waste levies currently in place in certain jurisdictions for residual packaging waste that flows to landfill.

[4] Calculated by consumer impact figure (MJA 2013c p. 40)/ 2013 Australian resident population (ABS Cat. 3222.0)

OPTION 4: MANDATORY CONTAINER DEPOSIT SCHEME

TABLE 12: KEY IMPACTS OF OPTION 4

	Sub-option		
	Option 4a	**Option 4b**	**Option 4c**
Cost (PV, $m)	**5,316.3**	**5,409.1**	**6,038.6**
Policy and Regulatory	357.9	275.8	97.9
Infrastructure and Operating	4,310.1	4,442.4	5,039.2
Industry Impacts	162.6	228.8	454.5
Participation	485.7	462.2	446.9
Benefits (PV, $m)	**1,532.8**	**1,551,.9**	**1,500.0**
Avoided landfill	321.6	309.0	274.9
Avoided litter	171.8	170.1	162.6
Recyclate value	1,027.3	1,016.5	963.8
Co-benefits	12.1	56.3	98.7
NPV ($m)	**-3,783.3**	**-3,857.2**	**-4,538.6**
BCR	0.3	0.3	0.2
Additional packaging recycling (tonnes)	6,067,300	5,871,600	5,338,900
Additional litter reduction (tonnes)	822,200	813,500	777,800

Source: MJA 2013c (Attachment M) p. 9, p. 23, MJA 2013a (Attachment K) p. 22

All three variants generate the greatest improvements in beverage container recycling volumes (up to 85 per cent from 2030) of any of the options and the quality of recyclate arising (PV $1.0 billion), as well as the largest improvements in litter (PV $0.2 billion).

Nevertheless, all three CDS options have a significantly negative NPV over the 20 years analysed, primarily due to the costs of operating the necessary infrastructure to facilitate the return and provision of item-by-item refund payments for around 14 to 15 billion containers each year (at a mature return rate of 80 per cent and above). The present value of these infrastructure costs ranges from $4.3 billion to $5.0 billion. This cost does not include the value of refund payments (which start at $1 billion in 2016 and rise to $3.2 billion by 2035) made back to redeeming consumers and other redeemers.

As with other options with a primary focus on beverage containers, such as option 2d, the recycling benefits of CDS are relatively small due to the low value of glass recyclate (even considering the premium value of containers collected and sorted by CDS infrastructure). CDS is both a costly way to increase beverage container recycling due to the infrastructure costs and the fact that more than seven-tenths of the containers processed by a national CDS are ‘rerouted’ from existing kerbside or C&I recycling systems, which reduces the associated benefits.

Of the CDS variants, option 4a achieves the least negative NPV of -$3.8 billion due to its reliance on lower-cost automated RVM infrastructure. Option 4c has the most negative NPV of -$4.6 billion due to the higher cost of its manual sorting depots and more complex industry administration associated with multiple coordinators, even when the co-benefits of manual depot collection are considered. Option 4c also carries higher implementation risks relating to brand sorting (see Incentives section).

DISTRIBUTIONAL IMPACTS

TABLE 13: DISTRIBUTIONAL IMPACTS ON STAKEHOLDERS OF OPTION 4 ($PV MILLIONS)

	Consumer	Local Government	C&I	Environment	Packaged Goods Industry	Government	Co-benefits (unallocated)
Option 4a	-7,196.4	1,083.1	2,549.2	175.7	-162.6	-357.9	12.1
Option 4b	-6,150.9	568.7	1998.2	173.9	-228.8	-275.8	56.3
Option 4c	-7,984.1	1022.4	2487.7	166.0	-454.5	-97.9	98.7

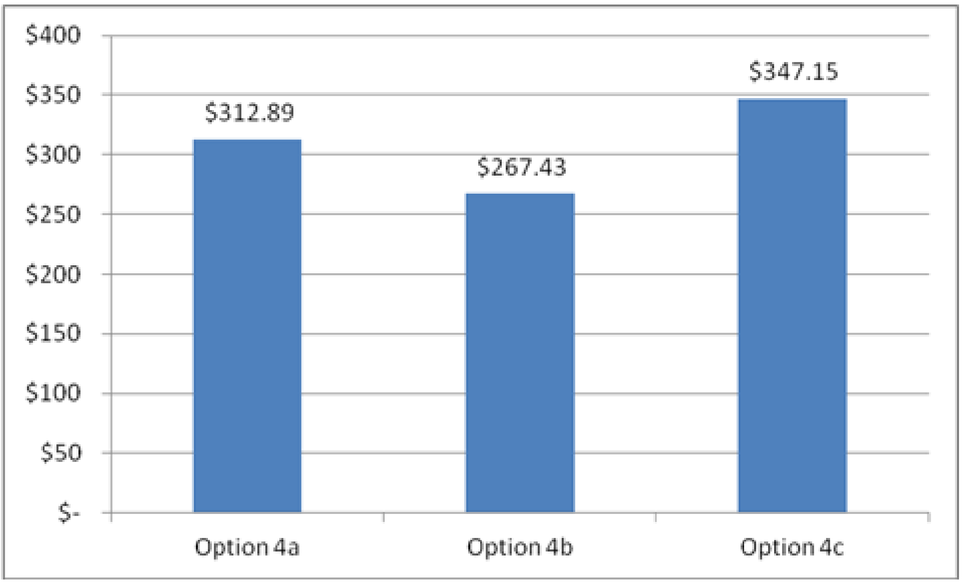
Source: MJA 2013c (Attachment M) p. 41

While there is an overall financial cost to the community, the distributional impacts on particular stakeholder groups show a larger negative figure as these include both net costs and also financial transfers from one group in society to another. Stakeholder groups, including Local Government and C&I, are expected to gain as they capture substantial amounts of money by being able to collect and redeem containers consumed in homes (kerbside bins) or on commercial premises (workplaces, shopping centres, airports, etc) or in public places.

Over the 20 years analysed, the present value of benefits (including transfers) to Local Government is estimated at between $0.6 billion and $1.1 billion while the present value of benefits (including transfers) to Commercial and Industrial entities is estimated at between $2.0 billion and $2.5 billion.

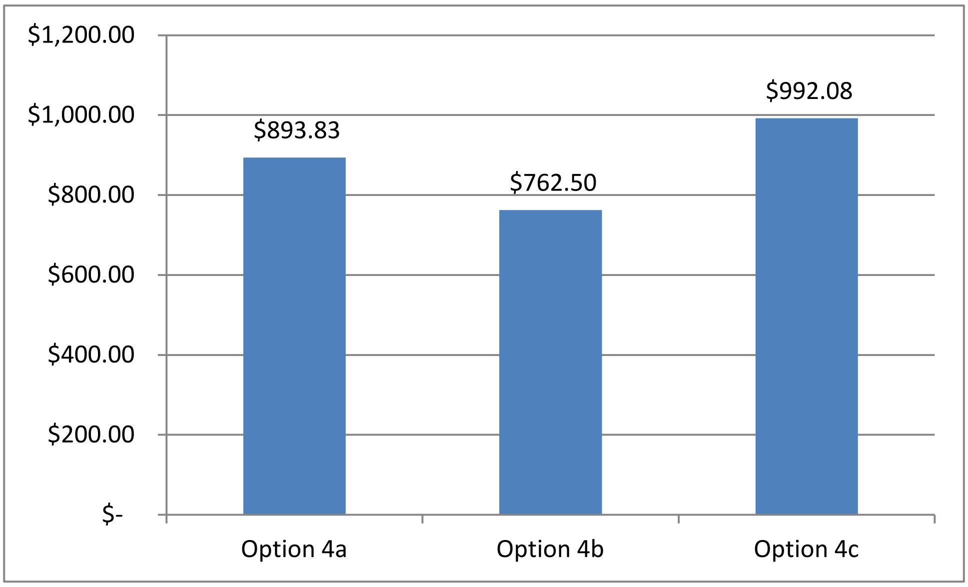
Consumers bear the highest costs under CDS as they are the source of these transfers (smaller amounts are also transferred from Government and from the Packaging Industry). Including these and other costs, consumers lose between $6.2 billion and $8.0 billion through capital and operating costs which range from 4.5 to 5.5 cents per container (weighted average, see Attachment M, Table 11). As Figure 6 shows, this equates to a range of approximately (PV) $267.43 to $347.15 per person of the 2013 population over the 20 year analysis period. To show the scale of the difference between CDS and non-CDS options, option 4b (which has the lowest impact on consumers of CDS options) is approximately 12.5 times more expensive than option 2c (which has the highest impact on consumers of the non-CDS options).

FIGURE 7: COST PER PERSON (2013 POPULATION) FOR CDS OPTIONS OVER THE 20 YEAR ANALYSIS PERIOD ($ PV PER AUSTRALIAN RESIDENT)



Source: MJA 2013c (Attachment M), Population sourced from ABS Cat 3222.0

FIGURE 8: COST PER HOUSEHOLD (2013) FOR CDS OPTIONS OVER THE 20 YEAR ANALYSIS PERIOD ($ PV PER AUSTRALIAN HOUSEHOLD)



Source: MJA 2013c (Attachment M), Population sourced from ABS Cat 3236.0

INCENTIVES

A CDS provides a strong incentive, through a refund, for consumers and others to return empty beverage containers to specific locations for recycling. This includes an incentive not to litter and/or to collect containers littered by others (if labels/barcodes are intact).

On the production side, however, CDS can have differential impacts. Rather than encouraging producers to opt for container materials with a lower environmental impact, the CDS imposes a uniform cost (of the deposit levy) on all sealed containers, regardless of the size of the container or the value of their contents. For example, an average water container is sold for $1.28 whereas an average wine bottle is sold for $11.50. This means that if we assume that a 10 cent deposit levy falls equally across products it will increase the price of the average water bottle by 8 per cent but the average wine bottle by just 1 per cent. Within these categories, the differential price impacts are also diverse. For example, the impact on water sold in bulk packs of 24 by many supermarkets would be comparatively greater as the CDS impact would fall on each bottle. Conversely, more expensive wine would experience a smaller price impact.

These price changes would be of no significance if all consumers opted to redeem all the containers they purchase, and if such redemption was effortless. The experience in South Australia is that around 68 per cent of households redeem the containers they have bought themselves. An additional 6 per cent have another person redeem containers on their behalf but keep or share the refund. A further 13 per cent give the containers to charity or community groups so that they can have the refund. Twelve per cent do not participate in the scheme at all. For some of those households who do not redeem their own containers, the impact of the deposit levy could alter their spending patterns in response to the higher price of beverages relative to other goods (Harrison Research 2012).

Loss of producer surplus for manufacturers of beverage container products is assumed to result from the price impacts of implementing a CDS scheme. The loss results because fewer beverages are assumed to be purchased (due to higher prices faced by those customers who do not collect their refunds) and lower sales lead to lower after-tax profits for the manufacturers (this is reflected in the Industry Impacts line of Table 13).

The CDS legislation in South Australia provides a framework for industry to establish the details of the system. In SA, industry has worked over time to resolve issues and increase efficiency of the system. For example, voluntary agreements allow bulking of containers by material type rather than requiring collection depots to split containers based on which super collector represents the producer or importer that originally sold the container. These agreements rely on super collectors sharing information regarding the declared sales of the beverage manufacturers they hold contracts with and contracting with each other for handling costs.

However, experience in the NT, where a CDS was established using similar legislation to SA, has shown that a system with complex arrangements could create additional costs. For example, the number of splits operated in the NT scheme is approximately 25 compared to eight in SA.

Option 4c has been modelled on the SA experience. To establish this nationally would require bulking to be achieved, but as bulking appears to be a product of cooperative arrangements, there is no clear path to achieving this through regulation. There is no way to predict if this would occur, as it has in SA, nor how quickly. In the mean time it would result in a CDS which is inefficient and considerably more expensive than modelled in this Decision RIS.

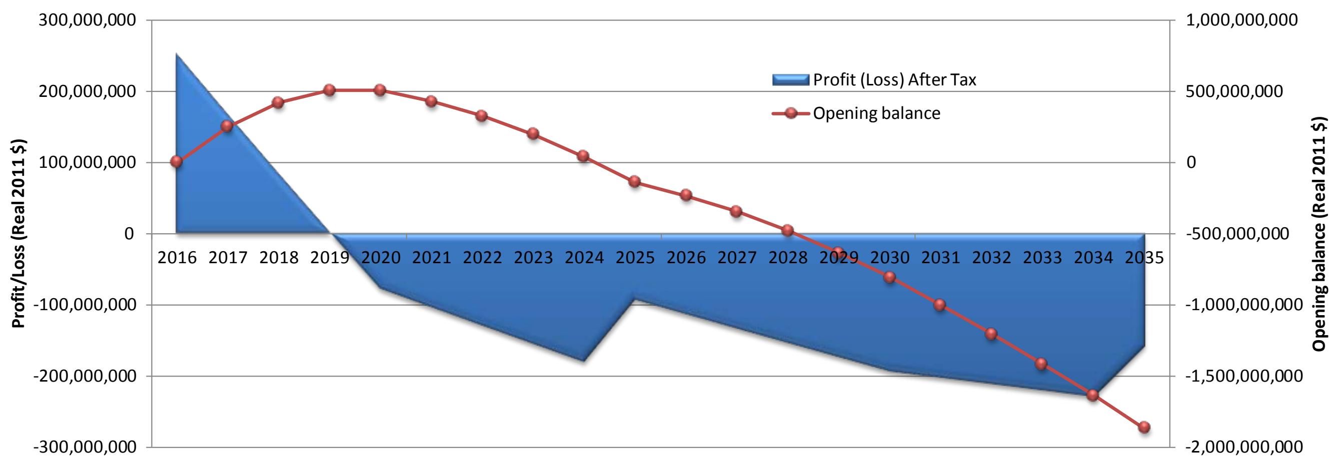
FINANCIAL ANALYSIS

Fundamentally, any deposit/refund scheme has higher funding needs as the proportion of sales presented for refund rise. Based on projected return rates, a detailed financial analysis of each of the CDS options has been undertaken to identify the necessary cash flows to retain their viability as higher return rates put pressure on the amount required to be refunded. For option 4a, this is in Figure 9, and for option 4b and c this is available in Table 14.

Option 4a is designed to have an up-front levy of 10 cents from the commencement of the scheme and hence there is the opportunity to temporarily forestall the financing problem by saving early surpluses (created when redemption rates are initially lower) into a special fund to defray rising costs as the level of returns increases. Some of this fund will also be spent on additional recycling programs, such as grants with the aim to stimulate the Australian reprocessing market. Once the fund is exhausted in 2028, however, governments will need to support the solvency of the scheme through additional appropriations, which may require an increase in the levy amount. By removing the additional program spend in the early years the surplus fund will support ongoing deficits for another four years to 2033, but will then be exhausted.

In the case of options 4b and 4c, the cost to consumers rises as the scheme matures and higher return rates increase unit-based net costs. This rise in consumer prices is necessarily higher than the value of the refund). For example, in 2024 options 4b and 4c are expected to cost consumers 11 cents and 11.7 cents per container purchased respectively, but the refund value of those same containers will remain 10 cents.

FIGURE 9: SCHEME OPERATOR FINANCIAL POSITION AND ANNUAL PROFIT (LOSS) IN OPTION 4A (WITH ADDITIONAL PROGRAM SPEND) (2011 $)



Source: MJA 2013c (Attachment M) p. 45

Figure 9 shows the annual costs and revenues of option 4a over the analysis period. The blue shaded area in the chart shows when the scheme is projected to generate more revenue than costs (2016–2019) and when it is projected to switch to incurring greater costs than revenues (2020 onwards). From 2025 the levy and deposit amount increases to 15 cents, causing the deficit to reduce in that year. The red dotted line shows the initial 'savings' of the scheme administrator (who preserves surplus revenues during the 2016–2019 period in a bank account to draw on in future years as needed). The initial surpluses allow the administrator to save nearly $500 million (including interest) and meet a further eight years of operating deficits until 2028. However, after 2028 this savings fund is exhausted.

TABLE 14: COMPARISON OF CDS OPTION DEPOSIT RATES

	Option 4b				Option 4c			
	Deposits received (nominal $m)	Refunds paid (nominal $m)	Net infrastructure costs (nominal $m)	Effective rate (nominal cents per container)	Deposits received (nominal $m)	Refunds paid (nominal $m)	Net infrastructure costs (nominal $m)	Effective deposit rate (nominal cents per container)
2016	1,380	1,073	307	7.9	1,459	1,053	406	8.5
2017	1,482	1,146	336	8.5	1,569	1,125	444	9.1
2018	1,585	1,219	366	9.1	1,681	1,196	484	9.6
2019	1,690	1,292	398	9.6	1,794	1,267	526	10.2
2020	1,795	1,364	431	10.2	1,908	1,339	570	10.8
2021	1,842	1,391	450	10.4	1,958	1,364	595	11.0
2022	1,889	1,418	471	10.6	2,009	1,389	621	11.2
2023	1,936	1,445	492	10.8	2,061	1,413	648	11.4
2024	1,985	1,471	513	11.0	2,114	1,438	676	11.7
2025	2,783	2,247	536	15.3	2,899	2,195	704	15.9
2026	2,832	2,276	556	15.5	2,953	2,222	731	16.1
2027	2,882	2,305	577	15.7	3,008	2,249	759	16.3
2028	2,932	2,333	599	15.8	3,064	2,277	787	16.5
2029	2,983	2,362	621	16.0	3,120	2,304	816	16.7
2030	3,035	2,391	645	16.2	3,178	2,331	847	16.9
2031	3,068	2,404	664	16.3	3,217	2,344	873	17.0
2032	3,102	2,417	685	16.4	3,256	2,357	899	17.1
2033	3,136	2,430	706	16.5	3,297	2,370	927	17.2
2034	3,171	2,444	727	16.5	3,338	2,383	955	17.4
2035	4,025	3,276	749	20.9	4,179	3,195	984	21.6

Source: MJA 2013c (Attachment M) p.44

COMPARATIVE PERFORMANCE OF OTHER OPTIONS

THE BASE CASE (STATUS QUO)

Over time, current efforts under the base case would result in modest growth in packaging recycling and an incremental reduction in litter. However, the base case does not include action to address current market failures which limit the recycling and litter reduction opportunities being exploited, especially away from home.

The base case does not address increasing fragmentation in jurisdictional approaches as it does not seek commitment to a strengthened national approach. This risks a patchwork of packaging regulations continuing to develop across Australia with associated costs to businesses and the economy.

OPTION 1—NATIONAL PACKAGING WASTE STRATEGY

Option 1 partially addresses increasing fragmentation in jurisdictional approaches through improved government coordination. However, it does this weakly due to the low scale of investment and outcomes delivered, which are unlikely to stop jurisdictions from implementing additional measures driven by community and stakeholder expectations. Arguably, some of the opportunities the option forecasts are already being pursued through government collaboration, potentially reducing the scale of additional outcomes that it may deliver.

Because it is funded by government revenue, which does not provide a price signal to consumers, option 1 may not be a strong mechanism for boosting incentives to recycle and prevent litter. Option 1 does not address the identified market failures as strongly as other options due to its low level of investment, which would leave many opportunities to address market impediments unexploited.

OPTIONS 2A-D—CO-REGULATION UNDER PRODUCT STEWARDSHIP ACT

Co-regulatory arrangements operating under new regulations made under the Product Stewardship Act (PS Act) would undertake recycling and litter actions on behalf of industry members and would have strong incentives to achieve outcomes at least cost.

The regulations would set tightly defined targets for additional recycling to ensure delivery. The trade-off is that a complex compliance monitoring framework is required. Therefore, although co-regulatory arrangements operate cost-effectively these options would increase government administration costs over the base case.

Because option 2a transfers current arrangements under this new framework, it involves increased administration costs to manage current levels of effort. At the same time, option 2a seeks only a modest increase in industry investment and the recycling rate, which is assumed to result from the strengthened enforceability of the regulated targets. This would leave many opportunities to address market impediments unexploited and is why it has a low Net Present Value.

Options 2b and 2d aim to achieve more ambitious targets and outcomes than option 2a, with greater levels of investment. However, 2b's sub-target for beverage container recycling and 2d's high overall target for beverage container recycling reduce the cost-effectiveness of these approaches. Three quarters of beverage containers sold in Australia are made of glass and therefore co-regulatory arrangements would be forced to invest heavily in glass recycling, with low market return and limited impact on environmental externalities (see Chapter 7). The focus on collecting beverage containers also limits opportunities to leverage co-benefits and value from the recycling of other packaging materials. These options therefore have a negative Net Present Value representing an overall cost to the economy and cannot be recommended for implementation.

Option 2c has a relatively high positive Net Present Value and overcomes the disadvantage of having a beverage container sub-target because it also proposes the greatest recycling target for all packaging materials. This push to recycle high volumes of the other materials compensates for the glass recycling by exploiting more opportunities than options 2b and 2d and delivering higher recyclate value overall. However, the cost-effectiveness per tonne of recycling is lower than in options 1, 2a and 2e. Regulated targets are a less flexible mechanism than the preferred option, and largely define the achievement of outcomes as chasing the recycling tonnage target. Finally, the ambitious outcomes sought by option 2c are likely to approach the known limits of recycling under current approaches, and the sensitivity and risk analysis identified that overall it carries a risk of projected outcomes not being achieved.

While these options would address increasing fragmentation in jurisdictional approaches by introducing consistent national regulations, options 2b, c and d increase the funding required from the packaged goods industry to pay membership fees to co-regulatory arrangements to address market failures and improve recycling and litter reduction substantially more than required by the preferred option, for a largely similar result. It is assumed that this cost would be at least partly passed on to and impact consumers.

OPTION 3—MANDATORY ADVANCE DISPOSAL FEE

Option 3 has a relatively high positive Net Present Value and was modelled to seek the same additional recycling and litter reduction outcomes as option 2c, but through a different regulatory mechanism. The advance disposal fee would be collected from industry based on tonnes of packaging brought to market and invested by government to fund recycling and litter initiatives.

Overall, this option has similar strengths and weaknesses to option 2c. It invests in more opportunities to achieve the greater outcomes, but with a lower cost-effectiveness per tonne than other options. There is also the same overall level of risk as in option 2c that the ambitious outcomes may not be achieved.

The primary impact of this option on business is to substantially increase the funding required from packaging manufacturers and importers to pay the advance disposal fee. It is assumed that this cost would be at least partly passed on to and impact consumers.

This option addresses increasing fragmentation in jurisdictional approaches by introducing a consistent national regulatory framework in the form of taxation (collection of fees).

OPTION 4—CONTAINER DEPOSIT SCHEME

The CDS options modelled in option 4 all impose substantially negative net costs to the economy and cannot be recommended for implementation. Although the introduction of new CDS options would deliver high beverage container recycling rates and overall the greatest litter reduction due to high rates of beverage container litter collection, this comes at an unsustainable cost. This cost is driven by the roll-out of parallel, purpose-built infrastructure that diverts recyclate from existing kerbside systems and must do so by handling and accounting for each unit—billions of beverage containers per year.

In addition, the recycling outcomes are lower than other options such as 2c and 3 as they are constrained by focusing on beverage containers rather than all packaging types. This remains true even taking into account the estimated co-benefits, which are generally lower in options 4a and 4b than the preferred option due to use of Reverse Vending Machines which can only take beverage containers. Option 4c is projected to achieve co-benefits on par with the preferred option, based on the performance of the SA scheme's more diverse manual collection points.

Option 4 would address increasing fragmentation in jurisdictional approaches by introducing consistent national regulations. However additional measures and costs are likely to be required for options 4a and 4b in particular to harmonise with the existing South Australian and Northern Territory schemes to form a national approach.

GLOSSARY

PACKAGING DEFINITIONS

Beverage containers: Containers manufactured from rigid or flexible packaging materials including glass, plastics, steel, aluminium and paper/cardboard to carry liquids for human consumption. **Sealed beverage containers** refers to beverage containers brought to market pre-filled and sealed.

Consumer Packaging: All packaging products made of any material or combination of materials, for the containment, protection, marketing and handling of consumer products throughout the supply chain. This includes **distribution packaging** and packaging used by businesses as consumers.

Distribution packaging: Packaging that contains multiple units of consumer product (the same or mixed product). This includes:

- **Secondary packaging** used to secure or unitise multiples of consumer product, for example, cardboard box, shippers, or shrink film overwrap.
- **Tertiary packaging** used to secure or bundle multiples of secondary packaging, for example, pallets, pallet wrapping, stretch film, shrink film and strapping.

Flexible packaging: Refers to non-rigid packaging. The majority of flexible packaging is paper/cardboard, flexible plastics and plastic film. Both are used extensively in **grouped packaging** and **transport packaging**.

Grouped packaging: Packaging which constitutes, at the point of purchase, a grouping of a certain number of sales units, whether the latter is sold as such to the final user or whether it serves only as a means to replenish the shelves at the point of sale. Grouped packaging can be removed from the product without affecting the characteristics of the product. Grouped packaging is sometimes referred to as **secondary or distribution packaging**.

Non-beverage containers: Containers used for grocery products such as foods, household and commercial liquids and powders. Common material types include glass, steel and plastic.

Packaging: Packaging protects and preserves raw materials and products as they move through supply chains to consumers. The roles of packaging include protecting and maintaining the integrity of products, promoting products, providing consumer information on usage, health, safety and disposal, allowing for unitisation or grouping of products for wholesale distribution and supporting efficient handling of products throughout the supply chain.

Rigid packaging: Packaging made from non-flexible materials such as glass, metal or rigid plastic.

Sales packaging: See **consumer packaging**.

Sealed beverage containers: Beverage containers that are brought to market pre-filled and sealed, for example wine, beer, milk and soft drink. Does not include **takeaway cups,** which are provided unsealed and filled with their contents at the point of sale.

Secondary packaging: See **distribution packaging** and **grouped packaging**.

Shelf ready packaging: Products delivered in packaging that can go straight on display for sale without unpacking or repacking.

Takeaway cups: Single-use takeaway cups, which may or may not be offered with lids, such as those used to transport coffee, soft drinks and milkshakes away from home.

Transport packaging: Transport packaging is designed to facilitate handling and transport of a number of sales units in unitised or **grouped packaging**, in order to maintain unit integrity and prevent physical damage. Transport packaging does not include road, rail, ship and air containers but can include pallets. Transport packaging is also referred to as **tertiary packaging** or **distribution packaging**.

Used / Waste Packaging: Packaging that has been used or consumed and can no longer be used for. This packaging may then be recovered for **recycling** or **reuse**.

OTHER DEFINITIONS

Advance disposal fee (ADF): Government excise imposed on industry to fund initiatives aimed at increasing packaging recovery and recycling, and reducing packaging litter.

Alternative Waste Technology (AWT): Refers to methods of waste management and disposal that offer a more sustainable solution than landfill, thus reducing environmental impact. AWT can include mechanical separation methods, biological processes, thermal technologies, mechanical biological treatment and methods for converting waste to energy.

At-home consumption: Consumption that occurs in the household, including of **packaging** and **packaged consumer goods**. It excludes consumption **away from home** in offices, the **C&I sector**, hospitality venues, institutions, shopping centres and **public places**.

Australian Packaging Covenant: The Australian Packaging Covenant, formerly the **National Packaging Covenant**, is the voluntary component of a co-regulatory arrangement for managing the environmental impacts of consumer packaging in Australia. **Brand owners** can choose to join the Covenant or comply with the relevant state based **National Environmental Protection (Packaging Materials) Measure (NEPM)**.

Away-from-home consumption: Consumption that occurs in offices, the **C&I sector**, hospitality venues, institutions, shopping centres and **public places**. It includes **packaged consumer goods** and associated **distribution packaging**. It does not include **at-home consumption**. For comparison see **public places**.

Away-from-home recycling: Using materials/products recovered from offices, the **C&I sector**, hospitality venues, institutions, shopping centres and **public places** as raw materials to produce other products. It does not include **kerbside recycling**.

Base case: The 'business as usual' scenario, including current arrangements, that occurs in the absence of any further government intervention.

Benefit Cost Ratio (BCR): One of the key outputs of a **Cost-Benefit Analysis (CBA)**, used to compare the net benefit to society and the net cost to society of a particular option, relative to the **base case**. The **BCR** is measured as the ratio of the **present value (PV)** of **incremental benefits** relative to the **base case** over the evaluation period to the present value of **incremental costs** over the evaluation period.

Brand owner: The owner or licensee of a trade mark under which **consumer product** is first sold or otherwise distributed in Australia (often with branded packaging). The brand owner may also be the franchisee of a business arrangement which allows an individual, partnership or company to operate under the name of an already-established business. In respect to in-store packaging, the brand owner may be the supplier of the packaging to the store[1]. The brand owner does not usually manufacture the packaging, but may commission branded packaging for its products. See also **packaged goods industry.**

Commercial and Industrial (C&I) waste: Waste produced by commercial and industrial businesses and enterprises, government agencies and institutions.

Consultation Regulation Impact Statement (RIS): A document that details a regulation impact assessment process for consultation with stakeholders. A Consultation RIS is generally followed by a Decision RIS. A Consultation RIS involves identifying the problems requiring government intervention, the proposed options for addressing the problems, the impacts of different options to address the problems and consultation with stakeholders.

Consumer: Someone that consumes, in this context packaging or a packaged product, who may be an individual or a business.

Consumer product: A product intended for sale to a consumer, which is packaged. This consumer may be an individual who obtains the product through **retail** sale for consumption, or a business who obtains the product for consumption through means such as **wholesale**.

Container deposit legislation (CDL): See **Container deposit scheme**.

Container deposit scheme (CDS): A deposit is levied on the sale of a product sold in a container. The deposit is refunded to the consumer after the product has been used and when the container is returned to a designated public redemption point. CDSs are most often confined to beverage containers, and some CDSs, such as that operating in South Australia, exclude (plain) milk and wine containers. A CDS is also known as **container deposit legislation (CDL)** as it operates under legislation.

Co-regulatory arrangement (CA): A product stewardship organisation (PSO) established by industry members to achieve product stewardship outcomes set in regulations on their behalf. In relation to this RIS, the regulations would be either under the co-regulatory provisions of the ***Product Stewardship Act 2011*** or the ***National Environment Protection (Used Packaging Materials) Measure 2011 (NEPM)***.

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[1] Source: Australian Packaging Covenant, as amended 10 October 2010.

Cost-Benefit Analysis (CBA): An analytical tool that compares the impacts of proposed options for government intervention to address identified problems, relative to a 'business as usual' scenario (the **base case**). Economic costs and benefits are examined from the perspective of the community as a whole to help identify the proposal with the highest net benefit. Where possible, these costs and benefits are monetised and discounted to convert them to their **Net Present Value (NPV)** for comparative purposes in today's dollars. Also known as an **economic analysis** as it assesses effects on the economy as a whole only.

Decision Regulation Impact Statement (RIS): A document that details the findings of a regulation impact assessment process for decision-makers. It is generally preceded by a Consultation RIS and stakeholder consultation. A Decision RIS draws conclusions on whether regulation is necessary, and if so, what the most efficient and effective regulatory approach might be, taking into account the outcomes of consultation and analysis of the costs and benefits of the options (a **CBA**).

Distributional impact analysis: Also known as a **financial analysis**.

Economic analysis: See Cost-Benefit Analysis.

Free rider: An individual or company who benefits from a good or a service without paying for it. In the context of packaging policy options, this usually refers to companies and groups that, under the principles of product stewardship, should be held accountable for the environmental impacts of packaging, but do not contribute to programs and initiatives designed to address the environmental impacts of packaging.

Financial analysis: See **distributional impact analysis**.

Hub and spoke: A hub and spoke-based system is one that operates with a large centre, which leads the system (the hub), and a series of smaller centres (the spokes) which operate parts of the system under the leadership of the hub. This is the structure of the recycling facilities in the proposed Boomerang Alliance CDS, as it will be centrally-managed by a CDS coordinator with the spokes represented by a network of **RVMs** for individual consumer redemptions and hubs for commercial-scale redemptions.

Importer: In the case of an imported product, the first person to sell that product in Australia.

Incremental benefits and costs: In a **Cost-Benefit Analysis**, the benefits and costs of the options to address identified problems are measured on an incremental basis relative to the 'business as usual' scenario (the **base case**). That is, they are costs and benefits compared to the **base case** rather than separate totals.

Industry Association: An organisation that coordinates and represents the views of members, who may be organisations or businesses from several industries or sectors, although generally fewer than those represented by an **umbrella organisation**. For example, the Australian Food and Grocery Council.

Kerbside recovery: Roadside collection of domestic solid waste. Waste may be sorted for recycling or otherwise prior to collection.

Kerbside recycling: Using materials and products recovered from roadside collections as raw materials to produce other products.

Liable party: The person or business who would become responsible under regulations to meet a product stewardship outcome or make a financial contribution to a **product stewardship scheme**.

Litter: The intentional or unintentional discard of end-of-life packaging, products or other items into the environment, for example, due to over-full receptacles or uncovered bins and vehicle loads.

Marine debris: The pollution of the marine environment by human generated objects, such as litter. This also occurs in freshwater waterways.

Material Recovery Facility (MRF): Sometimes referred to as a Materials Reclamation Facility. A MRF is a specialised (mechanical) plant that receives and separates recovered materials into recyclable and non-recyclable streams, and prepares recyclable materials for marketing to end-user manufacturers for reprocessing. A MRF can also employ people to assist with sorting where necessary, known as manual or hand sorting.

Municipal waste: Domestic waste from households, usually disposed of via roadside collection.

National Environment Protection Measure (NEPM): Legislative instruments designed to improve national consistency in environmental protection outcomes. Measures are made under the National Environment Protection Council (NEPC) Act by Commonwealth, state and territory environment ministers.

National Environment Protection (Used Packaging Materials) Measure 2011 **(NEPM):** A regulatory safety net designed to prevent industries in the packaging supply chain that choose not to participate in the **Australian Packaging Covenant** from gaining a competitive advantage. The NEPM encourages packaging manufacturers and **brand owners** to join the voluntary APC arrangement, as otherwise they would be required to achieve equivalent outcomes on their own.

National Packaging Covenant: See **Australian Packaging Covenant**.

National Waste Policy: The National Waste Policy was agreed to by all Australian environment ministers in November 2009 and endorsed by the Council of Australian Governments (COAG) in October 2010. The policy sets out a coherent approach to Australia's waste management and resource recovery up to 2020.

Net Present Value (NPV): One of the key outputs of a **Cost-Benefit Analysis**, used to determine the overall net benefit or cost to society of a particular option. The NPV is measured as the difference between the **Present Value (PV)** of the **incremental benefits** (relative to the **base case**) over the evaluation period and the present value of the **incremental costs**.

Packaged good / product: See **consumer product**.

Packaged goods industry/ies: Refers to **brand owners** who do not manufacture packaging but commission packaging for their products. Prominent packaging brand owners include the food and beverage industry and the **retail** industry.

Packaging industry: Refers to businesses that are involved in creating, manufacturing or supplying consumer packaging. As distinguished from **packaged goods industry/ies** and **brand owners**.

Packaging supply chain: All of the organisations that participate in creating, distributing and selling consumer packaging and/or products. These include but are not limited to suppliers of raw materials for consumer packaging, manufacturers of consumer packaging, suppliers/distributors of consumer packaging, manufacturers of consumer products, fillers of consumer packaging, brand owners of consumer products, wholesalers/distributors of consumer products and retailers of consumer products[2].

Product Stewardship: The concept of shared responsibility for product impacts by all sectors involved in the manufacture, distribution, use and disposal of **consumer products**.

Product Stewardship Act 2011**:** This legislation provides a framework to effectively manage the environmental, health and safety impacts of products and materials during and at end of life, and in particular those impacts associated with the disposal of products and materials. The framework includes voluntary, co-regulatory and mandatory product stewardship provisions. The legislation delivers on a key commitment by the Australian Government under the **National Waste Policy**.

Product Stewardship Organisation (PSO): An organisation established by industry participants, some of whom may be competitors, to deliver a product stewardship function for products or materials on their collective behalf.

Product Stewardship Scheme: A product stewardship scheme tends to be designed around the idea that producers of **consumer products** should bear responsibility for their management at end of life. As an example, for **packaging** this could involve industry establishing a **Product Stewardship Organisation** to operate the scheme and charging membership fees (similar to an ADF arrangement), which are used to fund initiatives aimed at increasing packaging recovery and recycling and reducing packaging litter.

Public places: A subset of **away-from-home consumption**. Public places are deemed to include 'local government area public places' (such as streets, highways and roadside verges and public recreation reserves, beaches, parks and gardens) and 'commercial public places' (such as shopping centres and hotels, bars and restaurants and sporting and event venues). This term does not include privately-owned, restricted access locations such as businesses and workplaces and other parts of the **C&I sector**.

Recovery: Collection of solid waste that can then be sorted and processed for **recycling**.

Recyclate: Material that has been collected, sorted and prepared (for example by removing contaminants) for **recycling**, which is incorporation into a new product (not necessarily packaging).

Recycling: Using recovered products and materials as raw materials to produce another product. The recovered material is called **recyclate**.

Reprocessing: See **recycling**.

[2] Source: Australian Packaging Covenant, as amended 10 October 2010.

Resource recovery: See **recovery**.

Retail: The sale of commodities to household or individual end-consumers, usually in small quantities (distinguished from **wholesale**).

Reuse: To use products and materials again in their original state without **reprocessing** or remanufacture.

Reverse Vending Machines (RVMs): RVMs are used in CDSs as automated deposit points for **beverage containers**. Containers are inserted into the RVM and then scanned, sorted by material type and processed into separate bins (glass bottles and aluminium cans are crushed, plastic bottles are shredded) to minimise storage requirements.

Super-collectors: Refers to an organisation that monitors performance and manages the flow of money between liable parties and depots under the South Australian **container deposit scheme**.

Umbrella organisation: A high level organisation that coordinates the views of members, who may be organisations or businesses from several industries or sectors. For example, the Australian Industry Group.

Use-value: Refers to the emotional or social payoff associated with incurring cost or inconvenience in order to perform recycling actions.

Wholesale: The sale of commodities or products in large quantities, to retailers, other businesses or wholesale merchants, rather than to end-consumers directly (distinguished from **retail**).

Willingness to Pay: Refers to the intrinsic value of knowing that other people are recycling.

Description of policy options being considered in the Packaging Impacts Decision Regulation Impact Statement (RIS)

Contents

The options descriptions in this document have been prepared for consideration in the Packaging Impacts Decision RIS. The descriptions do not represent a policy of the Australian, state or territory governments and have not been considered by ministers at this level of detail.

SUMMARY OF OPTIONS

On 24 August 2012 the Standing Council on Environment and Water (SCEW) agreed to develop the Packaging Impacts Decision RIS, following extensive public consultation earlier in the year on the Consultation RIS.

SCEW agreed that ten options be considered in the Decision RIS—the seven options analysed in the Consultation RIS, and three new options developed in response to consultation feedback:

Table 1: Summary of options to be considered in Decision RIS.

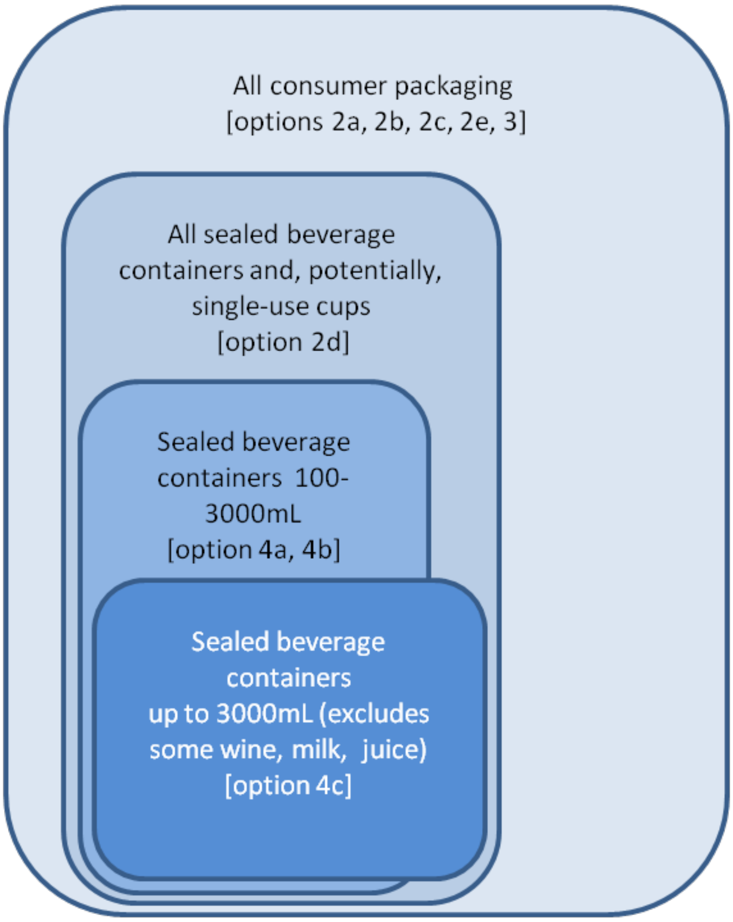
Approach	Option		Summary of option
No new regulation	**1**	National Packaging and Litter Strategy	A nationally coordinated government initiative targeting packaging recycling and litter
Co-regulatory product stewardship	**2a**	Australian Packaging Covenant replaced by co-regulatory product stewardship under the *Product Stewardship Act 2011* (PS Act)	An industry run co-regulatory product stewardship scheme under the PS Act to replace the existing Covenant
	2b	Industry Packaging Stewardship	An industry run co-regulatory product stewardship scheme under the PS Act based on the National Bin Network proposal developed by companies in the packaging and packaged goods industries
	2c	Extended Packaging Stewardship	An industry run co-regulatory product stewardship scheme under the PS Act that goes beyond the commitment from industry groups under option 2b
	2d	Beverage Container Stewardship (**new option**)	A co-regulatory product stewardship scheme under the PS Act that makes the beverage industry responsible for achieving an 80 per cent national beverage container recycling rate by 2025 While modelled for beverage containers this option has the potential to adopt a broader definition of 'beverage container' than Option 4, reflecting the prevalence of drink cups in litter.
	2e	Extended Australian Packaging Covenant (**new option**)	A co-regulatory scheme modelled on the existing Australian Packaging Covenant with a greater financial commitment from industry
Mandatory product stewardship	**3**	Advance Disposal Fee	An advance disposal fee on all packaging materials that generates revenue to fund packaging recycling and litter programs
	4a	Boomerang Alliance container deposit scheme	A national container deposit scheme proposed by Boomerang Alliance with a ten cent upfront deposit (payable by domestic producers and importers of sealed beverages) and a ten cent refund for redeemed containers
	4b	Centralised container refund scheme	A container refund scheme managed by a single national coordinator which allows consumers to receive a ten cent refund when they return their containers to an approved depot
	4c	South Australian container refund scheme (**new option**)	A national container refund scheme based on the South Australian scheme which allows consumers to receive a ten cent refund for eligible containers they return to approved depots

Summary of option scope (liable products):

Several options target all packaging used for consumer goods, which is consistent with the scope of the existing Australian Packaging Covenant. Other options have a narrower scope, specifically target beverage packaging. See Figure 1.

Figure 1: Scope of policy options - product classes

Packaging Impacts Decision Regulation Impact Statement



NON-REGULATORY
OPTION 1 – NATIONAL PACKAGING WASTE AND LITTER STRATEGY

Brief description:

A national packaging waste and litter strategy funded from additional government resources.

Scope:

All packaging materials and littered items.

How it works:

The strategy coordinates jurisdictional actions to increase recovery and recycling of packaging waste and reduce litter. It will lead to improved use of current infrastructure by providing targeted information and advice to consumers and greater sharing of information across governments.

Elements of a national packaging waste strategy may include:

- the development of a national litter methodology for measurement and monitoring of litter rates
- national programs to increase away-from-home recycling at mass consumption areas
- coordinated litter campaigns
- consistent labelling of recycling bins
- development of voluntary standards for end products and packaging labelling to highlight recyclability, and
- a national education initiative aimed at litter prevention.

Governance:

The national packaging waste and litter strategy does not include any additional regulatory requirements. It is funded by governments and facilitated by a national body made up of representatives from Commonwealth, state, territory and local governments.

The strategy includes collaboration between government, industry (packaging manufacturers, grocery and beverage industries and retailers), environment groups and local government.

CO-REGULATORY PRODUCT STEWARDSHIP OVERVIEW

This section describes the co-regulatory options 2a, 2b, 2c, 2d and 2e in general terms. Full descriptions of the sub-options appear below Table 2.

Common features of co-regulatory options 2a—2d

Options 2a—2d would be implemented by making Regulations under the *Product Stewardship Act 2011* ('PS Act'), activating the co-regulatory provisions in Part 3 of the PS Act with respect to:

- Defining the product classes (generally all consumer packaging, but option 2d is limited to beverage containers)
- Defining the liable parties as constitutional corporations who manufacture, import distribute or use relevant products (including appropriate small business exemption thresholds)
- Obliging liable parties to become a member of an approved co-regulatory arrangement (CA)
- Defining the outcomes and requirements which CAs must meet.

Co-regulatory option 2e

Option 2e would be implemented by the National Environment Protection Council (consisting of federal, state and territory environment ministers) agreeing to amend the existing Used Packaging Materials National Environmental Protection Measure (NEPM)[1], if necessary, to support a new Australian Packaging Covenant agreement between government and industry, with a substantial increase in industry's collective financial contribution. Any change to the Used Packaging Materials NEPM is likely to require amendments to the state and territory legislation which implements its terms.

Key differences between the co-regulatory options

The five co-regulatory options differ in relation to the classes of products to which they would apply and the recycling obligations of co-regulatory arrangements. The table below sets out these key differences and the forecast national recycling rate outcomes they are expected to contribute towards.

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[1] Such amendments are made under Division 2 of the *National Environment Protection Council Act 1994*

Table 2: Key differences between co-regulatory options

Option	Product class	Recycling target % product class consumption (estimated tonnes)	Preliminary forecast of national recycling rate for product class	Litter outcomes	Design outcomes
2a	Consumer packaging	2% annually (0.1m tonnes)	75% by 2020	Packaging litter plan (education, clean-up, product design)	Sustainable packaging design standards
2b		10% by 2020 (0.5m tonnes)	77.5% by 2020		
2c		16% by 2020 (0.8m tonnes)	80% by 2020		
2e (new)		No regulated target	80% by 2020		
2d (new)	Beverage containers	72.5% by 2020 80% by 2025 (0.9m tonnes in 2020)	72.5% by 2020 80% by 2025	Beverage container litter plan	Beverage container design standards

CO-REGULATORY PRODUCT STEWARDSHIP
OPTION 2A – AUSTRALIAN PACKAGING COVENANT REPLACED BY CO-REGULATORY PRODUCT STEWARDSHIP UNDER THE *PRODUCT STEWARDSHIP ACT 2011*

Brief description:

A co-regulatory product stewardship scheme under the *Product Stewardship Act 2011* (PS Act) to replace the existing Australian Packaging Covenant (APC). Under the scheme, an industry product stewardship organisation (co-regulatory arrangement) must meet outcome requirements specified in regulations relating to sustainable packaging design, packaging recycling and litter reduction. The packaging recycling target is 2 per cent per year of packaging materials brought to market by members, achieved by supporting increased at home and away from home recycling.

Scope (liable products):

Under this option, the class of products subject to regulation is[2] as:

- All consumer packaging.

Liability of a party under the regulation is based on the amount of consumer packaging materials brought to market by the manufacturer, importer, distributor or user of the consumer packaging. Only one such party in the supply chain will be identified as liable in relation to an item of consumer packaging. Only constitutional corporations who exceed a defined threshold will be liable (purpose is to exempt smaller businesses while capturing most packaging).

How it works:

Regulations under the PS Act establish the co-regulatory scheme, including liable parties and outcomes. The scheme replaces the current activities of the APC.

Corporations that produce and/or import packaged consumer products must join an approved co-regulatory arrangement (CA). The CA (or CAs) must achieve outcomes and other requirements based on the amount of packaging materials that their members bring to market.[3] The outcomes and requirements that the CA must achieve are:

- oblige members to develop a sustainability action plan and report annually against it
- demonstrate members' commitment to sustainable packaging design
- achieve packaging recycling targets – recycling 2 per cent of the packaging materials its members bring to market every year, and
- develop and implement a litter reduction plan, incorporating education, infrastructure and clean-up actions.

Failure to take reasonable steps to achieve these outcomes and requirements can lead to a CA's approval being revoked, which would expose its members to financial penalties for every day they are not a member of an approved CA. The regulations will not set out the specific actions that need to be undertaken to achieve the outcomes. Rather, it is the role of the CA to come up with a cost-effective means of achieving them.

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[2] The specific terms of any legislative instrument made to implement options are a matter for implementation, taking into account legal or practical matters arising.

[3] The APC model is based on a single industry CA. The PS Act regulations will not prohibit multiple CAs from establishing, so it is possible that there will be more than one CA. All references to the CA in this description should also be read as applying to multiple CAs.

The CA's recycling obligations are limited to its target - it is not obliged to ensure that the *national* packaging recycling rate reaches a certain level on a certain future date, as this rate is impacted by a multitude of other factors and other parties.

Action Plan

As under the current APC, liable parties under the scheme are obliged to develop an action plan outlining what actions they will undertake to support the objectives of the scheme (outlined in the regulations) and to report annually against it. Actions will include:

- implementing sustainable packaging guidelines (developed by CA)
- establishing on-site recovery systems for used packaging
- implementing a 'Buy Recycled' policy, and
- undertaking product stewardship actions – such as supply contracts that require take-back and recycling.

Sustainable packaging design

Under the co-regulatory scheme regulations, the CA must demonstrate the commitment of member companies to sustainable packaging design. This can be achieved by requiring members to implement sustainable packaging guidelines, and reporting annually on members' actions to optimise packaging for successful recycling and reuse and use fewer and more readily recyclable materials.

Packaging recycling

Under the scheme, the CA is responsible for a quantitative recycling target, modelled on the current APC commitment, to stimulate increases in packaging recycling rates in Australia. Recognising that parties outside the packaged goods industry (e.g. local governments, business consumers) already recycle a lot of packaging, the scheme makes the CA responsible for additional recycling on top of existing recycling efforts. It is expected that these other parties will continue to undertake recycling activities independently of the activities of the CA.

The CA's target is to recycle 2 per cent of the packaging its members bring to market every year (see Figure 2 below). This is calculated on the commitment which is estimated to be required from the packaged goods industry to result in an overall 75 per cent national packaging recycling rate by 2020.

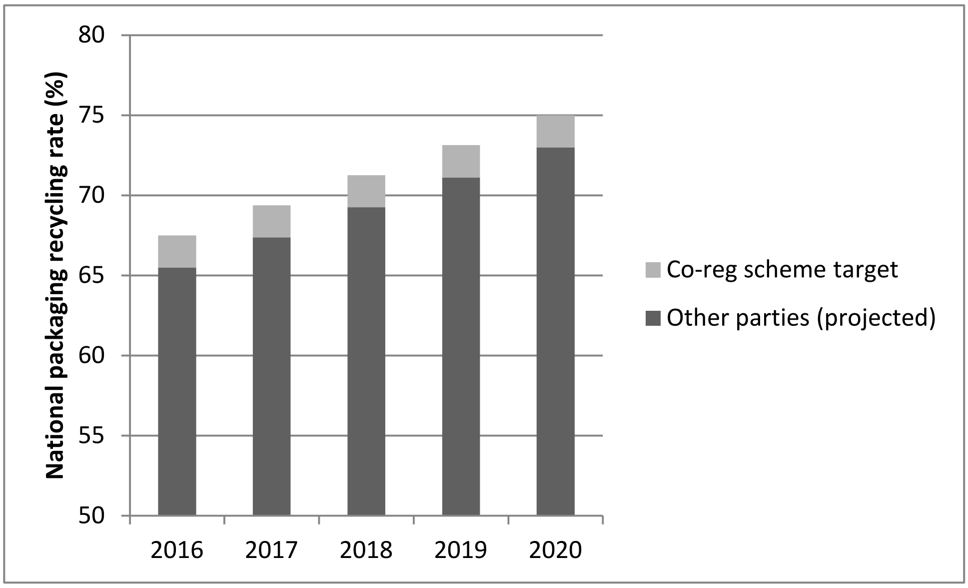

Figure 2 – Co-regulatory scheme recycling targets – option 2a

The CA must prove that its actions lead to additional recycling. For example, it could invest in projects to improve the output of existing recycling infrastructure, with the CA partnering with commercial operators to achieve its outcome targets. While projects can continue over multiple years, only the new recycling generated from the project each year can count towards the outcome target in that year (i.e. if a CA's project generates 200,000 tonnes in year 1 and 250,000 tonnes in year 2, the CA can only count 50,000 tonnes towards its target in year 2).

Litter reduction

The CA is obliged under the scheme to reduce the impact of litter in Australia by developing and implementing a litter reduction plan, incorporating education, infrastructure and clean-up actions. To be approved, the plan would need to meet specified assessment criteria, including:

- a focus on locations where litter has high environmental costs (such as waterways and stormwater which flow to sea and coastal environments)
- containing clearly measurable litter outcomes
- mitigating impacts in all Australian states and territories
- managing litter in cooperation with local governments (and if there are multiple CAs, avoiding duplicating other CAs' efforts).

<u>Governance:</u>

The Australian Government (AG) is responsible for: developing regulations to establish the co-regulatory scheme; assessing and approving CAs; and monitoring and enforcing compliance, which involves pursuing and potentially prosecuting liable companies that do not join a CA and ensuring that a CA fulfils its obligations under the scheme. The AG must also report annually to the Australian Parliament on the operation of the scheme.

Under the PS Act, an approved CA needs to take reasonable steps to achieve the specified outcomes and requirements of the scheme. The CA and its liable party members need to keep adequate records and make the records available on request. The CA must report regularly to the AG on its performance. The AG can issue an improvement notice to the CA or direct it to undertake an audit. If the CA's performance is unsatisfactory, the AG can cancel its approval.

CO-REGULATORY PRODUCT STEWARDSHIP
OPTION 2B – INDUSTRY PACKAGING STEWARDSHIP

Brief description:

An industry run co-regulatory product stewardship scheme under the *Product Stewardship Act 2011* (PS Act) based on the National Bin Network (NBN) proposal developed by companies in the packaging and packaged goods industries. Under the scheme, an industry product stewardship organisation (co-regulatory arrangement) must meet outcome requirements specified in regulations relating to sustainable packaging design, packaging recycling and litter reduction for packaged consumer products brought to market. The packaging recycling target for 2020 is 10 per cent of packaging materials brought to market by members, achieved by supporting increased at home and away from home recycling. The recycling target will include a beverage container sub-target.

Objectives to be achieved are:

- **Packaging design** — members of a co-regulatory arrangement (i.e. producers and importers of packaged consumer products):
    - o using the Sustainable Packaging Guidelines for design or procurement of packaging
    - o with formal processes in place to improve packaging design and recycling
    - o demonstrating other product stewardship outcomes for packaging.
- **Packaging recycling** — co-regulatory arrangement will support increased at-home and away-from-home recycling. This is expected to contribute to achieving a national packaging recycling rate of approximately 77.5 per cent by 2020. Recycling of beverage containers would comprise a substantial component of this contribution, projected to deliver a 70 per cent beverage container recycling rate by 2020 and 80 per cent by 2025 (up from 52 per cent in 2010-11).
- **Litter reduction** — co-regulatory arrangement will take actions that are reasonably expected to contribute to a 10 per cent reduction in all litter by volume by 2020.

Scope (liable products):

Under this option, the class of products subject to regulation[4] is:

- All consumer packaging.

Liability of a party under the regulation is based on the amount of consumer packaging materials brought to market by the manufacturer, importer, distributor or user of the consumer packaging. Only one such party in the supply chain will be identified as liable in relation to an item of consumer packaging. Only constitutional corporations who exceed a defined threshold will be liable (purpose is to exempt smaller businesses while capturing most packaging).

How it works:

Unlike option 2a, under option 2b the co-regulatory arrangement (CA) faces rising recycling targets, as well as a packaged beverage container recycling sub-target (that is, beverages in sealed containers).

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[4] The specific terms of any legislative instrument made to implement options are a matter for implementation, taking into account legal or practical matters arising.

In addition, the CA may continue to support recycling activities over multiple years and count the ongoing recycling performance of those activities towards outcomes in the year in which the recycling occurs.

PS Act co-regulatory provisions

Regulations under the PS Act establish the co-regulatory scheme, including liable parties and outcomes. The scheme replaces the current activities of the Australian Packaging Covenant (APC) and includes increased commitments, particularly for beverage containers.

Producers and importers of packaged consumer products must join an approved CA. The CA (or CAs) must achieve outcomes and other requirements based on the amount of packaging materials that their members sell into the Australian market.[5] The outcomes and requirements that the CA must achieve are:

- demonstrate its members' commitment to sustainable packaging design;
- achieve packaging recycling targets – e.g. by 2020 the CA needs to be recycling 10 per cent of the packaging materials its members bring to market (consisting of recycling not previously occurring); and
- take actions that are reasonably likely to contribute to a 10 per cent reduction in all litter (measured by volume).

Failure to take reasonable steps to achieve these outcomes and requirements can lead to a CA's approval being revoked, which would expose its members to financial penalties for every day they are not a member of an approved CA. The regulations will not set out the specific actions that need to be undertaken to achieve the outcomes. Rather, it is the role of the CA to come up with the most cost-effective means of achieving them.

The CA's recycling obligations are limited to its target - it is not obliged to ensure that the *national* packaging recycling rate reaches a certain level on a certain future date, as this rate is impacted by a multitude of other factors and other parties.

Sustainable packaging design

Under the co-regulatory scheme regulations, the CA must demonstrate the commitment of member companies to sustainable packaging design. This would be achieved by requiring members to implement Sustainable Packaging Guidelines and reporting annually on members' actions to optimise packaging for successful recycling and reuse, and use fewer and more readily recyclable materials.

Packaging recycling

Under the scheme the CA is responsible for much of the anticipated increase in packaging recycling rates in Australia. Recognising that parties outside the packaged goods industry (e.g. local governments, business consumers) already recycle a lot of packaging, the scheme makes the CA responsible for additional recycling on top of existing recycling efforts.

The CA's target is 2 per cent of the packaging its members sell into the Australian market in 2016; rising annually to achieve 10 per cent of packaging by 2020 (see Figure 3 below). This is calculated on the commitment which is estimated to be required from the packaged goods

[5] The NBN proposal envisages a single industry CA. The PS Act regulations will not prohibit multiple CAs from establishing, so it is possible that there will be more than one CA. All references to the CA in this description should also be read as applying to multiple CAs.

industry to result in an overall 77.5 per cent national packaging recycling rate by 2020. The CA has a specific sub-target for beverage container recycling forming a substantial component of the overall target, calculated on the commitment estimated to be required from the packaged goods industry to result in an overall 70 per cent national beverage container recycling rate by 2020 and 80 per cent by 2025.

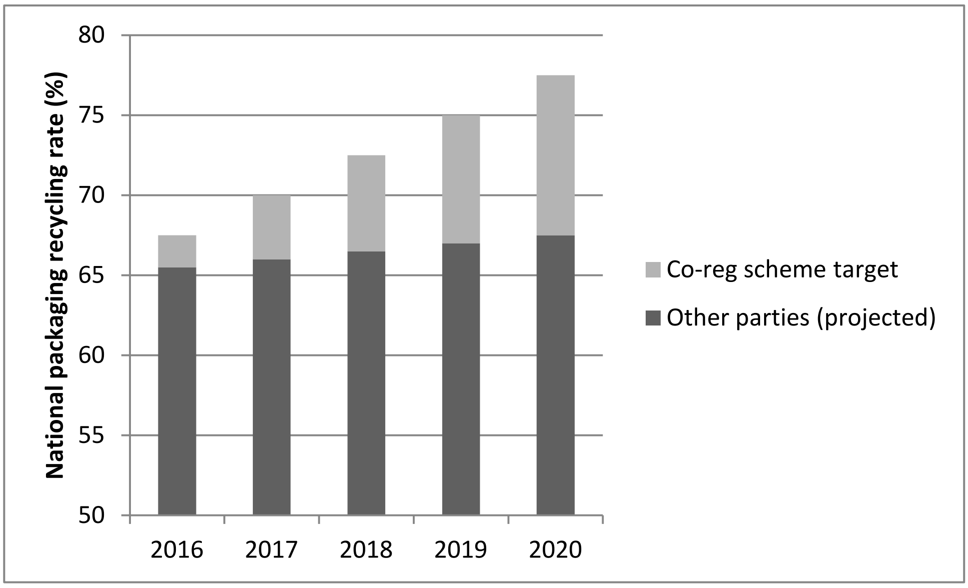


Figure 3 – Co-regulatory scheme recycling targets – option 2b

The CA must prove that its actions lead to additional recycling. For example, it could invest in projects to improve the output of existing recycling infrastructure, with the CA partnering with commercial operators to achieve its outcome targets. Projects can continue over multiple years, with the recycling from the project in each year counting towards the outcome target in that year.

Key actions would include:

Away from home recycling:

- Increased "away from home" recycling opportunities through the installation of dual waste/recycling bins for beverage and other packaging, newsprint and paper. Cost efficiencies would be achieved through a national competitive tender process and bulk bin purchase.
- **Primary Focus** - commercial venues (e.g. shopping centres, transport hubs, pubs and clubs, education sector, entertainment and tourism venues, sporting stadiums).
- **Secondary Focus** – local government managed venues where it can be demonstrated that the installation of away from home recycling systems will deliver a positive cost-benefit, or revenue neutral cost-benefit to local government.
- National education/promotion campaign, including the development of a national "where's the nearest bin" mobile device application.

At home recycling:

- Continued improvement of packaging recycling rates at home, particularly in glass, PET, HDPE, aluminium and liquid paperboard containers.
- Partnering with local government, recycling and waste organisations to develop initiatives that reduce contamination, increase the amount of recyclable packaging

materials presented in kerbside collections and stimulate secondary use markets for collected packaging materials.

- Increased investment in glass reprocessing infrastructure and market development:
- **Primary Focus** – funding for the establishment of new optical glass sorting facilities to recycle more glass back into glass containers.
- **Secondary Focus** – funding for new glass crushing infrastructure for using residual glass fines in civil construction applications (i.e. sand replacement) particularly in remote and rural areas, including ongoing investment in market development for recovered crushed glass in civil construction applications.

Litter reduction

The CA is obliged under the scheme to reduce the impact of all litter in Australia by developing and implementing a litter reduction plan aimed at reducing all litter nationally by 10 per cent by volume in 2020, incorporating education, infrastructure and clean-up/litter mitigation actions. To be approved, the plan would need to meet specified assessment criteria, including:

- a focus on locations where litter has high environmental costs (such as waterways and stormwater which flow to sea and coastal environments)
- containing clearly measurable litter reduction outcomes
- mitigating impacts in all Australian states and territories
- managing litter in cooperation with state and territory governments, their relevant agencies and local governments (and if there are multiple CAs, avoiding duplicating other CAs' efforts).

Key actions would include:

- Substantially increased funding for litter clean up/mitigation (**all** litter), education and enforcement:
- **Primary Focus** – Roadsides and Waterways – delivered through Keep Australia Beautiful's national network, funding to community groups/local government nationally to establish Adopt a Highway/Waterway Groups, with the objective to clean up litter hot spots and implement litter mitigation strategies (e.g. bins and signage/education/enforcement) to keep hot spots clean into the future.
- **Secondary Focus** – delivered through Keep Australia Beautiful's national network, funding to support active enforcement of existing litter legislation by jurisdictions, including a National Dob-in-a-Litterer hotline, website and mobile device application.

Partnering with Keep Australia Beautiful and other like minded organisations to deliver a national litter education campaign integrated into new and existing community environmental education programs. The aim will be to educate Australians through new ideas, enhanced awareness, award/recognition programs, community and direct action initiatives to reduce all litter. Includes the development of a national "where's the nearest bin" mobile device application. Also includes building technology tools to connect information about where litter is located throughout Australia and enable information and learnings to be shared amongst Adopt a Highway/Waterway Groups and other interested parties.

Governance:

The Australian Government is responsible for: developing regulations to establish the co-regulatory scheme; assessing and approving CAs; and monitoring and enforcing compliance, which involves pursuing and potentially prosecuting liable companies that do not join a CA and ensuring that a CA fulfils its obligations under the scheme. The government must also report annually to the Australian Parliament on the operation of the scheme.

Under the PS Act, an approved CA needs to take reasonable steps to achieve the specified outcomes and requirements of the scheme. The CA and its liable party members need to keep adequate records and make the records available on request. The CA must report regularly to government on its performance. The government can issue an improvement notice to the CA or direct it to undertake an audit. If the CA's performance is unsatisfactory, the government can cancel its approval.

CO-REGULATORY PRODUCT STEWARDSHIP
OPTION 2C – EXTENDED PACKAGING STEWARDSHIP

Brief description:

A co-regulatory product stewardship scheme under the *Product Stewardship Act 2011* (PS Act) that goes beyond the commitment from industry groups under option 2b. Under the scheme, industry product stewardship organisations (co-regulatory arrangements) must meet outcome requirements specified in regulations relating to sustainable packaging design, packaging recycling and litter reduction. The packaging recycling target for 2020 is 16 per cent of packaging materials brought to market by members, achieved by supporting increased at home and away from home recycling. The recycling target will include a beverage container sub-target.

Scope (liable products):

Under this option, the class of products subject to regulation[6] is:

- All consumer packaging.

Liability of a party under the regulation is based on the amount of consumer packaging materials brought to market by the manufacturer, importer, distributor or user of the consumer packaging. Only one such party in the supply chain will be identified as liable in relation to an item of consumer packaging. Only constitutional corporations who exceed a defined threshold will be liable (purpose is to exempt smaller businesses while capturing most packaging).

How it works:

Regulations under the PS Act establish the co-regulatory scheme, including liable parties and outcomes. The scheme replaces the current activities of the Australian Packaging Covenant and has substantially increased commitments.

Corporations that produce and/or import packaged consumer products must join an approved co-regulatory arrangement (CA). CAs must achieve outcomes and other requirements based on the amount of packaging materials that their members bring to market. The outcomes and requirements that CAs must achieve are:

- demonstrate members' commitment to sustainable packaging design
- achieve packaging recycling targets – e.g. by 2020 CAs needs to be recycling 16 per cent of the packaging materials their members bring to market, and
- develop and implement a litter reduction plan, incorporating education, infrastructure and clean-up actions.

Failure to take reasonable steps to achieve these outcomes and requirements can lead to a CA's approval being revoked, which would expose its members to financial penalties for every day they are not a member of an approved CA. The regulations will not set out the specific actions that need to be undertaken to achieve the outcomes. Rather, it is the role of CAs to come up with a cost-effective means of achieving them.

Option 2c is similar to option 2b, with a higher packaging recycling target. Unlike option 2a, under option 2c CAs may continue to support recycling activities over multiple years and count the ongoing recycling performance of those activities towards outcomes.

[6] The specific terms of any legislative instrument made to implement options are a matter for implementation, taking into account legal or practical matters arising.

The CA's recycling obligations are limited to its target - it is not obliged to ensure that the *national* packaging recycling rate reaches a certain level on a certain future date, as this rate is impacted by a multitude of other factors and other parties.

Sustainable packaging design

Under the co-regulatory scheme regulations, CAs must demonstrate the commitment of member companies to sustainable packaging design. This could be achieved by requiring members to implement sustainable packaging guidelines, and reporting annually on members' actions to optimise packaging for successful recycling and reuse and use fewer and more readily recyclable materials.

Packaging recycling

Under the scheme CAs are responsible for all of the anticipated increase in packaging recycling rates in Australia. Recognising that parties outside the packaged goods industry (e.g. local governments, business consumers) already recycle a lot of packaging, the scheme makes CAs responsible for additional recycling on top of existing recycling efforts.

The CAs' target is 3 per cent of the packaging their members bring to market in 2015; rising annually to 16 per cent by 2020 (see Figure 4 below). This is calculated on the commitment which is estimated to be required from the packaged goods industry to result in an overall 80 per cent national packaging recycling rate by 2020. CAs have a specific sub-target for beverage container recycling, equivalent to the target for option 2b.

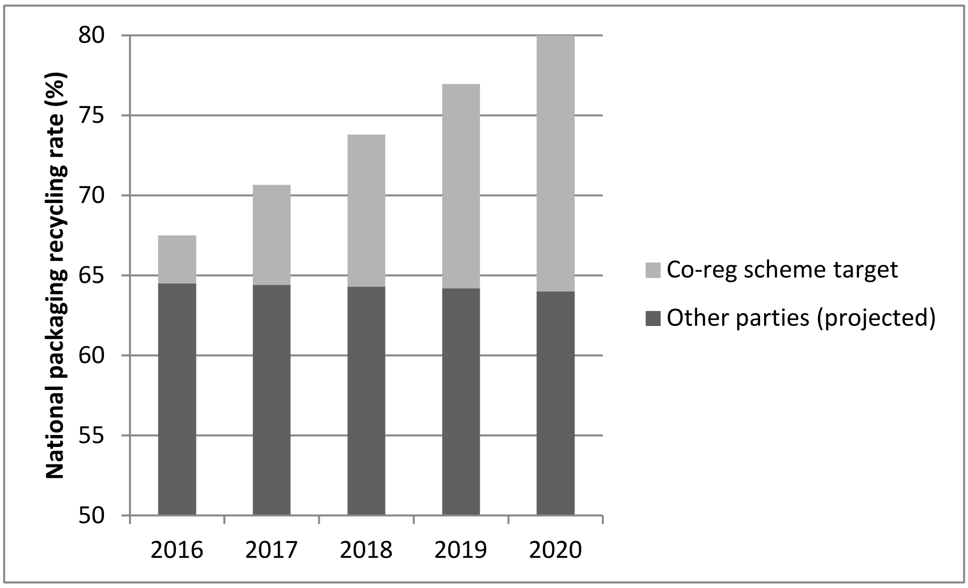


Figure 4 – Co-regulatory scheme recycling targets – option 2c

CAs must prove that their actions lead to additional recycling. For example, they could invest in projects to improve the output of existing recycling infrastructure, with CAs partnering with commercial operators to achieve their outcome targets. Projects can continue over multiple years, with the recycling from the project in each year counting towards the outcome target in that year.

Litter reduction

CAs are obliged under the scheme to reduce the impact of litter in Australia by developing and implementing litter reduction plans, incorporating education, infrastructure and clean-up actions. To be approved, plans need to meet specified assessment criteria, including:

- a focus on locations where litter has high environmental costs (such as waterways and stormwater which flow to sea and coastal environments)
- containing clearly measurable litter outcomes
- mitigating impacts in all Australian states and territories
- managing litter in cooperation with local governments, and
- avoiding duplicating other CAs' efforts.

Governance:

The Australian Government (AG) is responsible for: developing regulations to establish the co-regulatory scheme; assessing and approving CAs; and monitoring and enforcing compliance, which involves pursuing and potentially prosecuting liable companies that do not join a CA and ensuring that a CA fulfils its obligations under the scheme. The AG must also report annually to the Australian Parliament on the operation of the scheme.

Under the PS Act, approved CAs needs to take reasonable steps to achieve the specified outcomes and requirements of the scheme. CAs and their liable party members need to keep adequate records and make the records available on request. CAs must report regularly to the AG on their performance. The AG can issue an improvement notice to a CA or direct it to undertake an audit. If a CA's performance is unsatisfactory, the AG can cancel its approval.

CO-REGULATORY PRODUCT STEWARDSHIP
OPTION 2D – BEVERAGE CONTAINER STEWARDSHIP

Brief description:

A co-regulatory product stewardship scheme under the *Product Stewardship Act 2011* (PS Act) that makes the beverage industry responsible for achieving an 80 per cent national beverage container recycling rate by 2025. Under the scheme, industry product stewardship organisations (co-regulatory arrangements) must meet outcome requirements specified in regulations relating to sustainable packaging design, beverage container recycling and litter reduction. The scheme recycling target for 2020 is 72.5 per cent of beverage containers consumed nationally, rising to 80 per cent by 2025.

Scope (liable products):

Under this option, the class of products subject to regulation is[7] as:

- All sealed beverages consumed in Australia and—if practical and desirable—lidded beverage cups[8]consumed in Australia,
  - including sealed consumer beverage containers of any size
  - if practical and desirable, including containers designed to be filled and lidded by a retailer on its premises (e.g. takeaway hot and cold beverage cups) and lidded beverage containers sold for household use
  - excluding exports.

Liability under the scheme is based on the amount of packaging materials brought to market by the manufacturer, importer, distributor or user of such containers, in excess of a defined threshold (to exempt smaller businesses while capturing most packaging). Only one such party in the supply chain will be identified as liable in relation to an item of consumer packaging. Only constitutional corporations will be liable.

How it works:

Regulations under the PS Act establish the co-regulatory scheme, including liable parties and outcomes. The scheme does not replace the current activities of the Australian Packaging Covenant (APC), as its scope is narrower. Companies who are liable under this scheme may also be subject to the National Environment Protection Measure that supports the APC.

Corporations that produce or import sealed beverages and/or lidded beverage containers must join an approved co-regulatory arrangement (CA). CAs must achieve outcomes and other requirements based on the amount of beverage packaging that their members import or produce. The outcomes and requirements that CAs must achieve are:

- demonstrate members' commitment to sustainable beverage packaging design
- achieve packaging recycling targets – e.g. by 2025 CAs need to recycle 80 per cent of the beverage packaging materials consumed in Australia, and

[7] The specific terms of any legislative instrument made to implement options are a matter for implementation, taking into account legal or practical matters arising.
[8] Lidded beverage cups will be considered for inclusion at implementation because they (a) are beverage containers (b) appear often in litter surveys (c) are substitutable for sealed beverage containers in some retail circumstances, such as Quick Service Restaurants and (d) appear to be a strongly-growing consumer packaging item. Their inclusion in Option 4 is considered impractical due to the difficulty of monitoring the many premises that fill them.

- develop and implement a beverage litter reduction plan, incorporating education, infrastructure and clean-up actions.

Failure to take reasonable steps to achieve these outcomes and requirements can lead to a CA's approval being revoked, which would expose its members to financial penalties for every day they are not a member of an approved CA. The regulations will not set out the specific actions that need to be undertaken to achieve the outcomes. Rather, it is the role of CAs to come up with a cost-effective means of achieving them.

Option 2d differs from options 2a, 2b, 2c and 2e in that it is focused on beverage containers and makes the beverage industry responsible for all beverage container recycling, including the continuation of existing recycling efforts by other parties). The CA's recycling obligations are limited to its target – but by achieving its target in the later years of the scheme, this guarantees that the *national* packaging recycling rate reaches the desired level.

Sustainable packaging design

Under the co-regulatory scheme regulations, CAs must demonstrate the commitment of member companies to sustainable beverage packaging design. This could be achieved by requiring members to implement sustainable packaging guidelines, and reporting annually on members' actions to optimise packaging for successful recycling and reuse and use fewer and more readily recyclable materials.

Packaging recycling

Under the scheme CAs will ultimately be responsible for all beverage packaging recycling in Australia. The scheme recycling target for 2020 is 72.5 per cent of beverage containers consumed nationally, rising to 80 per cent by 2025 (see Figure 5 below). The slower path to 80 per cent reflects the challenge of raising relatively low current levels of beverage container recycling (compared with all packaging). Over the first 5 years of the scheme, CAs would also be obliged to show that 30 per cent of their outcome is met through away from home recycling activities (i.e. not sourced from residences).

Unlike options 2a, 2b and 2c, which require additional recycling activities to take place, option 2d allows CAs to meet a target by supporting any beverage container recycling activity, new or old, but sets recycling outcomes commensurately higher. For example, some CAs may elect to partner with the operators of container deposit schemes in South Australia and Northern Territory to count that recycling against their outcomes, or with local governments in other states.

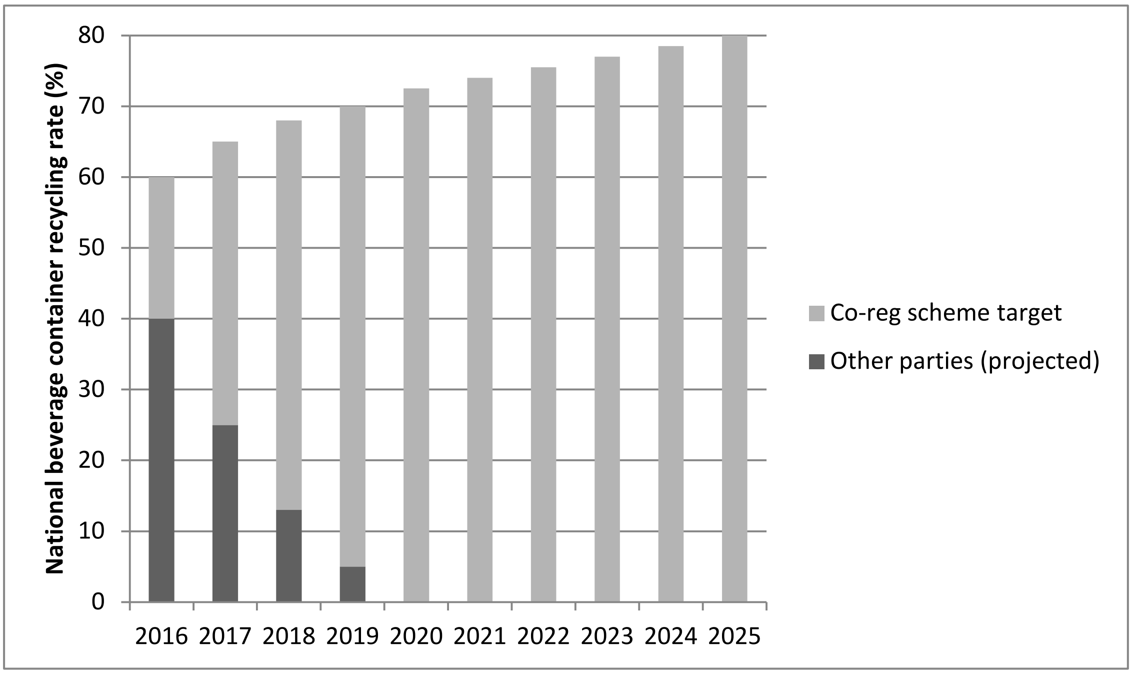


Figure 5 – Co-regulatory scheme recycling targets – option 2d

The recycling target for CAs will be calculated based on the market share of its members and may exceed the scheme target (as a percentage of its members packaging) to account for the exempt parties. For example, if exempt market share is 5 per cent, CAs would need to recycle 84 per cent of their own members' output.

Litter reduction

CAs are obliged under the scheme to reduce the impact of beverage container litter in Australia by developing and implementing litter reduction plans, incorporating education, infrastructure and clean-up actions. To be approved, plans need to meet specified assessment criteria, including:

- a focus on locations where beverage container litter has high environmental costs (such as waterways and stormwater which flow to sea and coastal environments)
- containing clearly measurable litter outcomes
- mitigating impacts in all Australian states and territories
- managing litter in cooperation with local governments, and
- avoiding duplicating other CAs' efforts.

Governance:

The Australia Government (AG) is responsible for: developing regulations to establish the co-regulatory scheme; assessing and approving CAs; and monitoring and enforcing compliance, which involves pursuing and potentially prosecuting liable companies that do not join a CA and ensuring that a CA fulfils its obligations under the scheme. The AG must also report annually to the Australian Parliament on the operation of the scheme.

Under the PS Act, approved CAs needs to take reasonable steps to achieve the specified outcomes and requirements of the scheme. CAs and their liable party members need to keep adequate records and make the records available on request. CAs must report regularly to the

AG on their performance. The AG can issue an improvement notice to a CA or direct it to undertake an audit. If a CA's performance is unsatisfactory, the AG can cancel its approval.

CO-REGULATORY PRODUCT STEWARDSHIP
OPTION 2E – EXTENDED AUSTRALIAN PACKAGING COVENANT

This sub-option differs from options 2a-2d in that it is not delivered under the co-regulatory provisions of the *Product Stewardship Act 2011*. Rather, it builds on existing (coordinated) state and territory legislation under the *National Environment Protection Council Act 1994*.

Brief description:

A co-regulatory scheme modelled broadly on the existing Australian Packaging Covenant (APC) which is an agreement between governments and industry to reduce the environmental impacts of consumer packaging. Under the scheme the packaging industry would provide funding for substantial litter reduction and recycling projects and initiatives, leading to a substantial increase in recycling and reduction in litter. The scheme aims to deliver an 80 per cent national recycling rate for all packaging and a significant reduction in packaging litter by 2020.

Scope (liable products):

Under this option, the class of products subject to regulation is:

- All consumer packaging.

Liability of a party under the regulation is simply to become a signatory to the APC and (in contrast to 2a, 2b, 2c and 2d) liability is not related to the amount of consumer packaging materials brought to market. Therefore, multiple parties in the supply chain may be identified as liable in relation to the same items of consumer packaging. All businesses (corporate and non-corporate) who turnover more than $5 million per annum will be liable (consistent with the current regulations supporting the APC).

How it works:

A new agreement, in the style of the existing APC, is negotiated with industry where industry commit substantially increased funding for litter reduction and recycling projects and initiatives. The agreement will commence in mid-2015 when the current APC Strategic Plan expires.

The level of industry investment is committed up front and directed towards priority projects and programs agreed jointly by industry and government. The funding (to be modelled at three different levels: $50 million per annum; $35 million per annum; $20 million per annum) is used to run a substantial grants program, data gathering activities and research and development designed for example to improve packaging design, increase recycling capability and address market impediments. Significant funding will also be expected to be directed to addressing packaging litter.

Governments commit to providing a regulatory safety net and enforcing regulation against free-riders, recognising the substantial funding commitment under this Option and the need to pursue businesses that do not voluntarily commit.

A representative Council will oversight the co-regulatory arrangement.

National packaging recycling and litter performance will be monitored, but there are no regulatory sanctions for failure to meet targets.

Industry members

As the voluntary component of a co-regulatory scheme, brand owners will be encouraged to sign the agreement and become scheme members, or else face regulation. Members will commit to providing funding to an industry body acting on members' behalf. The financial contribution of members will be determined using a formula based on annual packaging related turnover. Members will also undertake action in relation to their own businesses to reduce the environmental impacts of consumer packaging.

Brand owners with an annual turnover over a threshold amount (for example, $5 million as per existing APC) who choose not to become members or who fail to comply with requirements under the agreement are regulated either under a National Environmental Protection Measure (NEPM).

Government

Governments will be responsible for enforcement of free-rider regulations, commensurate with the increased level of funding committed by industry. There is no government co-funding for projects and initiatives (in contrast to the case under the current APC).

State and Commonwealth Governments will be represented on the oversighting Council and will be involved in discussions regarding strategic priorities and funding arrangements.

Industry organisation

An industry organisation will collect and expend member funding contributions. It will have substantial responsibilities to sign up and audit members, develop and manage projects and initiatives, provide grant funding, work with state and local governments, and collaborate with members and other industry sectors to ensure that the outcomes are met. It will act as a 'producer responsibility organisation' with accountability to industry members, governments and the community in relation to the outcomes and its operations. The industry organisation will be expected to be a lead player in the reduction of packaging litter and improvement in packaging recycling, and to otherwise reduce the environmental impact of packaging.

Governance

A council made up of industry, community and government (local, state and Commonwealth) representatives will oversee the implementation of the scheme. The council will meet regularly to discuss packaging issues and prioritise budget allocations, communications, procedures, reports and data collection, as well as what each individual sector has been doing to support the goals of the scheme.

MANDATORY PRODUCT STEWARDSHIP
OPTION 3 – ADVANCE DISPOSAL FEE

Brief description:

An advance disposal fee (ADF) is placed on all packaging materials. The fee would be designed as a weight based fee per tonne of packaging materials. Each packaging material would attract a different fee. The revenue collected would be dedicated to fund environmental initiatives for end-of-life management of packaging materials.

Scope (liable products):

Under this option, the class of products subject to the ADF is:

- All consumer packaging.

This includes packaging manufactured in Australia and imported packaging, but not packaging which is exported. Liability of a party to pay the ADF is based on the weight of consumer packaging materials brought to market by the manufacturer or importer. Only one such party in the supply chain will be identified as liable for the ADF in relation to an item of consumer packaging. Only parties (corporate and non-corporate) who exceed a defined threshold will be liable (purpose is to exempt smaller businesses while capturing most packaging volume).

How it works:

Application of the ADF

The ADF would involve imposing an ADF on all packaging materials. Different types of material would attract a different ADF amount. The ADF would be calculated as a weight-based fee per tonne of packaging materials brought to market.

Environmental initiatives

Governments would spend funds collected through the ADF on packaging recycling and litter programs. There is flexibility on how the funds collected from the ADF can be spent. Some examples include:

- Improvements to kerbside recycling to create national uniformity in bin types, bin colours, increased clarity of material types accepted for recycling and education initiatives in areas that have low recycling
- Special education and advice programs to increase the rate of at-home recycling of non-beverage packaging such as pet food containers and dishwashing liquid containers
- Extension and improvement of the coverage of recycling opportunities throughout local government areas (LGAs). This could be achieved by seed-funding for new or upgraded drop-off depots in remote LGAs. This may need to include development of innovative handling and transport arrangements to ensure that used packaging can be efficiently reported to reprocessing markets
- End market development support for materials types that are not necessarily reprocessed into their original product type; for example, glass that is used in road construction. This is especially important to facilitate recycling in remote areas.

Governance:

The ADF would be collected by government and its revenue would be earmarked to fund packaging recycling and litter initiatives and programs as described above.

MANDATORY PRODUCT STEWARDSHIP
OPTION 4A – BOOMERANG ALLIANCE CONTAINER DEPOSIT SCHEME

Brief description:

A centrally-managed national container deposit scheme (CDS) with, initially, a 10 cent upfront deposit levy (payable by domestic producers and importers of sealed beverages) and a 10 cent refund for redeemed containers. The scheme involves a comprehensive collection network of convenience points (automated reverse vending machines (RVM)) located near supermarkets which will be the primary mechanism for individuals to access redemptions, and larger-scale collection hubs for commercial-scale redemptions.

Scope (liable products):

All beverages sold in Australia in sealed containers of between 100 and 3000mL

- includes water, juice, milk, alcoholic beverages (including wine), soft drinks, sports drinks, and concentrated beverages (e.g. cordial)
- excludes containers filled by a retailer on its premises (e.g. takeaway coffee cups, fast food drink cups, milkshake cups, bubble tea cups)
- includes domestically produced and imported beverages
- excludes exported beverages and beverages imported for non-commercial purposes (e.g. duty free alcoholic beverages purchased for personal consumption).

How it works:

Sale of beverages

All liable products must be registered with the Central Organisation (CO) and labelled as eligible for a 10 cent refund. Sale of an unregistered or unlabeled container is an offence. The CO ensures compliance with registration obligations.

Producers and importers of liable products must: pay a 10 cent deposit levy to a government agency for every registered beverage brought to market and provide regular (i.e. monthly or quarterly) auditable sales data to the agency.

The agency passes deposit revenue to the appointed central CDS Coordinator to meet the costs of managing the CDS collection network and provides information on registered beverages and associated barcodes. Handling fees are set centrally by the CO to ensure system transparency.

The Coordinator appoints and licenses a network of hubs to handle bulk commercial and industrial (C&I) redemptions and kerbside recovery, and collect and process containers from convenience points and sub-depots.

Retailers must not sell unregistered containers and must separately itemise the 10 cent deposit on sales receipts (could be a message stating that the items purchased are eligible for $X container refunds) and display signage at the point of sale identifying the nearest redemption point and providing information to consumers about the CDS. Major retailers of groceries and/or beverages must establish a convenience point for consumer redemption (see *Convenience points* below).

Consumer redemption

Consumers can redeem the container for a 10 cent refund at an approved redemption point. To claim a refund, consumers need to ensure containers are uniquely identifiable e.g., returned with the barcode still legible; or in limited circumstances may wish to go to a sub-depot (see below).

The majority of these redemptions will occur at convenience points (mostly via automated RVMs) where refunds will be paid by store credit (which may be redeemed in store for cash but are usually used for purchases). These redemption points will generally be designed for convenient household access, for a higher number of lower to medium volume transactions, based on typical household shopping behaviour. This could include unloading direct from vehicles as they are designed to allow this (60m^2 space).

Where consumers forgo claiming a refund, containers will either remain unredeemed (e.g. through disposal to landfill) or be redeemed by a third party (see *Bulk redemption* below). The deposits paid on unredeemed containers will contribute to a fund to be used to offset scheme operation costs and fund additional programs (see *Additional programs* below).

Convenience points

Major retailers of groceries and/or beverages with a retail floor area of greater than 800m^2 (e.g. supermarkets, large liquor stores) must establish a convenience point in their car park or within 400m of the building in which they are housed. Retailers are reimbursed for the refunds they pay out and also receive an incentive payment for each container they accept to offset the cost of establishing and operating the convenience point. It is the retailer's responsibility to negotiate for space where it is outside their premises/lease (e.g. council or shopping centre car park).

Convenience points may be operated by the retailer or through a contract with a third party. The convenience point operator: registers with the Coordinator; collects registered containers; records barcode data; pays refunds (as store credits at the allied retailer); and crushes to devalue the container (so they cannot be redeemed again); and may compact the containers for collection by the hub operator (see below). Convenience points can be manual or automated, but where there is barcode recording requirements it is likely to need some automation (which can transmit the information to the retailer to avoid fraud). The majority of redemptions occur through these collection points.

Convenience point operators must provide verifiable redemption data to the Coordinator. The Coordinator reimburses the operator for refunds paid out (10 cents per container) plus handling and compaction fees to cover operational costs.

Hubs and sub-depots

Hubs collect the compacted containers from convenience points and other bulk collection systems within their region and receive crushing or baling and consolidation fees. Hubs are also able to collect other recyclable items, particularly from the C&I sector. They will include use of existing material recovery facilities, transfer stations and drop-off facilities. Transport from convenience points to the hub will be paid from the CO fund to the transport contractors.

In addition, hubs can establish and/or license other small-scale collection points, called sub-depots, in high beverage consumption areas (e.g. urban shopping strips, train stations, sporting or entertainment venues). Hubs, which were MRFs can collect small-scale redemptions directly from the general public via a sub-depot. Sub-depots need to be registered with the Coordinator and are paid the same handling fees as a convenience point (unless they are unable to record barcode information and compact, in which case they do not receive a compaction fee). Sub-depots are a contingency to address geographic gaps.

Remote locations

Remote location depots operate in remote areas where there are no large retailers that are required to establish convenience points. The location of remote depots is determined by the Coordinator based on reasonable access and other performance criteria. Remote depots receive higher handling fees and there are higher transport costs, but these depots could also crush and bale. If not, hubs will receive crushing and baling and consolidation fees.

Bulk redemption

Where containers are redeemed in bulk via hubs (from the commercial and industrial (C&I) sector or the household sector via kerbside) there are efficiencies of scale and lower estimated handling costs.

C&I operators

Hubs will primarily use bulk barcode reading technology to scan large-scale container redemptions from C&I operators (e.g. waste management companies collecting from shopping centres, businesses, community groups such as the Scouts collecting in bulk from households or large public events or community cleanups). Consequently, containers need to be redeemed intact or material accompanied by approved barcode data.

Refund payments to C&I operators are by EFT (the 10 cents deposit per container). Hubs receive a handling fee for receiving this material and crushing or baling and consolidation fees.

In certain circumstances, hubs can apply to the Coordinator for an exemption from the requirement to scan barcodes and may receive bulk redemptions on a weight-based formula.

The C&I sector will also have available collection facilities for other recyclables via the hub.

Kerbside recovery

Some containers will continue to be collected through kerbside recycling bins. To participate in the CDS, kerbside operators need to establish an arrangement with a hub and register as a redemption point with the Coordinator.

Kerbside operators deliver crushed and baled container materials to the hub and receive redemption payments (10 cents per container) based on a weight-based formula. The hub does not receive a handling fee, as the material will already be baled and ready to on sell to a reprocessor, but does receive a consolidation fee.

Material sales

The CO arranges for sale of the collected material at the best price and the revenue goes into a pool with unredeemed deposits. As noted in the Packaging Impacts Consultation RIS, because the materials are colour separated and cleaner than existing services, there is likely to be a premium paid.

Additional programs

After meeting system costs and quarantining a suitable amount as a buffer, if there are surplus funds from unredeemed deposits, material sales and interest earned, these are used by the CO to fund:

- A $16 million contingency fund to assist local governments that currently operate their kerbside recycling services at a profit with transitional costs (after netting out deposit and other savings to kerbside) stemming from beverage containers being diverted through the CDS.
- A $14 million contingency fund to cover risks relating to the elimination of South Australian super-collectors and Northern Territory co-ordinators, and others, and the potential need to buy out their operations.
- A $1 billion reprocessing bounty ($50 million per year for at least 20 years) to stimulate the domestic reprocessing industry and reverse the trend of exporting recyclate to other countries.
- A $646 million rural waste and recycling rebate ($32.3 million per year for 20 years) to support the provision of waste and recycling services by local governments across rural Australia.

Funding of these programs would be subject to the availability of surplus funds.

Governance:

The scheme is governed by a non-profit body, the Central Organisation (CO), with a board of directors comprising an independent Chair and Company Secretary (appointed by government) and representatives from the industry supply chain, collection stakeholders and the community sector. Community representatives and the two independent roles are remunerated.

A primary aim is that the scheme is a self- funding arrangement where there is no intention to charge the bottler or any other supply chain party an additional charge over and above the 10 cent deposit levy. The deposit levy is set by the legislation.

Deposit levy revenue will be collected by a government agency and appropriated to an account to be used for the scheme's purposes. Revenues earned from the sale of scrap, payment of handling fees and refunds will be processed via a fund administered by the CO and governed by the CO Board. The CO is responsible for: registering beverages; setting handling and other fees; establishing labelling and point of sale education requirements; auditing the CDS operations; reporting to government on the CDS performance; and managing additional programs. Government will be responsible for ensuring that beverage manufacturers and importers pay their 10-cent-per-container deposit levy.

A private sector CDS Coordinator appointed by the CO undertakes the day to day duties of administering the collection network. The Coordinator is responsible for: managing the collection network; achieving service and system efficiency targets; receiving and verifying collection data from redemption points; making refund, handling and other payments to redemption points; managing the sale of recovered materials; making incentive payments to retailers.

These arrangements would be legislated by Commonwealth and state parliaments with the state and territory governments jointly responsible for receiving regular reports and compliance and enforcement activities relating to penalties under the legislation. The CO will refer serious cases of non-compliance (i.e. that cannot be resolved through negotiation) to the relevant government authority for follow-up enforcement action.

MANDATORY PRODUCT STEWARDSHIP
OPTION 4B – CENTRALISED CONTAINER REFUND SCHEME

Brief description:

A centrally-managed national container refund scheme with a variable upfront deposit levy (payable by domestic producers and importers of sealed beverages) and a 10 cent refund for redeemed containers. The scheme is operated by a single coordinator appointed by government through a competitive tender process for a fixed term (e.g. three years). The coordinator will be required to establish a comprehensive network of collection points to achieve performance targets. Legislation will require all beverage producers and importers to register with the single coordinator, pay a levy to government for each container brought to market, and label their containers as eligible for a 10 cent refund when returned to an approved depot.

Scope (liable products):

All beverages sold in Australia in sealed containers of between 100mL and 3000mL:

- includes water, juice, milk, alcoholic beverages (including wine), soft drinks, sports drinks, and concentrated beverages (e.g. cordial)
- excludes containers filled by a retailer on its premises (e.g. takeaway coffee, fast food drink cups, milkshake, bubble tea)
- includes domestically produced and imported beverages
- excludes exported beverages and beverages imported for non-commercial purposes (e.g. duty free alcoholic beverages purchased for personal consumption).

How it works:

Scheme coordinator

After a competitive tender process, the government appoints a scheme coordinator for a fixed term (e.g. three years) to manage the scheme. The coordinator is required to meet performance and reasonable access obligations, such as: paying out a 10 cent refund for every eligible container returned; achieving a reasonable return rate by 2020 at least cost; and having a collection point within a reasonable distance of population centres.

Sale of beverages

All beverages covered by the scheme are required to be registered with the coordinator and labelled as eligible for a 10 cent refund when returned to a collection point. Penalties apply to beverage producers and importers who fail to register their product with the coordinator, fail to pay any levy as assessed and/or label their containers as eligible for a 10 cent refund. Penalties will also apply to retailers who sell products that are not labelled or are incorrectly labelled as a beverage eligible for a refund.

Consumer redemption

Consumers will be eligible for a 10 cent refund, payable by cash or EFT, when they return their empty container to an approved depot (one that has a contract in place with the coordinator). The container is required to be labelled as eligible for a 10 cent refund and be intact for fraud detection purposes.

Collection points

The coordinator is responsible for appointing collection depots to operate as a collection point for consumers to receive their 10 cent refund per container returned. Consideration will need to be given to the location and opening hours of depots to ensure that customers have reasonable opportunity to return their containers and receive their refund. The coordinator will remunerate the depot for operating costs (e.g. handling and transportation fees, and reimbursement of refunds paid to customers) through contract.

A depot approach could be the primary means of collection for consumer containers. An example could be retailers operating store-front style depots that are supported by reverse vending machines (RVMs). The coordinator could also contract with other retailers, sporting clubs, and entertainment venues to act as approved collection centres.

Ultimately it is at the discretion of the coordinator to contract with depots and make arrangements that are the most efficient means to increase the overall performance of the scheme. It will, however, be a requirement of the scheme to ensure access and equity to the scheme for those who are located in less densely populated areas.

Bulk Redemption

Provisions could be made within the enabling legislation to allow the coordinator to contract the collection depots to refund a negotiated price that is below the legislated 10 cents per container (e.g. 8 cents per container) for bulk redemptions where containers cannot be counted individually but are determined by the weight of the load. The lower price per container is permitted to be offered as the original consumer of the beverage is not receiving the refund and it may be difficult to determine if the load is contaminated with containers that are not eligible for a refund.

Similar provisions could be made for the contractual arrangements with local councils for the redemption of containers collected through kerbside collection services offered by the council to residents within their locality. To promote greater efficiency local councils could take their collected and bailed containers to an approved depot where they may be offered a further reduced refund per container (e.g. 6 cents) based on the weight of the bailed package. The reduced refund would still be greater per container than the market value of the beverage container materials.

In setting refunds for bulk redemption, the coordinator will have to consider the incentive they may create for bulk collectors to access higher value channels.

Operational costs

The operational cost of the scheme will be met by domestic beverage producers and importers based on their share of containers brought to market. The single coordinator will estimate the overall cost of the scheme (including fees set by contractual arrangements, amount of refunds paid out, transportation costs, and its own reasonable management costs), minus the value collected from the sale of the container material collected, and government will determine an appropriate per-container levy for the period ahead—which may be more or less than 10 cents per container depending on costs and return rate. In this way, a company which sells 14 per cent of eligible containers will pay 14 per cent of the overall expected operational cost of the scheme, even if only 10 per cent of containers collected actually bear its brand.

This arrangement will create a scheme where operational costs will float relative to return rates expected; that is, when return rates begin to increase, so will the cost of the scheme and thus so will the levy paid by beverage companies. As a result there will be no ‘unredeemed deposits’ as beverage producers and importers are only charged for the expected number of containers that are returned and the net operational costs of collecting them. This is to create an open and transparent scheme where containers and funds can be more easily monitored and accounted for.

Governance:

The scheme is operated by a single not-for-profit coordinator, appointed by government via a competitive tender process for a fixed term, and operates within the boundaries set by legislation. Government would be responsible for revenue collection and also for compliance and enforcement of obligations on retailers (only sell containers with proper labelling) and beverage producers (container registration, etc). A board consisting of representatives from the beverage industry, government and community sector would oversee the operation of the coordinator.

If government feels that the coordinator is not meeting its responsibility in ensuring the scheme is performing to expectations, it has the option to appoint a new coordinator either when the contract expires or earlier (in cases of serious underperformance).

The operational aspects of this scheme (e.g., contracting with collection points, making payments to them, audit and fraud control, managing container registers) is designed to operate with as little government involvement as possible, leaving the coordinator to find the most efficient means for the scheme to reach expected levels of performance. There will, however, be reporting and audit requirements on the coordinator to ensure that it is operating within the performance standards in its contract. These requirements would not extend to requiring disclosure of commercial arrangements between the coordinator and its individual service providers (e.g. depots, logistics providers, material processors).

MANDATORY PRODUCT STEWARDSHIP
OPTION 4C – SOUTH AUSTRALIAN CONTAINER REFUND SCHEME

Brief description:

A container refund scheme which allows consumers to receive a 10 cent refund for eligible containers they return to approved depots. The legislation sets out arrangements for authorisation by the government of depots and super-collectors. Depots are the primary redemption point and their collections go to super-collectors for recycling. Producers and importers of beverage containers covered by the scheme need to register and have a waste management arrangement in place as the sale of unregistered products are prohibited.

Scope (liable products):

All beverages sold in Australia in sealed containers of up to 3L, with the exception of:

- Any container used to contain plain milk.
- Containers of 1L or more used to contain flavoured milk
- Glass containers used for containing wine or spirits
- Containers of 1L or more used for pure fruit or vegetable juice (comprising at least 90 per cent fruit juice or vegetable juice, or a mixture of the two)
- Containers made of cardboard and plastic, or cardboard and foil, that are 1L or more, and used for containing wine, wine based beverage, or water
- Containers made of plastic or foil, or plastic and foil, used for the purpose of containing 250mL of wine.

If the South Australian model is adopted nationally, there would be an opportunity to extend its coverage to include containers for milk and wine.

How it works:

Sale of beverages

Under the legislation, domestic beverage producers and importers must have an approved 'waste management arrangement' (a contractual arrangement with a super-collector where that particular super-collector has agreed to collect their returned containers for a certain price) before they can sell their beverage. It is an offence for a producer or importer to supply, or a retailer to sell, a beverage that is known to be without a waste management arrangement.

The government may refuse a beverage producer or importers application if it believes that the material of the container is unsuitable for recycling, reuse, or other disposal.

Producers and importers must also appropriately label their products as eligible for a refund when returned to an approved depot. It is an offence to supply or sell products included in the scheme without the appropriate label.

Consumer redemption

The refund amount is set by legislation at 10 cents. Consumers who return their empty containers to an approved depot (under legislation a reverse vending machine is also considered a depot) are eligible for a 10 cent refund payable by cash or EFT. The depot must take back the container and issue a refund unless it is in an unclean condition (including being crushed).

While there is no up-front deposit set by legislation, it can be assumed that, to the extent that the market will allow, scheme costs be passed through to consumers.

Depots

Depots must be approved by the government and need to show they have ongoing, effective and appropriate waste management arrangements with all approved super-collectors in relation to the class of containers proposed to be handled, and also effective processes for resolving disputes between the parties to those arrangements.

Depots are funded by super-collectors. While the refund amount paid to customers returning the container is legislated, the associated handling fee paid to the depot by the super-collector is not. Rather, this is negotiated between the depot and super-collector and agreed through contract. The super-collector reimburses the depot for the 10 cent refund and pays the agreed handling fee for each eligible container it receives from the depot.

A feature of the South Australian scheme is a network of drive-up depots. While drive-up depots may be established in other states, different depot styles may also be implemented to reflect local differences in population densities and transport use.

Super-collectors

Similar to depots, super-collectors must also gain government approval before they can operate and must show they have arrangements in place with at least one producer and/or importer to collect their containers.

The super-collectors have contracts with depots to take the containers returned to depots by consumers. Depots may contract with multiple super-collectors, however, 'bulking' arrangements between super-collectors serve to eliminate the need for inefficient sorting of containers by brand/importer and only sorting by material type is required. Super-collectors subsequently seek end markets for the aggregated containers collected from depots.

Super-collectors are funded by beverage producers/importers. Super-collectors invoice beverage producers/importers based on commercial contracts for their services. If 'bulking' is occurring, the super-collector may invoice producers/importers based on the percentage of a container type recovered – e.g. if the return rate for glass bottles is 80 per cent, an approval holder that brings 10,000 glass bottles to market could be charged for refund payments and handling fees for receiving 8,000 glass bottles.

<u>Governance:</u>

The scheme is operated by super-collectors that have been approved by government through an administrative process and are required to operate within the boundaries set by legislation. Government has a compliance role to ensure that those who have requirements set by legislation are fulfilling those requirements e.g. beverage container approval holders complying with labelling standards.

Super-collectors will be required to report to the Government on return rates for various products or material types so that this information can assist in the resolution of disputes between beverage manufacturers and super-collectors. This design element addresses the recommendations of the Senate Inquiry.

COAG STANDING COUNCIL ON ENVIRONMENT AND WATER

8 JUNE 2012

PACKAGING IMPACTS CONSULTATION REGULATION IMPACT STATEMENT

CONSULTATION SUMMARY REPORT

Background

On 7 December 2011, the Standing Council on Environment and Water (SCEW) released the Packaging Impacts Consultation Regulation Impact Statement (RIS) for public comment. Public comment was sought on the following policy options:

- Option 1: National Waste Packaging Strategy
- Option 2: Co-regulatory Packaging Stewardship, with three specific sub-options
  - 2 (a): the Australian Packaging Covenant replaced by co-regulation under the *Product Stewardship Act 2011*
  - 2 (b): Industry Packaging Stewardship
  - 2 (c): Extended Packaging Stewardship
- Option 3: Mandatory Advance Disposal Fee
- Option 4: Mandatory Container Deposit Scheme (CDS), with two specific sub-options
  - 4 (a): Boomerang Alliance CDS
  - 4 (b): Hybrid CDS

Eleven public consultation sessions were arranged, in all capital cities and three regional centres (Townsville QLD, Albury NSW and Bunbury WA), commencing in Brisbane on 13 February 2012 and concluding in Sydney on 7 March 2012. Due to low registrations, the Canberra session was cancelled. In total around 250 people attended the sessions. Each session consisted of a two hour public forum, including a presentation by PricewaterhouseCoopers on the economic analysis. The sessions were followed by a series of 30 minute bilateral meetings with interested stakeholders.

The closing date for public submissions on the Packaging Impacts Consultation RIS was 30 March 2012. A total of 197 submissions were received, including four late submissions. In addition, around 3,000 'campaign'[1] submissions were received with a form message in support of a national container deposit scheme.

This report provides a summary of the key messages arising from the public consultation sessions and public submissions. It is an overview of the main matters raised by the public regarding the Consultation RIS and should be read in conjunction with the Packaging Impacts Consultation RIS and associated documents, available at:
www.scew.gov.au/strategic-priorities/packaging-impacts.html.

Methodology

Submissions which did not fall into the 'campaign' category are referred to as 'substantive' submissions and were classified according to the stakeholder group they represented. A list of these substantive submissions and their stakeholder classifications is at Appendix A. Submissions were then analysed to identify the views expressed on the various options, as well as any additional matters raised relating to the RIS.

Due to the volume and use of a consistent pro-forma message, campaign submissions were analysed as a group, with any personalised messages or preferences in relation to policy options recorded.

Views expressed by participants at public forums were also considered and key themes that emerged at forums have been included in the analysis.

The consultation report discusses the views expressed in submissions in terms of the following categories:

- Problem (the policy problems that are being addressed)
- Base case (the 'no additional government action' scenario modelled)
- Options (policy options to address the identified problems)
- Cost-benefit analysis (analysis of the potential costs and benefits of the policy options to the Australian economy)
- Distributional impacts (impacts that the options will have on particular stakeholder groups – i.e. consumers, local governments, etc.)
- Data (any technical issues with the accuracy of data presented or new data provided)

[1] The SCEW Secretariat identified 'campaign' submissions as those where a pro forma email was generated by the submitter entering their details into a website and a 'non-campaign' submission as one that was individually submitted. It is noted that there were a number of 'non-campaign' submissions that contained form text in support of a national container deposit scheme, but were individually emailed from the submitter's email account.

Summary

During the public consultation period for the Packaging Impacts Consultation Regulation Impact Statement (RIS) from 7 December 2011 to 30 March 2012, around 250 people attended public forums and many submissions were received. 197 substantive submissions were from a diverse range of stakeholders including from organisations representing industry, local government, industry/government partnerships and the community, as well as from companies, state and local governments and individuals.

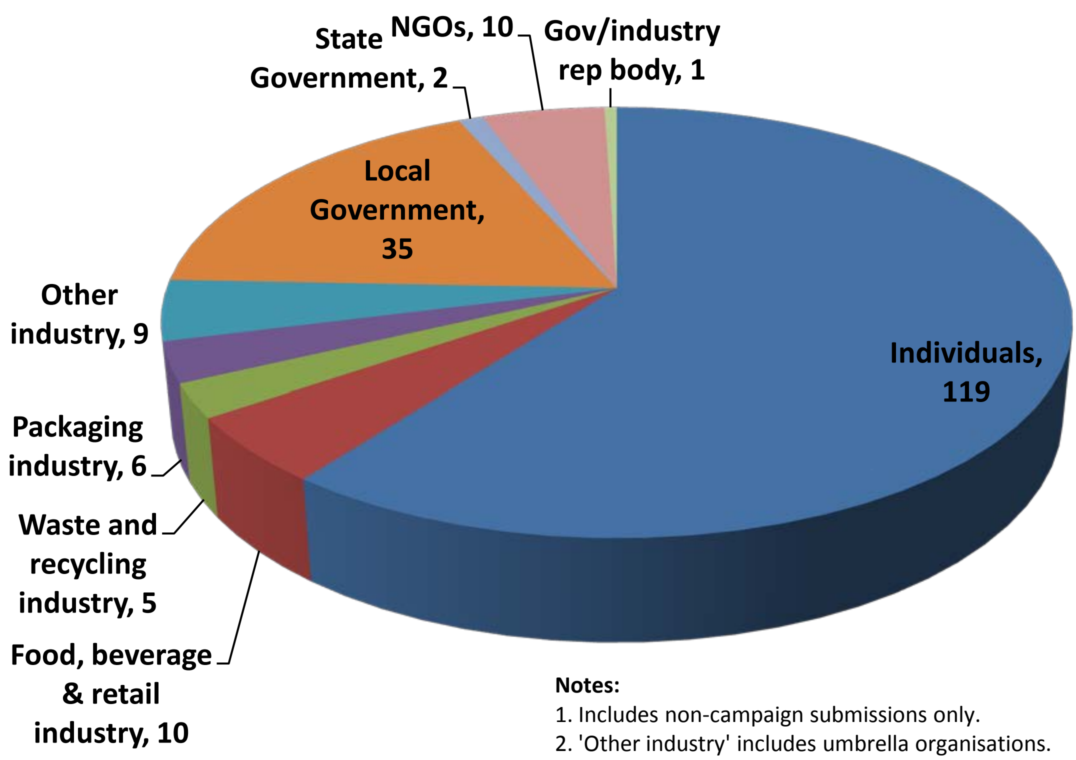
The industry submissions covered a wide spectrum of interests and were grouped by sector:

- Food, beverage and retail
- Waste and recycling
- Packaging
- Other (which captured tobacco, electronics and publishing as well as umbrella organisations representing a broad range of industry sectors).

Around 3000 submissions were a petition-style campaign (the form text of which can be read at Appendix B) expressing support for a container deposit scheme.

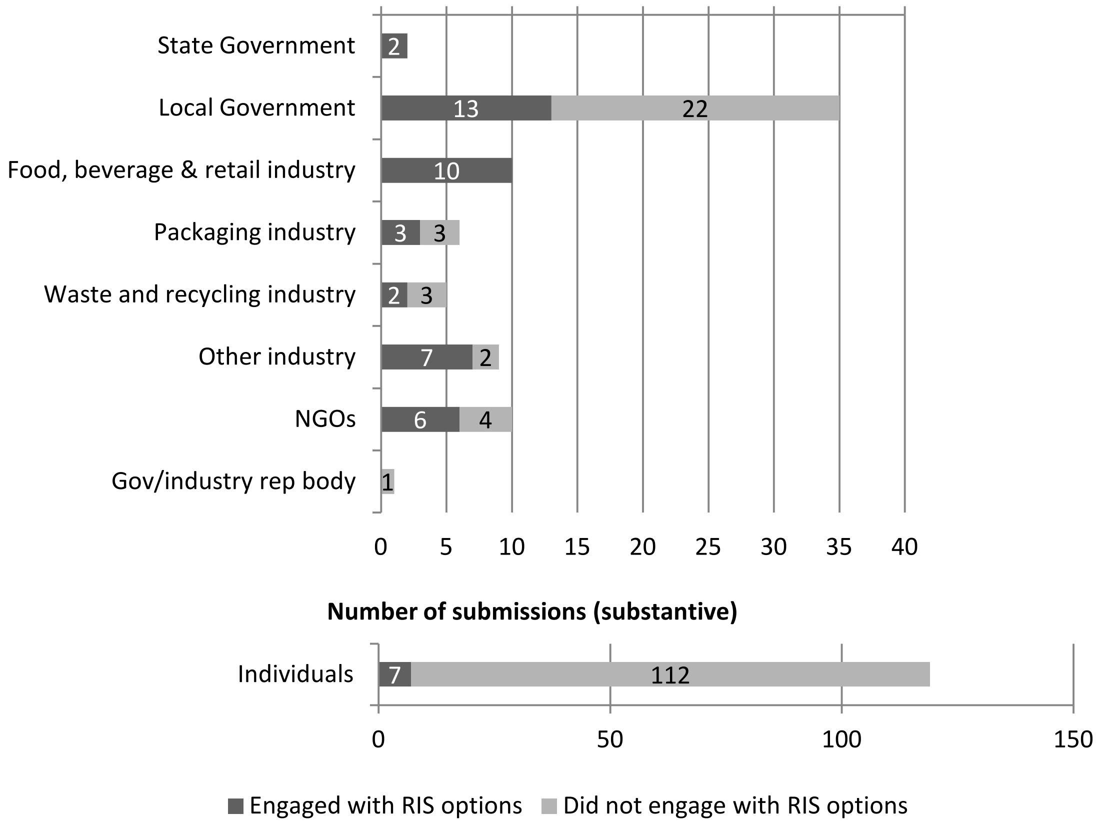
Figure 1 provides a breakdown of the composition of substantive submissions by stakeholder type (it does not include the campaign submissions).

Figure 1: Composition of substantive submissions by stakeholder type



While a number of substantive submissions provided detailed discussion on the merits of the various options in the Consultation RIS, a large proportion, particularly from individuals and local government, expressed a position in support of a particular approach without engaging with specific options. Figure 2 shows the stakeholder types and whether those substantive submissions engaged with the options presented in the Consultation RIS by discussing and expressing a view on one or more option.

Figure 2: (Split chart) substantive submissions by stakeholder type and type of engagement with RIS options



PRoblem

The Consultation RIS defined the problem which may lead to government policy action as:

> The key problem with the current state of packaging consumption and recycling in Australia is that Government objectives for reduced waste and increased resource recovery are not being met due to the low or suboptimal rates of recycling for glass, plastic, steel and aluminium in the commercial, hospitality and institutional sectors (away-from-home). This leads to loss of resources, increased use of landfill and environmental externalities including litter.
>
> Another issue is that innovations in packaging design are not necessarily improving the recyclability of packaging materials.
>
> In addition, there is a potential for increasingly fragmented jurisdictional approaches which add to regulatory complexity, increase business costs and uncertainty for investment, and fragment end-markets. The resultant inconsistency and duplication hinder the efficient operation of businesses operating in a national market.
>
> Continued improvements in recycling rates will rely on local government who provide municipal services. The current disparity in provision of services across urban, regional and rural settings illustrates that an expansion and improvement of these services cannot be assumed.

Furthermore, the Consultation RIS stated that the objectives of government action are to:

- reduce packaging waste and increase packaging resource recovery
- reduce the need to landfill recyclable packaging materials
- reduce the negative amenity, health and environmental impacts of packaging waste and litter in line with community expectations, and
- promote a consistent national approach to regulating packaging.

This summary of the problem or the stated objectives was not questioned by the majority of substantive submissions (noting that campaign submissions did not address this).

Many substantive submissions expressed the view that producers of packaging (who are generally businesses which manufacture and sell a packaged product) lack enough incentive to reduce their use of packaging and to reduce the use of non-recyclable materials in their packaging. This was often expressed in terms that industry uses 'too much' packaging.

Submissions from local government emphasised the costs they bear in addressing downstream impacts of packaging waste through the operation of kerbside recycling programs for households and of litter cleanup programs in public places.

Many individuals and local governments indicated that litter was a problem of visual amenity, public safety (broken glass) and wildlife protection (generally plastics). The majority of these submissions were most concerned about beverage container litter affecting streets, highway roadsides and parks. Concerns about the impact on litter within the marine environment were also raised at the Hobart public forum. Concerns that cigarette butts were not included in the analysis were raised at a number of public forums, including in Melbourne.

A number of industry submissions (including two out of three umbrella organisations) questioned the extent of the problem, noting that the Consultation RIS 'base case' projects an improved level of future recycling and better litter outcomes without any additional government intervention. In terms of defining the problem, industry submissions also indicated that:

- Sustainability is not just about recycling. For example, the trend to light-weight packaging is environmentally positive even if lighter packaging materials are not (currently) recyclable.
- The relationship between recycling rates and litter volumes is contestable. For example, some submissions emphasised the importance of consumer decisions in littering.
- The concept of meeting 'community expectations' in relation to packaging waste and litter is not a clear definition of a policy objective.

BASE CASE

The **base case** is the estimate of recycling and litter rates between 2010 and 2035 if the current arrangements remain in place: including kerbside recycling in all states and territories, a CDS operating in South Australia and the Northern Territory, and the Australian Packaging Covenant arrangement continuing in operation.

Under the base case, the Consultation RIS assumes an increase in recycling from 62.5 per cent to 79.0 per cent from 2010 to 2030 and a 10 per cent reduction in litter relative to 2010.

A submission by the SA Government, and submissions by a number of NGOs and industry associations, expressed a view that the Consultation RIS presented an overly-optimistic view of future recycling and litter outcomes. At the Adelaide public forum there were also questions raised about the base case projections.

Options

Almost all submissions identified a need to take action to address packaging waste and litter and a large number suggested that industry should take greater responsibility for the environmental impacts of packaging.

All campaign submissions and 131 of the 197 substantive submissions expressed general support for a national container deposit scheme. Those submissions that provided discussion around the options were more mixed in their views.

6.1 Option 1: National Waste Packaging Strategy

Establishment of a **non-regulatory national strategy covering all packaging materials** and funded from additional government resources which would co-ordinate jurisdictional action to reduce packaging litter and increase packaging recycling. Projected 81.1% packaging recovery rate by 2035. Projected 15% litter reduction relative to 2010 levels by 2035.

A number of submissions from industry associations and the food and beverage industry supported option 1. It was supported because it is non-regulatory, promotes national consistency among jurisdictions and shows substantial recycling and litter benefits for a relatively low cost.

Several NGOs were opposed to option 1 because it still relies on taxpayer, rather than industry, funding of a suite of programs which may be expected to have a moderate impact on recycling performance but run the risk that targets may not be met. Concerns were expressed that this option may not motivate behavioural change by the producers or consumers of packaging and that it does not hold industry responsible for meeting targets.

6.2 Option 2: Co-regulatory Product Stewardship (three sub-options)

2(a)—**Australian Packaging Covenant replaced by co-regulation under the Product Stewardship Act 2011**. Packaging 'brand owners' and distributors would be liable parties under the Act. Regulations would prescribe enforceable recycling targets and other outcomes for approved co-regulatory arrangements. Projected 80.6% packaging recovery rate by 2035. Projected 15% litter reduction relative to 2010 levels by 2035.

2(b)—**Industry Packaging Stewardship based on the National Bin Network** proposal by the beverage-manufacturing sector which builds on option 2(a) with added targeted initiatives for away-from-home beverage containers. Projected 81.9% packaging recovery rate by 2035. Projected 15.4% litter reduction relative to 2010 by 2035. 2(c)—**Extended Packaging Stewardship** which includes all initiatives in options 2(a) and 2(b) plus larger improvements in packaging recycling and litter reduction. The focus would be identified problem areas such as low recycling rates. Projected 86.4% packaging recovery rate by 2035. Projected 15.4% litter reduction relative to 2010 levels by 2035.

Out of those substantive submissions that examined specific options within the Consultation RIS (see dark grey sections of bar chart at Figure 2 above), option 2 attracted the most support.

The food and beverage industry supported option 2(b) and generally accepted options 2(a) and 2(c) as viable alternatives. The packaging industry supported sub-option 2(b). One packaging industry association supported options 2(a) and 2(b). A retail industry submission supported option 2(a) since it builds on the Australian Packaging Covenant concept but provides a system of enforceable targets to guarantee scheme performance and which could better manage free-riders. At several public forums, including in Sydney, stakeholders highlighted that away-from-home recycling is not restricted to stadiums and public places, but also includes workplaces, businesses and other commercial areas.

Campaign submissions, the SA Government submission, some local government submissions, and one umbrella industry association submission, expressed concerns that plans under option 2(b) for industry to install public place recycling bins could become a responsibility for local government to maintain and empty and/or that public place recycling bins tend to get contaminated with non-recyclable material.

Concern was expressed at the Perth public forum that the projected recycling under this option was unlikely to eventuate in WA because distance factors mean that the critical mass of recyclate needed to encourage investment in recycling would not occur.

Three local government representative organisations supported an extended producer responsibility approach (option 2(c)), along with a small number of individual local councils.

Two umbrella industry bodies did not support option 2 on the basis that it involves a regulatory intervention by government. These submissions expressed the view that the compliance costs and risks associated with regulation-making and enforcement are not justified by the modest benefits described in the Consultation RIS.

Some substantive submissions interpreted elements of option 2 (such as option 2(a)) as a form of industry self-regulation. This interpretation prompted some to express concerns about the extent to which industry 'could be trusted to meet targets', and noted that the Australian Packaging Covenant model had underperformed in meeting its targets in the past.

6.3 option 3: Mandatory Advance Disposal Fee (ADF)

A **mandatory ADF** levied on all packaging materials to influence packaging producers' choices in respect of choice of packaging material. The fee would vary depending on the type of material utilised and funds raised would be used for initiatives similar to those proposed under option 2(c). As a result, projected recovery rates and litter trends for option 3 are the same as option 2(c)

Projected 86.4% packaging recovery rate by 2035

Projected 15.4% litter reduction relative to 2010 levels by 2035

Two local government representative organisations and 3 local councils, along with a consumer-advocacy NGO and several individuals indicated support or limited support for this option.

A larger number of substantive submissions did not support option 3, including industry associations and individual companies, several NGOs and a local government representative organisation. The most common concern expressed was that an ADF would be seen by the community as a tax and that it could cause consumer prices to rise. Associated with this was a concern that a taxation approach may fail to engage individuals, industry and communities in a positive way and/or fails to take a lifecycle approach to the packaging problem.

Specific concerns expressed about option 3 related to uncertainty over how an ADF would be implemented. For example, there was a concern that, if imposed as a uniform excise duty per tonne of packaging material produced, then the financial impact on glass beverage containers would be greater than the impact on PET or aluminium substitutes, since glass containers are heavier. There were other concerns that suggested that the ADF option would exempt imports and therefore might unfairly disadvantage Australian producers of packaging or packaged products, exposing them to unfair competition from untaxed imports.

6.4 option 4: Mandatory Container Deposit Scheme (two sub-options)

[Note: The contents of campaign submissions and those submissions that did not examine particular options, most of which supported the concept of a container deposit scheme, are discussed in Section 6.5 below.]

4(a)—**Boomerang Alliance CDS**. A Boomerang Alliance CDS model based on a hub and spoke container redemption/collection model and a $0.10c per container deposit. A not-for-profit organisation would consolidate deposits and collect revenue from the sale of redeemed recyclate.

Projected 82.8% packaging recovery rate by 2035.

Projected 12.4% litter reduction relative to 2010 levels by 2035.

4(b)—**Hybrid CDS**. A CDS model based on international schemes and some data from the SA scheme. This is an industry-run scheme operated by a Product Stewardship Organisation. The number of collection points is the same as for 4(a) however with a focus on store-front style depots.

Outcomes in terms of recovery rates and littering trends are the same as for 4(a) but estimated establishment and operating costs are higher.

While all campaign submissions and a large number of substantive submissions from individuals supported the broader concept of a container deposit scheme (see section 6.5 below) only a small number discussed the CDS options outlined in the Consultation RIS. Nine submissions from individuals expressed support or limited support for options 4(a) and/or 4(b) and one individual was opposed to both sub-options.

One-third of state/local government submissions (including local government representative organisations) supported at least one of the option 4 sub-options. Local governments commonly noted that providing recycling and litter clean-up services to their residents is costly and that the implementation of option 4 should ensure that the packaging aspects of these costs are borne by the packaging industry rather than by ratepayers.

The Local Government Association of Queensland was opposed to option 4 and provided a detailed cost-benefit analysis of the potential impacts of this option, arguing that Queensland councils would bear higher costs than estimated in the Consultation RIS. In addition, some local government attendees at the Albury and Darwin public forums expressed concerns about the potential negative impacts of a container deposit scheme on local governments in relation to existing waste services contracts.

The majority of industry submissions did not support options 4(a) and 4(b). They were generally seen as expensive options that would result in increased regulatory burden on the beverage industry. Industry associations for the food and beverage industry, the retail industry, the packaging industry and umbrella organisations expressed strong concerns. Three packaging industry submissions and three food and beverage industry submissions indicated opposition to option 4. The waste and recycling industry submissions did not explicitly support or oppose option 4 but one commented that the option would require new infrastructure which competes with existing kerbside and material recovery facility infrastructure; therefore, it argued that preference should be given to policies that promote investment in new infrastructure which builds upon, and does not compete with, existing assets.

Industry comments emphasised that these options were ineffective in addressing the broader environmental impacts of packaging, and could stifle innovation in more sustainable packaging design. Some industry submissions noted that option 4 does not target away-from-home recycling specifically and has the potential to undermine existing at-home recycling systems.

Two NGOs indicated support for option 4(a) and one of these also supported option 4(b). One NGO did not support both sub-options. Boomerang Alliance was the proponent of option 4(a) and expressed the view that the Consultation RIS overestimated the costs and underestimated the potential benefits of this option. They also pointed out that the analysis of option 4(a) did not include the creation of an 'unclaimed deposit' fund to incentivise domestic recycling, which was an element of their preferred model.

In addition, a number of substantive submissions suggested that the SA container deposit scheme should have been used as a model for a national approach.

6.5 campaign Submissions and other general support for container deposit schemeS

Around 3000 'campaign' submissions came from individuals, which contained standard wording from an NGO's website and indicated in-principal support for a national container deposit scheme in Australia, stating that this is the only effective way to tackle Australia's growing problem with packaging waste and litter. A number of people included additional personal comments, such as describing favourable experiences with schemes in South Australia, Europe and North America, and referring back to when beverage companies used to pay consumers to return bottles for re-use and opportunities for children and low-income people to earn pocket money through redeeming containers. Frustrations were also raised with the highly visible nature of beverage container litter, the danger and inconvenience of broken glass and the impact of litter on native wildlife (land and water). See Appendix B for the pro-forma text accompanying campaign submissions.

A number of substantive submissions from individuals were also generally supportive of container deposit schemes without indicating a preference for any of the options identified in the Consultation RIS. 107 individuals indicated in-principal support for the concept of a container deposit scheme but few addressed the details of option 4 in the Consultation RIS. Local governments, also, were often supportive, with 19 local governments indicating in-principal support. Of these, one local government organisation was also supportive of options 4(a) and 4(b). Three NGOs and one waste and recycling industry participant also indicated in-principle support.

6.6 Other options

A common theme among substantive submissions, other than from the packaging industry, was the idea that industry should be required to design all their packaging so that it is recyclable. Some also suggested that industry should be obliged to include recyclate from Australian sources in their packaging.

COst-Benefit analysis

A small number of substantive submissions commented on the cost-benefit analysis (CBA) presented in the Consultation RIS and in *Attachment C – Cost-Benefit Analysis Report*. Generally, these comments were at a high level, although some submissions engaged with the detailed analysis.

General comments in substantive submissions included:

- The costs and benefits are realistic.
- The costs are too uncertain, and the benefits do not account for upstream and other environment benefits, such as greenhouse gas reduction.
- Excluding non-use values leads to an incomplete analysis. Options 1-3 achieve significant benefits if the willingness-to-pay values are considered.
- While the willingness-to-pay results indicate residents will pay more for recycling, local government experience indicates they do not want to pay higher rates (a form of property tax).

A few of these submissions specifically commented on the costs estimated in the CBA for option 4. Some asserted that the estimated costs for option 4 were too high. Three submissions (from the SA Government, an NGO and a waste and recycling company) provided specific information to substantiate the claim that the costs estimated for option 4 were too high and questioned the estimated costs and/or projected outcomes for option 2; particularly for option 2(b) (industry packaging stewardship).

Conversely, a local government association, which had re-estimated the costs and benefits for option 4 in Queensland, argued that the Consultation RIS underestimates the participation costs and overestimates the savings to local government for this option. Concerns were also expressed at the

Darwin public forum that the participation costs applied in the Consultation RIS for a CDS were not high enough and questioned whether transport costs had been included in the CBA.

A theme in substantive submissions, including several individual submissions, was that further work is needed to assess the 'co-benefits' of different options, especially a national container deposit scheme. The Consultation RIS had identified a number of potential co-benefits: increasing recycling of other materials, reducing litter in general (not just packaging litter), increasing employment, and reducing greenhouse gas emissions and water use. Many submissions stressed that a container deposit scheme would have substantial co-benefits and these should be quantified.

Distributional impacts

Most local government submissions emphasised that local governments currently fund the operation of kerbside recycling collection and litter cleanup services. These also recommended that any policy decision made following the Consultation RIS should ensure that the packaging aspects of these costs should be passed through to industry and consumers, as the parties responsible for packaging design and consumption decisions.

Many local government submissions expressed a view that a container deposit scheme would have the desired effect of moving part of their costs to industry and consumers; however, some commented on the need for possible compensation to waste contractors as a result of lower kerbside yields. A submission from the Local Government Association of Queensland presented analysis which indicated that container deposit schemes would not reduce local government costs. Two food and beverage industry submissions and a waste industry submission also believed container deposit schemes would bring higher costs for local governments.

Industry submissions expressed concern that regulatory interventions are likely to increase consumer prices for packaged products. Submissions by the food, beverage and packaging industries also warned that such price rises would cause substantial job losses as a result of reduced sales. Other submissions, including campaign submissions, suggested that container deposit schemes would give rise to many new jobs in the recycling industry.

Substantive submissions from individuals who favoured container deposit schemes generally expressed views that industry, not consumers, should bear the costs of such a scheme. Many indicated that they expected consumer prices to go up by only 10 cents, being equal to the value of its deposit. Campaign submissions stated that the net cost of such a scheme would be less than half a cent per container.

DAta

Several substantive submissions suggested that the Australian Packaging Covenant's packaging consumption and recycling data and the estimates used in the Consultation RIS for beverage container consumption and recycling were incorrect. These submissions claimed that consumption data has been underestimated and recycling data has been overestimated, leading to inflated recycling rates. An NGO submission provided re-estimated consumption and recycling data.

The Australian Packaging Covenant pointed out in its submission that its recycling data is sourced and collated from primary sources by independent consultants based on an agreed and robust methodology.

Other data was also presented in submissions, including:

- estimated price rises and job losses under a national container deposit scheme, and
- beverage container litter incidence in different jurisdictions.

APPENDIX A – LIST OF SUBMISSIONS

List of substantive submissions classified by stakeholder group:

Number	Respondent	Stakeholder group
001	Clint Garrett	Individual
002	Fay Briggs	Individual
003	John Tillman	Individual
004	Helen Lynes	Individual
005	Alison Dorn	Individual
006	Alex Portnoy	Individual
007	Ross Headifen	Individual
008	Horsham Rural City Council	Local government
009	Liverpool City Council	Local government
010	Northern Territory Senior Round Table	NGO
011	Bland Shire Council	Local government
012	City of Newcastle	Local government
013	Broken Hill City Council	Local government
014	Christine Jones	Individual
015	Ross Headifen	Individual
016	Dawn & Steven Tuften	Individual
017	Wentworth Shire Council	Local government
018	Wesfarmers	Food, beverage and retail industry
019	Keep Australia Beautiful WA	NGO
020	Holroyd City Council	Local government
021	Gabrielle Ryan	Individual
022	Simone van Hattem	Individual
023	Craig Walters	Individual
024	Helen McCormick	Individual
025	Sally Stent	Individual
026	Mike O'Rourke	Individual
027	Ben Bush	Individual
028	Walter Bloom	Individual
029	Stuart Dean	Individual
030	Michael Strickland	Individual
031	Josephine (Nina) Jurak	Individual
032	Shire of Manjimup	Local government
033	Dereka Ogden	Individual
034	David Whistler	Individual
035	Cassi Plate	Individual
036	Liz Thornton	Individual
037	Simone Gillespie	Individual
038	Areana Eivers	Individual
039	John Parkinson	Individual
040	Rowena Skinner	Individual
041	Glenda John	Individual
042	Wendy John	Individual
043	Mick Daley	Individual
044	Olha Brumerskyj	Individual

Number	Respondent	Stakeholder group
045	Roberto	Individual
046	Douglas Whitehead	Individual
047	Nina Scott	Individual
048	Sue Hall	Individual
049	Australian Packaging Covenant	Industry/government representative body
050	Amorina Priestley	Individual
051	Jenny Henty	Individual
052	Rosemary Sankey	Individual
053	AFROCAB	NGO
054	Robin Knox	Individual
055	Peter Mills	Individual
056	William Solomon	Individual
057	Gary Browne	Individual
058	Coca Cola	Food, beverage and retail industry
059	Government of South Australia	State government
060	Helen Wainwright	Individual
061	Johanne Green	Individual
062	Louise Sales	Individual
063	David Wyatt	Individual
064	Uniting Justice Australia	NGO
065	Peter D. Jones	Individual
066	Conny Harris	Individual
067	John Ahern	Individual
068	Signe Westerberg	Individual
069	Confidential	NGO
070	Kate da Costa	Individual
071	Dave Brigden	Individual
072	Margaret Davies	Individual
073	Ben O'Callaghan	Individual
074	Graham and Jenny West	Individual
075	Gabi Duigu	Individual
076	Umprun Incentive Recycling	Waste and recycling industry
077	Wendy Bishop	Individual
078	Rod and Desiree Mould	Individual
079	Richard Telford	Individual
080	Southern Waste Strategy Authority	Local government
081	Lara McMahon	Individual
082	Gavin Imhof	Individual
083	John Nave	Individual
084	Colin Maltman	Individual
085	Grant Evington	Individual
086	Jasmine Wigley	Individual
087	Tia Terry	Individual
088	Sarah Lam	Individual
089	Julie Marlow	Individual
090	Helen D Harris	Individual
091	Michael Hassett	Individual

Number	Respondent	Stakeholder group
092	Jane Stephens	Individual
093	Mimi Hayton	Individual
094	Matthew and Felicity Wilson	Individual
095	Dee Sier	Individual
096	Mark and Anne Verhagen	Individual
097	Suzanne Waterman	Individual
098	Alcoa Australia Rolled Products	Packaging industry
099	Carolyn Miller	Individual
100	Consumers Association of WA	NGO
101	Patricia Boyd	Individual
102	Waste Contractors and Recyclers Association of NSW	Waste and recycling industry
103	Alice Beauchamp	Individual
104	John Boom	Individual
105	Sarah Hatcher	Individual
106	Lismore City Council	Local government
107	Helen Smith	Individual
108	Margaret Makewell	Individual
109	Sjirk Bangma	Individual
110	Mandy Stubbs	Individual
111	Caroline Ryan	Individual
112	Madison Cooke	Individual
113	Anina Rich	Individual
114	Alan Wardrop	Individual
115	Mark Landmann	Individual
116	Paul Vonwiller	Individual
117	Manly Council	Local government
118	Keep South Australia Beautiful (KESAB)	NGO
119	Marion Cook	Individual
120	Lion Ltd	Food, beverage and retail industry
121	Australian Beverages Council	Food, beverage and retail industry
122	Ashleigh Kemp	Individual
123	British American Tobacco Australia	Other industry
124	Alasdair Stuart	Individual
125	National Packaging Covenant Industry Association (NPCIA)	Packaging industry
126	Bungendore - Palerang Council	Local government
127	Confidential	Local government
128	Australian Information Industry Association (AIIA)	Other industry
129	Pamela Rey and Peter Tierney	Individual
130	Lake Macquarie City Council	Local government
131	Packaging Council of Australia	Packaging industry
132	Jocelyn Seton	Individual
133	Mark Ziebell	Individual
134	City of Sydney	Local government
135	Willoughby City Council	Local government
136	Susanna Evington	Individual
137	Whitehorse City Council	Local government
138	Catriona Wagg	Individual

Number	Respondent	Stakeholder group
139	Prudence Wawn	Individual
140	Hobsons Bay City Council	Local government
141	Confidential	Individual
142	Win Chandler	Individual
143	Shire of Broomehill Tambellip	Local government
144	Wollongong City Council	Local government
145	Mindarie Regional Council	Local government
146	Andrew Judd	Individual
147	Waverley Council	Local government
148	Australian Council of Recycling (ACOR)	Waste and recycling industry
149	Orange City Council	Local government
150	Australian Chamber of Commerce and Industry	Umbrella industry group
151	Warringah Council	Local government
152	SITA Australia	Waste and recycling industry
153	Imperial Tobacco Australia Limited	Other industry
154	Mal Everett	Individual
155	Schweppes Australia	Food, beverage and retail industry
156	Australian Food and Grocery Council (AFGC)	Food, beverage and retail industry
157	Adam Guise	Individual
158	Winemakers Federation of Australia (WFA)	Food, beverage and retail industry
159	Australian Industry Group	Umbrella industry group
160	Australian Hotels Association	Food, beverage and retail industry
161	Boomerang Alliance	NGO
162	Confidential	Packaging industry
163	Local Government Association of NSW	Local government
164	Keep Australia Beautiful National Association	NGO
165	Local Government Association of Queensland	Local government
166	Gosford City Council	Local government
167	Jo Daniels	Individual
168	Peter Morris	Individual
169	Judy Blyth	Individual
170	Confidential	Individual
171	Philip Morris Limited	Other industry
172	Confidential	Packaging industry
173	Yarra Ranges Council	Local government
174	South Australian Wine Industry Association	Food, beverage and retail industry
175	Moira Shire Council	Local government
176	Municipal Association of Victoria	Local government
177	Clean Up Australia	NGO
178	Business South Australia	Umbrella industry group
179	Revive Recycling	Waste and recycling industry
180	Australian National Retailers Association	Food, beverage and retail industry
181	Kalyna Micenko	Individual
182	Epson Australia	Other industry
183	Confidential	Packaging industry
184	Kael Driscoll	Individual
185	Publishers National Environment Bureau	Other industry
186	Jill Merrin	Individual

Number	Respondent	Stakeholder group
187	Shauna Forrest	Individual
188	Zena Hotker	Individual
189	Keelah Lam	Individual
190	Western Australian Local Government Association	Local government
191	Cowra Shire Council	Local government
192	Andrew Mackinnon	Local government
193	Peter Thompson	Individual
194	Ben Huxham	Individual
195	Northern Territory Government	State government
196	Moreton Bay Regional Council	Local government
197	City of Swan	Local government

APPENDIX B – FORM TEXT OF CAMPAIGN SUBMISSIONS

RE: Packaging Impacts Consultation Regulation Impact Statement

I wish to make comment on the *Packaging Impacts Consultation Regulation Impact Statement*.

I believe that a 10-cent recycling refund for drink containers is the only effective way to tackle Australia's growing problem with packaging waste and litter.

The beverage industry's alternative – placing recycling bins in public places – will not work and cannot take the place of a proven recycling refund solution that is already working in many countries.

Placing recycling bins in public places will do nothing to reduce litter. These bins become contaminated and vandalised and are a huge burden on the finances of local government. On the other hand, a recycling refund scheme will save money for local councils, reduce litter and pay people to do the right thing when they recycle.

For years, under the *National Packaging Covenant*, recycling targets have not been met. We cannot let ineffective solutions and flawed industry schemes distract us any longer.

The *Regulation Impact Statement (RIS)* makes it clear the main packaging problem is beverage containers with overall recycling well below 50%, and away-from-home recovery at about 22%. Beverage containers need to be the priority for action.

A container deposit scheme will cost less than half a cent per container and will generate new sustainable recycling industries, jobs and investments. A recycling refund scheme also has the potential to support a network of recycling drop-off centres that could be used to collect electronic goods and other valuable waste material for recycling.

The *RIS* says a container deposit scheme is expensive because it requires investment in new infrastructure – but this is investment by the private sector in recycling systems, which should be encouraged instead of treated as a cost.

It's important for the community to participate in recycling, but they have to know it will benefit the environment. Only a container deposit scheme delivers clean material for recycling so we can save maximum energy and resources and reduce pollution globally and in our communities.

REPORT 12 JULY 2013

Distributional and Cost Benefit Analysis for the Packaging Impacts Decision Regulation Impact Statement

Data Assumptions

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1. Introduction and overview

1.1 Introduction

Australian environment ministers, through the Standing Council on Environment and Water, have agreed to develop a Decision Regulation Impact Statement (DRIS) in 2013 on a range of national options to increase packaging resource recovery rates and decrease packaging litter. The Packaging Impacts Decision RIS will continue a process progressed through the 'Packaging Impacts Consultation RIS'. A 'Distributional and Cost Benefit Analysis', entailing financial and economic analysis of the options, will provide an important input to development of the Decision RIS. In general terms, the Distributional and Cost Benefit Analysis (CBA) will involve:

- a comprehensive review of the methods and assumptions employed for the Consultation Regulatory Impact Statement (CRIS) analysis, especially in light of stakeholder feedback received through the consultation process;
- expanded and more in-depth analysis to meet the requirements for a DRIS, especially of the distributional (financial) impacts; and
- consideration of an expanded number of options.

The project team has undertaken a review of data assumptions contained in the CRIS. The aim of this review was to identify assumptions that need updating due either to:

- a greater level of detail being required to facilitate the distributional analysis (detail which was not required in the CRIS) and therefore varying assumptions by state or territory, by metropolitan (metro) or non-metropolitan (non-metro) region and/or by stakeholder; or
- the project team's assessment (informed by additional research and consideration of stakeholder input) that an alternative assumption or methodology used to derive that assumption is required.

This document presents outcomes of the review.

1.2 Overview of data assumptions review

The data assumptions review has been structured in line with the classification of assumptions as presented in the cost benefit analysis report for the CRIS (PWC & WCS 2011 at Attachment C in the CRIS). Assumptions in that report are presented in four broad categories:

- **background general assumptions** relating to the base year, structure and timing of options and the discount rate applied to future revenues and costs;
- **consumption, recycling, landfill and litter projections** for the base case and options;
- **cost assumptions** – incremental costs to businesses, households, the packaging industry and governments associated with the options; and
- **benefit assumptions** – benefits and avoided costs associated with the options.

Additional data assumptions required for the DRIS but not estimated in the CRIS are also identified and discussed.

There are also assumptions relevant to financial impacts on stakeholder groups examined through the distributional analysis. These are discussed briefly in a separate **distributional analysis assumptions** section.

In summary, outcomes from the review have been classified as follows:

- the project team agrees with the CRIS assumption and recommends its use in the DRIS; or
- the project team recommends revising the assumption as identified, noting that revisions to assumptions could include:
  - changes to the totality of the assumption as presented in the CRIS;
  - changes to a part but not all of the assumption; and
  - changes to how the assumption is applied - over time, with changes to rates of recycling, or between jurisdictions and regions.

Table 1 summarises outcomes of the review of CRIS data assumptions, focussing on key revised assumptions, which can be defined as “assumptions that have the potential to significantly affect outcomes of the analysis”.

Full discussion of these key assumptions and all other assumptions is provided in the main report.

Table 1: Overview of key assumptions

Data variable	CRIS assumption	Proposed DRIS assumption	Comment
Consumption recycling and litter			
Base case consumption projections	Split of packaging consumption by packaging type: - beverage 25% - non-beverage 8% - flexible 67%	Split of packaging consumption by packaging type: - beverage 30% - non-beverage 8% - flexible 62%	Total packaging consumption estimates for base year and subsequent years remain unchanged.
Base case recycling projections	79% overall recycling rate by 2030 70% beverage recycling rate by 2030	73% overall recycling rate by 2030 63% beverage recycling rate by 2030	DRIS recycling rates are assumed to be significantly lower post 2020 than are assumed in the CRIS. This has implications for recycling rates under the options.
Litter rates	6% littered as a proportion of total packaging available to be littered	Propensity to litter (base case): 24% littered as a proportion of public place[1] packaging available to be littered, decreasing over time at different rates for different options (see comment) 1.3% littered as a proportion of all other packaging available to be littered, decreasing over time at different rates for different options (see comment)	Option 1: propensity rates decrease by 5% relative to base case reflecting impact of litter programs. Options 2a-2e, 3: propensity rates decrease by approximately 5-15% over the period 2015-2020, reflecting impact of litter programs. Options 4a, 4b, 4c: reduction in propensity rates of up to 37% over time reflecting significant impact of container refund on beverage container litter rates.
Costs			
Government administration costs	Development costs < $1m for options Ongoing admin. costs < $0.2m for options	Development costs $1m – 47 m for options Ongoing admin. costs $1m – 43m for options	DRIS assumes substantially greater administration costs for all options.

1 ‘Public places’ are deemed to include ‘LGA public places’ (such as streets, recreation reserves and public parks and gardens) and ‘commercial public places’ (such as shopping centres and hotels, bars and restaurants).

Data variable	CRIS assumption	Proposed DRIS assumption	Comment
Household participation costs	Value of time $13.01/ hour Significant accumulation costs 4a, 4b, 4c are assumed to involve the same frequency and proportion of new trips	Value of time $7.67/ hour Accumulation costs assumed to be zero 4a, 4b, 4c are assumed to involve different frequency and proportion of new trips	The value of time is assessed as non-business/ leisure time at 30% of the average Australian wage in 2011. The number of trips per year and proportion of new trips have been altered to reflect an increased number of trips to RVMs (26/ year) compared to non-RVM infrastructure (3.55/ year), but a lower proportion of new (purpose-specific) trips.
Collection and transport costs	Household kerbside: $187/ tonne Commercial and industrial: $26/ tonne Load to MRF: 10 tonnes/ truck	Recyclables: (metro) $ 97/ tonne; (non-metro) $173/ tonne Garbage: (metro) $132/ tonne; (non-metro) $177/ tonne Load to MRF: 5 tonnes/ truck	The key distinction in cost of kerbside waste collection is not between household and commercial but between metro areas and non-metro areas. Changes to collection and transport tonnages under options are 'discounted' by 15% to reflect fixed costs.
Processing costs at MRF facilities	Cost to landfill residual waste: $200/ tonne	Cost to landfill residual waste: variable	Variable between jurisdictions and regions but generally lower than $200/ tonne
Infrastructure and operating costs: Options 2a-2e, 3	Predetermined costs/ investments, not linked to recycling levels	Costs determined by recycling targets and type of recyclate 'Premium' applied to reduce risk of options not meeting beverage container recycling targets	Costs derived through application of 'Marginal recycling cost curves'. Premium applied to fund an extensive and ongoing education & information campaign to complement infrastructure & service investments. Applied exponentially in proportion to beverage container recycling targets (i.e. greatest premium applied to Options 2b, 2c/3 and 2d).
Infrastructure and operating costs: Options 4a, 4b, 4c	Infrastructure, coordination and handling costs/ tonne (averaged across all regions): Option 4a: $689/ tonne Option 4b: $749/ tonne	Infrastructure and handling (excluding co-ordination costs) costs/ tonne: Option 4a: $537/ tonne (average all regions) Option 4b: $557/ tonne (average all regions) Option 4c: $648/ tonne (average all regions)	Lower costs for Option 4a relative to 4b and 4c reflect assumed lower operating and capital costs for RVMs compared with collection centres. Costs estimated to be approximately 17%, 16% and 14% higher in non-metro regions relative to metro regions for options 4a, 4b and 4c respectively, reflecting higher rental fees (for RVMs) and higher transport and operating costs in non-metro regions.

Data variable	CRIS assumption	Proposed DRIS assumption	Comment
Business compliance costs	Annual costs < $1m for all options	Upfront costs of $25m Options 4a and 4b and $12.5m for Option 4c. Annual costs of $2.25m, Options 2a-2c, 2e & 3; $3.0m Options 4a, 4b; $1.5m Option 4c. Retailer compliance costs of $0.5m assumed for Option 4a	DRIS assumes substantially greater annual compliance costs for most options. Option 4a retailer compliance costs are associated with a requirement on large retailers to establish convenience points in all stores over a certain size.
Loss of producer surplus	Not assessed	Assessed for beer, bottled water, fruit juice, milk, soft drink, spirit and wine manufacturers for Options 4a, 4b and 4c. Indicative impact - $148 m over the period of study (present value) for Option 4a	Estimates for Options 4b and 4c will be provided with the CBA report. Estimates for other options will also be provided, but due to lack of data about product categories and industries affected these estimates will be order of magnitude.
Benefits			
Value of materials	Glass: $30/ tonne general; $100/ tonne premium Plastics: $560/ tonne beverage; $560/ tonne non-beverage LPB: $150/tonne general	Glass: $0/ tonne general; $40/ tonne premium Plastics: $676/ tonne beverage; $349/ tonne non-beverage LPB: $150/tonne general; $220/tonne premium	Proposed changes reflect discussions with industry sources
Avoided costs of litter	Reduced litter clean-up costs in proportion with % reduction in packaging litter tonnes relative to base case and packaging litter as a proportion (37%) of all litter	$501/ tonne of all public place packaging litter reduced relative to base case	$501/ tonne represents a shadow price for the economic cost of litter

2. Background and general assumptions

The CRIS details a number of background and general assumptions relating to:

- options development and timing;
- infrastructure requirements for the options; and
- general assumptions aimed at ensuring consistent assessment of the costs and benefits of options relative to the base case.

Each of these sub-categories is discussed in turn below.

2.1 Options development and timing

2.1.1 CRIS assumptions

The CRIS specifies development periods, a commencement year and indicative years of operation for each of the options in the model. It also specifies initiatives that will be implemented under Options 1, 2a, 2b, 2c and 3, in line with the years of operation.

2.1.2 Discussion

The length of time allowed in the CRIS for developing each of the options appears to be reasonable, as does the indicative years of operation.

The CRIS assumes however, that the DRIS will be completed in 2012, with development of options commencing after 30 June 2012. It is now apparent that development of options is unlikely to commence until after 30 June 2013 at the earliest. To maintain consistency with the CRIS and with description of policy options provided in the options paper, however, the development periods and commencement period have been left unchanged. The fact that an option, if selected, would not actually commence implementation until at least one year after the date indicated should not materially affect the outcomes of the analysis.

2.1.3 DRIS assumptions

Recommended development periods and commencement years are provided in Table 2. Development periods and commencement years are also provided for the new options, 2d, 2e and 4c. Indicative years of operation for each of the options are also in line with those presented in the CRIS.

Initiatives assumed in the CRIS for Option 1 will be maintained in the DRIS. The general nature of initiatives assumed in the CRIS will also be maintained in the DRIS. Specific aspects of these initiatives will be updated however, to reflect analysis of scheme infrastructure and operating costs undertaken for Options 2a, 2b, 2c, 2d, 2e and 3 using 'Marginal recycling cost curves'. This approach is discussed in Section 4.7.

Table 2: Option development and commencement timing assumptions

Category	Application	CRIS assumption		DRIS assumption	
		Development period	Commencement year	Development period	Commencement year
Options development and timing	Option 1	2012-2013	2014	2013-2014	2015
	Option 2a Option 2b Option 2c Option 2d Option 2e Option 3	2013-2014	2015	2013-2015	2016
	Option 4a Option 4b Option 4c	2012-2015	2016	2013-2015	2016

2.2 Infrastructure requirements

All options examined in the cost benefit and distributional analysis will require recycling infrastructure. The discussion below focuses on infrastructure that is embodied in the design of specific options, notably Options 2b, 2c and 4a, 4b and 4c.

2.2.1 CRIS assumptions

Infrastructure requirements are pertinent to Options 2b and 2c (the National Bin Network) and Options 4a and 4b (container deposit infrastructure). The National Bin Network is a core element of Options 2b and 2c under the CRIS, with the National Bin Network requiring the installation of 30000 additional bins between 2016 and 2020 (5000-6000 bins per year), targeting away from home recycling. Container deposit infrastructure required for Option 4a consists of a mix of hubs, collection depots, reverse vending machines (RVMs) and rural/ remote collection centres, entailing 1900 collection points in total (see Table 3). Option 4b also consists of 1900 collection points but has a greater proportion of collection depots compared with Option 4a and a lower proportion of RVMs.

2.2.2 Discussion

The National Bin Network will remain a core element of Options 2b and 2c under the DRIS.

In line with the revised container deposit scheme (CDS) model provided by the Boomerang Alliance (December 2012), significant changes to infrastructure requirements are proposed for Option 4a. These will entail:

- a greater emphasis on the use of RVMs; [2]
- a reduction in the number of hubs, from 250 to 165; and

[2] Note the ability of Option 4a to operate effectively as a RVM based system is dependent on the capacity of RVMs to accept the full range of container and material types proposed for recycling under this option including glass, plastics (PET, HDPE), aluminium, steel and LPB. Information provided on behalf of RVM manufacturers indicates that machines are capable of processing these material types.

- an increase in the total number of collection points in metro and regional centres, from 1200 to 1565 (including 1400 RVMs and 165 hubs).

Further, to achieve parity with Option 4a, it is recommended that the number of collection points in Option 4b also be changed to a total of 1565 across areas (except remote areas) and that the new Option 4c also have a total of 1565 collection points across metro and regional areas. For both options, the increase in collection points is assumed to come through a greater use of RVMs, reflecting the likely cost effectiveness of RVMs (relative to collection depots), especially in densely populated urban centres.

An important point to consider regarding the use of RVMs in a container deposit or container refund scheme, but especially Option 4a which is predicated almost entirely on the use of RVMs for container redemption, is whether RVM infrastructure is capable of handling the required quantities of beverage containers. Analysis for the DRIS on container numbers to be recycled is presented in Table 3. The data reveals that the quantity of containers recycled through RVMs is expected to rise from about 774,000 tonnes in 2020 to 930,000 tonnes in 2035. This represents an estimated 6.7 million containers/ RVM/ year in 2020, rising to 8.1 million containers/ RVM/ year in 2035. Although this appears to be an unrealistically large quantity, data provided by industry sources indicates that RVMs in use elsewhere and modelled in the DRIS are capable of handling more than 8 million containers per year.

Table 3: Containers recycled through RVMs under Option 4a

	2020	2025	2030	2035
Recycling rate	77.50%	82.50%	85.00%	85.00%
Beverage consumption tonnes	1,421,421	1,466,214	1,513,993	1,555,799
Beverage recycling tonnes	1,101,601	1,209,626	1,286,894	1,322,429
Recycling tonnes via RVMs	774,426	850,367	904,686	929,668
Number of RVMS	1,400	1,400	1,400	1,400
Av. tonnes/ RVM/ year	553	607	646	664
Av. Containers/ RVM[3]	**6,584,278**	**7,229,944**	**7,691,772**	**7,904,168**

Additionally, a reduced number of remote collection points is recommended, declining from 700 to 100. The reduced number still provides for 1.5% of all redemptions to take place through remotely located centres (proportional to the total population living in remote locations[4]), but the average container throughput at each remote collection point is now assumed to be about one quarter of the container throughput at collection points located in metropolitan and regional areas. This compares with container throughput at each remote collection point of less than 4% of metropolitan and regional collection points under the CRIS assumption of 700 remote collection points.

3 Assuming an average of 11,903 containers/ tonne.

4 Note an additional 0.8% of Australia's population currently resides in 'very remote' locations.

2.2.3 DRIS assumptions

Applying the recommended changes, discussed above, the three options can now be broadly defined (in infrastructure terms) as follows:

- 4a – predominantly RVMs, but with some collection through hubs;
- 4b – a mix of RVMs and other types of collection points; and
- 4c – predominantly drive-through depots, but with RVMs in densely populated urban areas.

The new Option '4c', modelled on the South Australian container refund scheme, is consistent with the most recent published options description. The network of drive-through collection depots, RVMs and remote collection depots, implemented through this option, will be supported by a number of super collectors. The total number of super collectors is not defined for this analysis, but for the purpose of efficiency should be kept to a relatively small number (e.g. 1 to 3) for each jurisdiction.

Recommended infrastructure assumptions for Options 4a, 4b and 4c are summarised in Table 4.

Table 4: Infrastructure assumptions Options, 4a, 4b and 4c

Category	Application	CRIS assumption (no.)	DRIS assumption (no.)	Infrastructure
Infrastructure requirements	Option 4a	250	165	Hubs
		310	0	Collection depots
		640	1400	RVMs
		700	100	Remote collection centres
	Option 4b	250	165	Consolidation depots
		600	600	Collection depots
		350	800	RVMs
		700	100	Remote collection centres
	Option 4c	na	Not defined	Super collectors
		na	1200	Collection depots
		na	365	RVMs
		na	100	Remote depots

2.3 General assumptions

2.3.1 CRIS assumptions

A number of general assumptions have global application in the CRIS CBA. These include the analysis base year, the base year for valuation (of costs and benefits), the discount rate applied to costs and benefits over time and sensitivity discount rates.

2.3.2 Discussion

In our view, it makes practical sense for the base year to shifted forward two years from 2011 to 2013, since revenue and costs will not start to accrue in the model until at least 2014 (depending on the option).

The core discount rate used in the CRIS (7%) is supported, being consistent with Australian Government guidelines (Department of Finance and Deregulation, 2010), as are the sensitivity rates of 3% and 10%. The lower bound sensitivity rate of 1.35% used in the CRIS is not supported however, since its application in the *Garnaut Climate Change Review* (Garnaut 2008) was intended to apply to issues having major intergenerational implications. We do not believe that this is the situation with respect to the packaging issue.

2.3.3 DRIS assumptions

Recommended general assumptions are outlined in Table 5 below.

Table 5: General assumptions

Category	Application	CRIS assumption	DRIS assumption	Data variable
General assumptions	Global	2011	2013	Base year
		2011	2011	Prices
		2011-2035	2013-2035	Evaluation period
		7%	7%	Core discount rate
		1.35%, 3%, 10%	3%, 10%	Discount rate sensitivity

3. Consumption, recycling and litter projections

3.1 Packaging consumption

3.1.1 CRIS assumptions

Projected growth in packaging consumption

Projections of growth in packaging consumption in the CRIS are linked on the one hand to population growth and, on the other hand, to a slight reduction in the ratio of consumption to population to reflect light weighting of packaging material. Application of this approach, outlined in Table 5, results in estimated annual growth of packaging consumption of 0.75% in the period 2011-2015, falling gradually to annual growth of 0.54% by 2031-2035. Total packaging consumption in the base year (2010) is approximately 4.4 million tonnes.

Material composition of packaging

The CRIS adopts 2010 estimates of packaging material composition and assumes that these will remain unchanged over the study period 2011-2035. Drawing on Australian Packaging Covenant (APC) data (APC 2011), the CRIS notes that there has been a small increase in glass consumption (as a proportion of total packaging) in the period for which reliable national data is available (2003-2010) and a correspondingly small decrease in plastics consumption. The CRIS also references trends in packaging technology, materials and design noted by the APC (APC 2011), which could affect future plastic consumption, but it is unclear from these trends what the overall impact will be over time.

Product composition and location of packaging consumption

The CRIS assumes that the distribution of packaging materials by product type (beverage containers, non-beverage containers, flexible packaging) will remain unchanged over time at approximately 25%, 8% and 67% respectively. It also assumes that the split of consumption by location (at-home versus away-from-home) remains unchanged.

3.1.2 Discussion

Since completion of the CRIS new packaging consumption and recycling data has been compiled drawing on primary sources (Industry Edge and Equilibrium 2013). The new data suggests that while total base year packaging consumption data used in the CRIS is appropriate, the beverage container component of that total is likely to be understated by approximately 5 percentage points and the flexible packaging component overstated by approximately 5 percentage points. Given the robust basis for compilation of the Industry Edge data, we propose therefore to revise base year beverage container consumption data for the DRIS so that it is in line with primary sourced data. The effect of this change is to alter the proportionate split of beverage containers, non-beverage containers and flexible packaging to 30%, 8% and 62%

respectively, held constant over time (see Table 7)[5]. Total packaging consumption estimates are largely unaffected.

The approach used in the CRIS to develop packaging consumption growth projections appears to be soundly based. The approach produces a contestable outcome, however, in that per capita consumption of packaging falls, albeit slightly, over the period of the analysis. Nevertheless, in the absence of specific evidence or a rationale to challenge this outcome, we have accepted the CRIS packaging assumptions for the purpose of the DRIS analysis.

3.1.3 DRIS assumptions

DRIS assumptions for packaging consumption growth and composition of packaging consumption are outlined in Table 6 and Table 7 respectively.

As previously noted, all assumptions on packaging consumption growth that are applied in the CRIS are recommended for use in the DRIS. However, the split between beverage container and other packaging has been revised to reflect the new primary sourced packaging consumption data discussed earlier. Thus beverage containers are estimated in the DRIS to represent approximately 30% of packaging consumption in the base year compared to approximately 25% in the CRIS.

Table 6: Packaging consumption growth assumptions

Data variable	Application	CRIS assumption	DRIS assumption	Unit
Projected packaging growth 2011-2015	Base case	0.75	0.75	% p.a.
Projected packaging growth 2015-2020	Base case	0.73	0.73	% p.a.
Projected packaging growth 2020-2025	Base case	0.63	0.63	% p.a.
Projected packaging growth 2025-2030	Base case	0.63	0.63	% p.a.
Projected packaging growth 2030-2035	Base case	0.54	0.54	% p.a.

Table 7: Material and packaging type composition of packaging consumption

Data variable	Application	CRIS assumption	DRIS assumption	Unit
Composition of packaging by material	Global	Paper/cardboard - 58.6	Paper/cardboard - 56.1	%
		Glass - 25.0	Glass - 26.5	%
		Plastics - 12.4	Plastics - 14.0	%
		Steel cans - 3.0	Steel cans - 2.1	%
		Aluminium cans - 1.1	Aluminium cans - 1.3	%
Composition of packaging by packaging type	Global	Beverage – 25.0	Beverage – 29.9	%
		Non-beverage – 8.1	Non-beverage – 8.0	%
		Flexible – 66.9	Flexible – 62.1	%

5 Available Industry Edge data is consistent with APC data, confirming that non-beverage containers represent approximately 8% of all packaging. Instead, it is flexible packaging that appears to have been overstated (in proportionate terms).

3.2 Recycling projections

3.2.1 CRIS assumptions

Base case

The base case scenario in the CRIS assumes the current local, State and Commonwealth Government arrangements will continue and that APC arrangements under the NEPM also continue.

In 2010, total recycling was 62.5%, lower than the target of 65% set in the APC Strategic Plan. The CRIS assumes that recycling continues to increase to 2015 but at a lower rate than the APC target of 70%. The base case assumed that recycling will reach 67.5% in 2015. A further increase in recycling is assumed in the CRIS over the period 2020 to 2030, peaking at 79% and remaining stable until 2035. This total includes:

- significant growth in beverage container recycling, improving steadily from 48.7% in 2010, to peak at nearly 70% by 2030;
- slower growth in non-beverage container recycling, increasing slowly from the current estimated 40.2% to 50% by 2025; and
- significant growth in flexible (non-container) recycling from 70.2% in 2010 to almost 86% by 2030.

Non-regulatory options

Option 1 – National Packaging Waste & Litter Strategy

This non-regulatory option is based on national coordination of jurisdictional actions relating to packaging waste. The strategy will focus on improved use of current infrastructure through increased knowledge, education and information sharing.

The CRIS assumes that recycling increases at a slightly more rapid rate than the base case, reaching 69% by 2015. Beverage container recycling, non-beverage container recycling and flexible packaging recycling are assumed to be slightly more rapid than in the base case.

Co-regulatory options under provisions of the Product Stewardship Act 2011

Option 2a – Co-regulatory Product Stewardship

Option 2a is designed to maintain a similar level of industry commitment under current APC arrangements and targets packaging 'brand owners' as the liable parties. This would involve enforceable targets based on overall achievement of targets identified in the APC Strategic Plan 2010-2015. The CRIS assumes that recycling rates under this option would increase at a slightly faster pace than in the base case, with a 75% recycling rate achieved by 2020. The slightly increased recycling rate is due to the potential for additional recycling targets being established under the *Product Stewardship Act 2011*, as well as greater industry/PSO responsibility. Over time, however, the CRIS assumes that the difference between the base case and Option 2a will decline, reflecting an increase in APC membership under the base case. Beverage container recycling is assumed to be more rapid than in the base case, reaching 70% by 2025, and 75% by 2030. This is assumed to be the probable maximum beverage container recycling rate in the absence of financial incentives for beverage consumers or development of alternative markets for used packaging materials.

Option 2b – Industry Packaging Stewardship

Option 2b is based on the development of a new product stewardship scheme to tackle specific issues including beverage container recycling and litter prevention. The option builds on Option 2a and includes an enhanced focus on away-from-home beverage container recycling and packaging litter reduction. It deals with all packaging materials, but with targeted initiatives on beverage containers and glass market development. The National Bin Network proposal made by members of the packaging industry is a core element of the option. The rate of increase in beverage container recycling under this option is assumed to be greater than in the base case and Options 1 and 2a, with an industry claim of 70% beverage container recycling after five years of operation accepted. As a result, overall growth of recycling is slightly more rapid than under Option 2a, with 77% recycling by 2020, 82% by 2025 and 82% maintained to 2035.

Option 2c – Extended Packaging Stewardship

Option 2c is based on a co-regulatory approach, with the APC being regulated under the *Product Stewardship Act*. It is assumed that this option will have significantly greater industry funding than Option 2b and therefore would involve a significant increase in recycling and litter initiatives and increased recycling rates relative to Option 2b. An overall recycling rate of 83% is assumed to be achieved by 2035, with beverage container recycling reaching 72.5% by 2020 and 80% by 2025.

Mandatory product stewardship options

Option 3 – Advance Disposal Fee

This option is assumed to be funded through the application of a mandatory Advance Disposal Fee (ADF) on packaging, with the funds to be collected and administered by the Commonwealth Government. These funds would be used for similar initiatives to Option 2c. Assumed recycling rates are therefore the same as for Option 2c.

Option 4a – Boomerang Alliance Container Deposit Scheme

The Boomerang Alliance (BA) has proposed a national CDS with a 10 cent upfront deposit (payable by domestic producers and importers of sealed beverages) and a 10 cent refund for redeemed containers.

The CRIS assumes that following implementation of the BA CDS in 2016, beverage container recycling increases to 80% by 2020, climbing further to 85% by 2025 and remaining steady at that level to 2035. This recycling rate is higher than that achieved in SA in 2009/10 (which was 81.4% of containers eligible for redemption[6]). Outcomes for non-beverage packaging are assumed in the CRIS to be in line with the base case.

Option 4b – Centralised Container Refund Scheme

This option is assumed to be an industry managed, mandatory CDS scheme operating under the *Product Stewardship Act*. The scheme combines features of the British Columbia CDS and some aspects of the SA CDS. However, it differs from the SA CDS in that option 4b has a single central non-government coordinator, appointed by government, whereas the SA CDS is coordinated by multiple industry-run supercollectors. It also differs from the BA CDS in configuration of infrastructure, notably the revised version submitted by BA, which has a much greater reliance on RVMs (see section 2.2). Nevertheless, the CRIS assumes that recycling rates will be the same as for Option 4a.

6 Note that the SA scheme covers a narrower range of beverage containers than proposed under Options 4a or 4b.

3.2.2 Discussion

Base case

We concur with the view expressed in the CRIS regarding uncertainty about projecting future recycling rates, especially beyond the next 10 to 15 years. Nevertheless, we note that government waste management policies and investments have been the major factors driving growth in recycling in the past. Given this, it is our view that, in the absence of significant additional policy drivers, or additional new government investment above what is already occurring, growth in recycling rates is likely to slow considerably beyond 2015. This slowed rate of growth is not fully reflected in the base case recycling rates presented in the CRIS, which assume annual growth in overall recycling of almost 1% between 2015 and 2030, compared with a growth rate of a little over 1% between 2010 and 2015. Beverage container recycling is assumed to be about 1.7% between 2015 and 2030.

It is recommended, therefore, that the assumed average annual growth rate in recycling between 2015 and 2030 be reduced by half relative to the CRIS to approximately 0.5%, with the average annual growth rate for beverage container recycling also reduced, to approximately 0.7% per annum.[7] The higher assumed growth rates for beverage containers reflect:

- recent growth in recycling of beverage containers, which has been higher than growth in recycling of non-beverage containers; and
- the fact that the current APC has significantly more initiatives targeting beverage container recycling than non-beverage container packaging.

Options

Options 1, 2a, 2b, 2c and 3

It is recommended that the general approach to estimating recycling rates for Options 1, 2a, 2b, 2c and 3, as outlined in the description of policy options and applied in the CRIS, be retained. The focus of the options in terms of proposed recycling and litter programs should also be retained.

Given proposed adjustments to base case recycling rates, however, the absolute recycling rates for these options, as modelled in the CRIS, are likely to be difficult to attain without very substantial increases in investment, especially in the longer term. Given this, recycling rates for these options have been adjusted in proportion to the changes to base case recycling rates, meaning that the 'recycling effort' required to achieve increased recycling rates maintains parity with the options as modelled in the CRIS. Modelled in this way, the options will provide a more useful basis for comparison with the new Options 2d and 2e.

Option 2d – Beverage Container Stewardship

Beverage Container Stewardship is a co-regulatory product stewardship scheme under the *Product Stewardship Act* that makes the beverage industry responsible for achieving an 80% national beverage container recycling rate by 2025. Under the scheme, industry product stewardship organisations (co-regulatory arrangements) must meet outcome requirements

[7] Note, growth rates are assumed to slow over time. For all recyclates the annual growth rates are approximately 1%, 0.5%, 0.5% and 0.25% for 2013-2015, 2015-2020, 2020-2025 and 2025-2030 respectively. For beverage containers, the annual growth rates are approximately 1.5%, 1.0%, 0.5% and 0.25% for 2013-2015, 2015-2020, 2020-2025 and 2025-2030 respectively.

specified in regulations relating to sustainable packaging design, beverage container recycling and litter reduction.

The scheme recycling target for 2020 is approximately 72% of beverage containers consumed nationally, rising to 80% by 2025. This rate of 80% is assumed to be maintained through to 2035. Recycling rates for non-beverage containers and flexible packaging are assumed to increase in line with the base case.

Option 2e – Extended Australian Packaging Covenant

The Extended Australian Packaging Covenant is a co-regulatory scheme modelled broadly on the existing APC but with a greater financial commitment from industry. Under the scheme, the packaging industry would provide funding for substantial litter reduction and recycling projects and initiatives, leading to a substantial increase in recycling and reduction in litter. The scheme aims to deliver an 80% national recycling rate for all packaging and a significant reduction in packaging litter by 2020.

Notwithstanding the stated scheme target of 80% national recycling by 2020, achievability of this target will be substantially influenced by overall industry investment in the scheme. For the DRIS, we propose to model three variations of the scheme based on three different levels of investment: $20 million per annum for five years from 2015 to 2020; $35 million per annum; and $50 million per annum.

The impacts of these respective levels of investment on recycling rates will be determined through the application of the 'Marginal recycling cost curves' (see Section 4.7).

Options 4a and 4b

Similar beverage container recycling rates to those assumed in the CRIS are recommended for Options 4a and 4b in the DRIS. It seems unlikely however, that the very rapid growth in beverage container recycling rates assumed for the first five years of operation (from 53.8% in 2015 to 80% by 2020) are achievable given the relatively low refund rate of 10c. Less rapid growth in beverage container recycling is therefore proposed for the 2015-2020 period (from 56% to 77.5%). Furthermore, achieving and maintaining high (80% +) beverage container recycling rates will, in our view, require the refund for eligible containers to increase over time. Evidence from South Australia, prior to and following an increase in the refund rate (from 5c to 10c in 2008) indicates that, prior to the increase in refund, the beverage container recycling rate had stagnated at less than 70% overall (EPA South Australia, 2012). Following the increase, the recycling rate grew rapidly to greater than 80% in two years, a level that appears to be holding.

Option 4c – South Australian Container Refund Scheme

The South Australian container refund scheme allows consumers to receive a 10c refund for eligible containers they return to approved depots. Under the proposed scheme, the arrangements currently applied in South Australia would be introduced nationally. Legislation would set out arrangements for authorisation by the government of depots and super-collectors. While legislation would not dictate a particular configuration or type of infrastructure, it is here assumed that depots would be the primary redemption point and their collections would go to super collectors for recycling.

The scheme would cover all beverages sold in Australia in pre-sealed containers of between 100 and 3000mL, with the exception of:

- all containers of plain milk;

- containers of 1L or more of flavoured milk;
- glass containers used for containing wine or spirits;
- containers of 1000mL or more used for pure fruit or vegetable juice (comprising at least 90 per cent fruit juice or vegetable juice, or a mixture of the two);
- containers made of cardboard and plastic, or cardboard and foil, that are 1000mL or more, and used for containing wine, wine based beverage, or water; and
- containers made of plastic or foil, or plastic and foil, used for the purpose of containing 250mL of wine.

If the South Australian model is adopted nationally, there would be an opportunity to consider extending its coverage to include containers for milk, wine and fruit juice.

3.2.3 DRIS assumptions

Base case

Table 8 and Table 9 provide overviews of base case recycling rate assumptions under the CRIS and proposed for the DRIS respectively. Bearing in mind that a different base year is proposed for use in the DRIS compared with the CRIS (2013 versus 2010), 2015 recycling rates are higher in DRIS than the CRIS, particularly for beverage containers. This reflects revised packaging recycling data used for the baseline analysis (Industry Edge and Equilibrium 2013 – see section 3.1.2). The recycling rates proposed for the DRIS in later periods reflect the revised annual growth rates post 2015 discussed above. Application of the revised growth rates gives an overall national recycling rate of 72.5% in 2030 compared with the rate of 79% used in the CRIS. Recycling rates for beverage containers, non-beverage containers and non-container packaging in 2035 are all lower accordingly.

Table 8: Base Case packaging recycling rate assumptions (CRIS)

	2010	2015	2020	2025	2030	2035
Overall	**62.5%**	**67.5%**	**72.5%**	**77.1%**	**79.0%**	**79.0%**
Beverage	48.7%	53.8%	58.1%	66.8%	69.7%	69.7%
Non-beverage	40.2%	44.2%	49.2%	50.0%	50.0%	50.0%
Flexible	70.2%	75.4%	80.7%	84.1%	85.9%	85.9%

Table 9: Base Case packaging recycling rate assumptions (DRIS)

	2013	2015	2020	2025	2030	2035
Overall	**65.1%**	**67.0%**	**70.0%**	**71.6%**	**72.5%**	**72.5%**
Beverage	55.1%	56.8%	60.2%	62.1%	63.0%	63.0%
Non-beverage	39.8%	41.1%	42.9%	43.8%	44.2%	44.2%
Flexible	73.1%	75.3%	78.2%	79.8%	80.6%	80.6%

Options

Table 10 and Table 11 provide recycling rate assumptions for each of the options under the CRIS and proposed for the DRIS respectively. Projected recycling rates for each option in the DRIS were developed on a five-year basis, with projections to be interpolated between these periods. As in the CRIS, consideration was given to the types of products/materials targeted by the option and the likely yield of the initiatives assumed to be included in the option given their proposed funding.

Table 10: CRIS packaging recycling rate assumptions

	2010	2015	2020	2025	2030	2035
Option 1						
Overall	62.5%	68.8%	74.0%	79.0%	81.1%	81.1%
Beverage	48.7%	58.8%	63.5%	70.0%	75.0%	75.0%
Non-beverage	40.2%	44.9%	50.0%	50.0%	50.0%	50.0%
Flexible pack.	70.2%	75.4%	80.7%	85.9%	87.1%	87.1%
Option 2a						
Overall	62.5%	67.5%	75.4%	79.4%	80.6%	80.6%
Beverage	48.7%	53.8%	62.3%	70.0%	75.0%	75.0%
Non-beverage	40.2%	44.2%	50.0%	50.0%	50.0%	50.0%
Flexible pack.	70.2%	75.4%	83.3%	86.4%	86.4%	86.4%
Option 2b						
Overall	62.5%	67.5%	77.3%	81.9%	81.9%	81.9%
Beverage	48.7%	53.8%	70.0%	80.0%	80.0%	80.0%
Non-beverage	40.2%	44.2%	50.0%	50.0%	50.0%	50.0%
Flexible pack.	70.2%	75.4%	83.3%	86.4%	86.4%	86.4%
Option 2c						
Overall	62.5%	67.5%	80.0%	83.2%	85.7%	86.4%
Beverage	48.7%	53.8%	72.5%	80.0%	82.5%	85.0%
Non-beverage	40.2%	44.2%	55.0%	60.0%	60.0%	60.0%
Flexible pack.	70.2%	75.4%	85.7%	87.1%	90.0%	90.0%
Option 3						
Overall	62.5%	67.5%	80.0%	83.2%	85.7%	86.4%
Beverage	48.7%	53.8%	72.5%	80.0%	82.5%	85.0%
Non-beverage	40.2%	44.2%	55.0%	60.0%	60.0%	60.0%
Flexible pack.	70.2%	75.4%	85.7%	87.1%	90.0%	90.0%
Option 4a						
Overall	62.50%	67.50%	77.90%	81.60%	82.80%	82.80%
Beverage	48.70%	53.80%	80.00%	85.00%	85.00%	85.00%
Non-beverage	40.20%	44.20%	49.20%	50.00%	50.00%	50.00%
Flexible pack.	70.20%	75.40%	80.70%	84.10%	85.90%	85.90%
Option 4b						
Overall	62.50%	67.50%	77.90%	81.60%	82.80%	82.80%
Beverage	48.70%	53.80%	80.00%	85.00%	85.00%	85.00%
Non-beverage	40.20%	44.20%	49.20%	50.00%	50.00%	50.00%
Flexible pack.	70.20%	75.40%	80.70%	84.10%	85.90%	85.90%

Table 11: DRIS packaging recycling rate assumptions

	2013	2015	2020	2025	2030	2035
Base case						
Overall	**65.1%**	**67.0%**	**70.0%**	**71.6%**	**72.5%**	**72.5%**
Beverage	55.1%	56.8%	60.2%	62.1%	63.0%	63.0%
Non-beverage	39.8%	41.1%	42.9%	43.8%	44.2%	44.2%
Flexible pack.	73.1%	75.3%	78.2%	79.8%	80.6%	80.6%
Option 1						
Overall	**65.1%**	**67.0%**	**72.0%**	**74.0%**	**74.6%**	**74.6%**
Beverage	55.1%	56.8%	64.6%	64.9%	65.3%	65.3%
Non-beverage	39.8%	41.1%	43.9%	44.6%	45.0%	45.0%
Flexible pack.	73.1%	75.3%	79.2%	82.1%	82.9%	82.9%
Option 2a						
Overall	**65.1%**	**67.0%**	**74.8%**	**75.0%**	**75.0%**	**75.0%**
Beverage	55.1%	56.8%	67.0%	67.0%	67.0%	67.0%
Non-beverage	39.8%	41.1%	45.8%	45.8%	45.8%	45.8%
Flexible pack.	73.1%	75.3%	82.3%	82.6%	82.6%	82.6%
Option 2b						
Overall	**65.1%**	**67.0%**	**77.0%**	**78.9%**	**79.0%**	**79.0%**
Beverage	55.1%	56.8%	73.8%	80.0%	80.0%	80.0%
Non-beverage	39.8%	41.1%	46.6%	46.6%	46.6%	46.6%
Flexible pack.	73.1%	75.3%	82.4%	82.6%	82.6%	82.6%
Option 2c						
Overall	**65.1%**	**67.0%**	**79.9%**	**81.3%**	**81.4%**	**81.4%**
Beverage	55.1%	56.8%	75.7%	80.0%	80.0%	80.0%
Non-beverage	39.8%	41.1%	53.4%	53.5%	53.5%	53.5%
Flexible pack.	73.1%	75.3%	85.3%	85.6%	85.6%	85.6%
Option 2d						
Overall	**65.1%**	**67.0%**	**74.8%**	**78.6%**	**79.8%**	**79.8%**
Beverage	55.1%	56.8%	72.5%	80.0%	82.0%	82.0%
Non-beverage	39.8%	41.1%	44.4%	46.0%	46.6%	46.6%
Flexible pack.	73.1%	75.3%	79.8%	82.1%	83.0%	83.0%
Option 2e ($20 m)						
Overall	**65.1%**	**67.0%**	**74.5%**	**76.0%**	**76.7%**	**76.7%**
Beverage	55.1%	56.8%	69.5%	71.0%	71.7%	71.7%
Non-beverage	39.8%	41.1%	47.5%	49.8%	51.4%	51.4%
Flexible pack.	73.1%	75.3%	80.4%	81.7%	82.3%	82.3%
Option 2e ($35 m)						
Overall	**65.1%**	**67.0%**	**75.6%**	**77.0%**	**77.7%**	**77.7%**
Beverage	55.1%	56.8%	70.9%	72.4%	73.1%	73.1%
Non-beverage	39.8%	41.1%	48.4%	50.7%	52.3%	52.3%
Flexible pack.	73.1%	75.3%	81.3%	82.6%	83.2%	83.2%
Option 2e ($50 m)						
Overall	**65.1%**	**67.0%**	**76.4%**	**77.8%**	**78.5%**	**78.5%**
Beverage	55.1%	56.8%	70.9%	72.4%	73.1%	73.1%
Non-beverage	39.8%	41.1%	49.6%	51.8%	53.4%	53.4%
Flexible pack.	73.1%	75.3%	82.5%	83.8%	84.3%	84.3%

Option 3						
Overall	**65.1%**	**67.0%**	**79.9%**	**81.3%**	**81.4%**	**81.4%**
Beverage	55.1%	56.8%	75.7%	80.0%	80.0%	80.0%
Non-beverage	39.8%	41.1%	53.4%	53.5%	53.5%	53.5%
Flexible pack.	73.1%	75.3%	85.3%	85.6%	85.6%	85.6%
Option 4a						
Overall	**65.1%**	**67.0%**	**75.3%**	**78.0%**	**79.3%**	**79.3%**
Beverage	55.1%	56.8%	77.5%	82.5%	85.0%	85.0%
Non-beverage	39.8%	41.1%	44.9%	46.8%	47.2%	47.2%
Flexible pack.	73.1%	75.3%	78.2%	79.8%	80.6%	80.6%
Option 4b						
Overall	**65.1%**	**67.0%**	**75.2%**	**77.7%**	**79.0%**	**79.0%**
Beverage	55.1%	56.8%	77.5%	82.5%	85.0%	85.0%
Non-beverage	39.8%	41.1%	42.9%	43.8%	44.2%	44.2%
Flexible pack.	73.1%	75.3%	78.2%	79.8%	80.6%	80.6%
Option 4c						
Overall	**65.1%**	**67.0%**	**74.7%**	**77.2%**	**78.4%**	**78.4%**
Beverage	55.1%	56.8%	76.0%	80.6%	82.9%	82.9%
Non-beverage	39.8%	41.1%	42.9%	43.8%	44.2%	44.2%
Flexible pack.	73.1%	75.3%	78.2%	79.8%	80.6%	80.6%

Key assumptions underpinning the recycling rates for options, detailed above, are as follows.

Option 1

Recycling rates are consistent with assumptions in the CRIS, but reflect lower base case recycling rates.

Option 2a

The target is to recycle 2% of the packaging its members bring to market every year from 2016 to 2020 additional to existing recycling projects. This leads to an overall recycling projection of approximately 75% by 2020. There is minimal additional investment in recycling after this period, but there are small increases in recycling rates after 2020 reflecting residual effects of earlier investments.

Option 2b

The recycling target is a percentage of packaging brought to market, rising from an additional 2% in 2016 to 10% in 2020 leads to an overall recycling projection of approximately 77% by 2020. Additionally, there is a 70% beverage target by 2020 and 80% beverage target by 2025. There is additional investment needed in the period 2021-2025 to meet the beverage target, but there is minimal further investment in non-beverage recycling in that period. After 2025, small increases in recycling rates reflect residual effects of earlier investments.

Option 2c

The recycling target is a percentage of packaging brought to market, rising from an additional 3% in 2016 to 16% in 2020 leads to an overall recycling projection of approximately 80% by 2020. Additionally, there is a 70% beverage target by 2020 and 80% beverage target by 2025. There is additional investment needed in the period 2021-2025 to meet the beverage target, but there is minimal further investment in non-beverage recycling in that period. After 2025, small increases in recycling rates reflect residual effects of earlier investments.

Option 2d

There is a 72.5% beverage recycling target by 2020 and 80% by 2025. Incremental growth in beverage container recycling rates after 2025 reflect residual impacts of investments up to 2025. Non-beverage recycling rates experience a small degree of growth due to projects that collect a mix of beverage and non-beverage materials.

Option 2e

Recycling rates have been determined through application of the Marginal Recycling Cost Curves at three different levels of investment: $20 million per annum for five years, $35 million per annum for five years and $50 million per annum for five years.

Option 3

Outcomes are assumed to match Option 2c.

Option 4a

Rapid growth in beverage container recycling rates are assumed for the period from 2015 to 2020, although less rapid than assumed in the CRIS. Growth slows after 2020, reaching 82.5% in 2025 (assumed to be maximum feasible with a 10c refund). As previously noted, changes to the refund rate are proposed under the DRIS for Option 4a, as well as for Options 4b and 4c. These are set out in Table 12 below. Increases are in 5c increments approximately in line with projected increases in CPI.

Table 12: Proposed beverage container refund for Options 4a, 4b and 4c

	2015	2020	2025	2030	2035
Refund rate	10c	10c	15c	15c	20c

An increase in the refund to 15c in 2025 leads to further growth in the beverage container recycling rate to 85% in 2030. An increase in the refund to 20c in 2035 will be necessary to maintain the recycling rate at this level.

Non-beverage rates are consistent with the base case except that some interest earned on funds from the scheme's operating surplus in the early years of operation are assumed to be used for a rural recycling grants program. This increases recycling rates for non-beverage containers above the base case.

Option 4b

Recycling rates for beverage containers are the same as for Option 4a. There is a rapid growth in beverage recycling rates between 2015 and 2020. Growth slows after 2020, reaching 82.5% in 2025 (assumed to be maximum feasible with a 10c refund). An increase in the refund to 15c in 2025 leads to further growth to 2030. Non-beverage rates are consistent with the base case.

Option 4c

As per Options 4a and 4b, except that a smaller range of beverage containers covered by 4c results in beverage container recycling rates of approximately 2 to 2.5 percentage points lower than Options 4a and 4b over the life of the assessment. Wine, fruit juice and milk containers are the principal container types assumed to be excluded from Option 4c. Drawing on industry data, estimates of wine, milk and fruit juice consumption in Australia indicate that wine containers represent approximately 2% of all beverage containers covered by Options 4a and 4b[8]. Fruit juice containers represent a further 2% of containers and milk 9% of containers. Drawing on this data, estimates of beverage container recycling rates have been made assuming base case recycling rates for milk, wine and fruit juice containers respectively and the same recycling rates as for Options 4a and 4b for all other containers. Results of this process are presented in Table 13.

Table 13: Estimated recycling rates for beverage containers, Option 4c

	2015	2020	2025	2030	2035
Milk containers % of total recycled beverage containers	8.1%	8.2%	8.4%	8.5%	8.7%
Weighted average recycling rate milk containers	68.1%	69.0%	70.0%	70.5%	70.5%
Wine & fruit juice containers % of total beverage containers	4.0%	3.9%	3.9%	3.8%	3.8%
Weighted average recycling rate wine and fruit juice containers	56.0%	58.2%	60.5%	61.8%	61.8%
All other containers % of total beverage containers	87.9%	87.8%	87.7%	87.6%	87.5%
Weighted average recycling rate all other containers	54.9%	77.5%	82.5%	85.0%	85.0%
Option 4c beverage container recycling rates	**57.7%**	**76.1%**	**80.6%**	**82.9%**	**82.9%**

[8] DRIS calculations drawing on industry consumption and sales data including from ABS 2012, Dairy Australia 2013 and Fruit Juice Australia 2012

3.3 Litter projections

3.3.1 CRIS assumptions

Litter projections used in the CRIS are based on an estimate of the proportion of packaging that may end up as litter. Drawing on the Problem Report for Packaging (PWC 2012), this was estimated to be around 1 million tonnes in 2010. Total litter per annum was estimated to be between 40,000-160,000 tonnes, implying litter rates of 4%-16% of total packaging that may be littered.

The CRIS assumes that packaging litter quantities were approximately 60,000 tonnes in 2010, based on an assumed littering rate of 6% of the estimated 1 million tonnes of packaging that may be littered.

Litter reduction estimates are provided in the CRIS for the base case and each of the options as set out in the table below.

Table 14: CRIS litter reduction assumptions

Year	Litter reduction assumption (%)						
	Option 1	Option 2a	Option 2b	Option 2c	Option 3	Option 4a	Option 4b
2010	0	0	0	0	0	0	0
2015	5	5	5	5	5	5	5
2020	10	10	11.1	11.1	11.1	7.2	7.2
2025	15	15	15.4	15.4	15.4	11.5	11.5
2030	15	15	15.4	15.4	15.4	12.4	12.4
2035	15	15	15.4	15.4	15.4	12.4	12.4

3.3.2 Discussion

As noted in the CRIS, estimation of litter levels is problematic given the limited availability of litter data nationally. Even so, minimal information is provided in the CRIS to support the litter reduction estimates for each of the options presented. Thus it should be possible to provide more robust estimates than are provided there. Three steps need to be taken before litter rates can be estimated for the base case and options though:

1. The current (baseline) litter rate must be estimated.
2. This rate can then be used to estimate consumers' 'propensity to litter'.
3. Estimates of potential changes to consumers' propensity to litter under the different options must then be made.

These steps are discussed below.

Step 1 – current litter rate

An estimate of current annual litter rates can be made by developing estimates of the quantities of litter cleaned up each year (QLC), the change in the stock of litter on land (Δ LLS) and the quantity of litter ending up in the marine environment each year (QML) – see Box 1, equations (1) to (6).

Box 1. Litter stocks and flows

Litter can be measured in terms of litter stocks and litter flows. The change in the stock of litter from one year to the next (ΔLS) is the sum of the change in the land based stock of litter (ΔLLS) and marine based stock of litter (ΔMLS), expressed as:

(1) $\Delta\, LS = \Delta\, LLS + \Delta\, MLS$

The change in land based stock of litter is in turn the sum of the quantity littered on land and remaining on land (QLL) less the quantity cleaned up on land (QLC), expressed as:

(2) $\Delta\, LLS = QLL\text{-}QLC$

Similarly, the change in marine based stock of litter is the sum of the quantity littered on land and transported to the marine environment (QML(LB)) and the quantity littered at sea (QML(MB) - noting that the quantity of litter cleaned up in the marine environment is assumed to be zero since little if any marine litter is cleaned up[9]). This is expressed as:

(3) $\Delta\, MLS = QML(LB)+QML(MB)$

Drawing on equations (1) to (3), the total littered in any one year (QL) can be expressed in the following three equations:

(4) $QLL = QLC + \Delta\, LLS$

(5) $QML = QML(LB) + QML(MB)$

(6) $QL = QLL + QML$

Although there are no specific data available for QLC, Δ LLS and QML, it is possible to interpolate from available data to provide estimates for each of these variables.

Quantity of litter clean up (QLC)

An estimate of annual packaging litter clean up in Australia has been made drawing on Clean Up Australia data (Clean Up Australia 2010) and Victorian Local Government data (Sustainability Victoria 2011).

The data, presented in Table 15, extrapolates Victorian local government litter clean up data to a national basis based on population and assuming roughly equivalent litter levels between Victoria and other jurisdictions. Litter collection associated with the annual Clean Up Australia day has been added to the local government total to arrive at an estimate of total litter clean up for Australia. This total is then adjusted to exclude non-packaging litter, with estimated proportions (on a weight basis) of packaging litter to total litter being as follows:

- litter traps – packaging litter 66%;
- illegally dumped rubbish – packaging litter 15%;
- roadside litter – packaging litter 90%; and
- Clean Up Australia – packaging litter 90%.

Data for the two years has been averaged to 67,706 tonnes/ year.

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9 Except for litter that has been washed onto beaches, which is counted in estimates of QLC. Also, litter in freshwater environments (lakes, rivers, drains) is accounted for when it flows to marine environments or is cleaned up on land (e.g. litter traps).

Table 15: Estimates of packaging litter clean up in Australia (tonnes)

Activity	2008/09 All litter (t)	Estimated Packaging (t)	2009/10 All litter (t)	Estimated Packaging (t)
Litter traps	11,175	7,376	10,877	**7,179**
Illegally dumped rubbish	64,763	9,714	61,061	9,159
Roadside litter	41,228	37,105	40,378	36,340
Clean Up Australia	15,560	14,004	16,150	14,535
All activities	132,726	**68,199**	128,466	**67,213**

Sources: Clean Up Australia 2010; Sustainability Victoria 2011

Change in land based litter stock (ΔLLS)

Estimating the change in land based litter stock is more problematic there being no reliable data on the stock of litter nationally. National Litter Index (NLI) data (Keep Australia Beautiful, 2010) provides estimates of litter stock by undertaking a litter count at approximately 1000 sites across Australia each year. There are a number of potential problems with this data though, including that:

- the data is provided on a per item and volume basis rather than by weight;
- sample sites do not account for population densities;
- sample sites only cover land based litter; and
- the same sample sites are used each year.

Noting these shortcomings, it is feasible to calculate an indicative estimate of the land based litter stock in Australia by extrapolating from the NLI to all built up areas in Australia and then converting the NLI volumetric data to tonnes. A similar method was adopted in the CRIS. Data from this exercise is presented in Table 16 below.

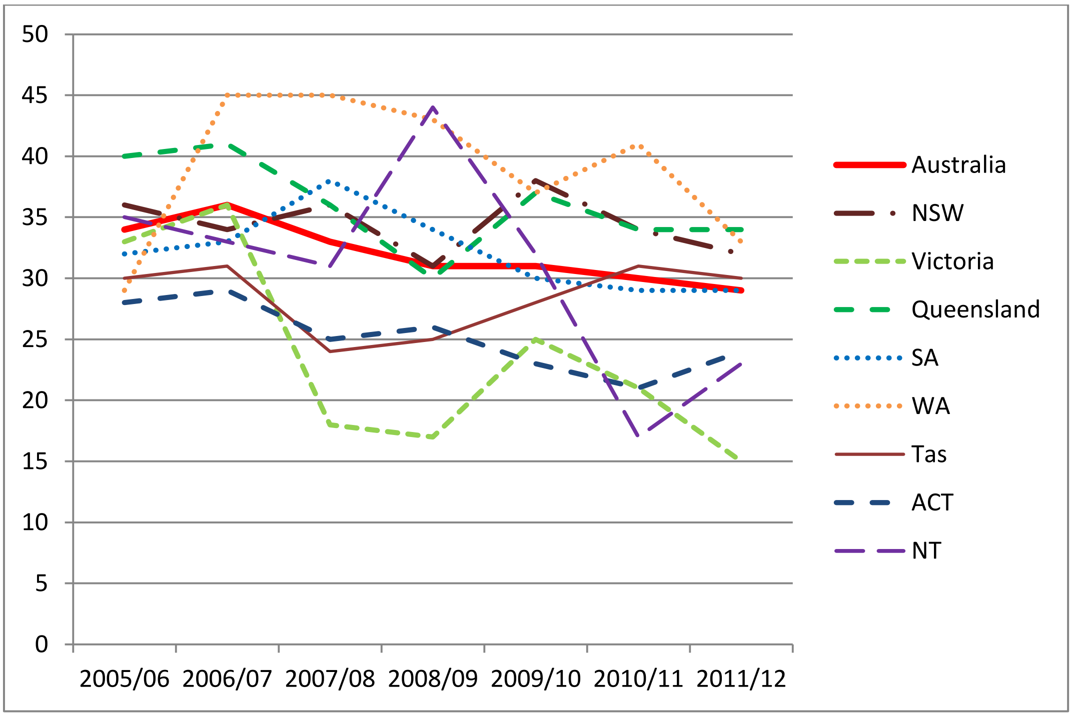
Table 16: Estimated stock of land based packaging litter, built up areas

Packaging litter	glass	metal	paper/ paperboard	plastic	Total
Total volume/ NLI survey sites (litres)	685.6	1272.7	2056.9	2528.4	6543.6
Total area of survey sites (m^2)	983,000	983,000	983,000	983,000	983,000
Area of built environment, Australia (m^2)	26,313,000,000	26,313,000,000	26,313,000,000	26,313,000,000	26,313,000,000
Site volumes extrapolated across built up areas (m^3)	18,352	34,068	55,059	67,680	175,159
Conversion factor (m^3 to tonnes)	0.347	0.039	0.1	0.013	
Estimated land based litter stock built up areas (tonnes)	6,368	1,329	5,506	880	14,083

Sources: Geosciences Australia, Bureau of Rural Sciences 2010; Keep Australia Beautiful 2010; Sustainability Victoria 2011

Due to uncertainties with the extrapolation process and shortcomings with the NLI data, the estimate provided in this table should be regarded as having a wide margin of error. Nevertheless it provides a useful basis for estimating changes in litter stock, which can be made by drawing on trends in litter stock established through NLI data. Figure 1 provides a summary of the number of litter items collected at NLI sites, averaged over Australia for the period 2005/06 to 2011/12. The data indicates that there may be a slight downwards trend in the total stock of litter in Australia over time, suggesting that the amount being littered is falling steadily, albeit at uneven rates between jurisdictions; estimated at approximately 3.1% per annum over this period.

Figure 1: Trends in Australian litter count (items)



Source: Macgregor Tan Research, National Litter Index Annual Report 2011-12

Drawing on the total stock estimates in Table 16 and the average annual rate of change provided in Figure 1 of -3.1%, the change in land based litter stock from one year to the next has been estimated at – 437 tonnes/ year. [10]

Land based litter rate (QLL)

Thus, applying the equation QLL = Δ LLS + QC we derive an estimate for land based litter, Australia wide, in the base year of 67,269 tonnes where:

- QC = 67,706 tonnes
- Δ LLS = - 437 tonnes

Marine litter rate (QML)

Data on the quantity of marine litter is also absent. Nevertheless an estimate has been derived by first developing a 'bottom-up' estimate of marine litter drawing on NLI data and comparing this with a 'top-down' estimate derived from international marine litter estimates. Both the

10 Although the estimate of total stock of litter is highly uncertain, changing the estimate of land base litter stock , even by a significant quantity, will not greatly affect the estimate of Δ LLS.

bottom up and top estimates are presented in Table 17. The bottom up estimate is derived from NLI data (Macgregor Tan research 2012), which can be used to derive an estimate of beach litter. From this estimate, an estimate of marine litter can be derived in turn, with a number of studies (Hardesty & Wilcox 2011, Taffs & Cullen 2005, UNEP 2005) indicating that approximately 15% of litter entering the marine environment (from either land or sea base sources) ends up on beaches. Using this approach, marine litter is estimated to be around 12,000 tonnes per annum. The top down estimate is derived from international data (UNEP 2005), indicating that approximate 6.4 million tonnes of litter enter the world's oceans each year[11]. On a per capita basis this represents more than 20,000 tonnes per annum[12].

A mid-point between the two estimates of 16,254 tonnes per annum is used as the estimate of total litter entering the marine environment in any one year. It is necessary to estimate the proportion of this total that is packaging litter. This in turn involves understanding the sources of marine litter (land-based versus sea-based) and the proportions of each source that are likely to be packaging litter. Studies indicate that a little under half of all litter entering the marine environment comes from land based sources, but that land based sources are the dominant source of packaging litter, with significant quantities of packaging litter, principally plastics, being washed into bays, estuaries and oceans via stormwater and waterways (Hardesty & Wilcox 2011, Taffs & Cullen 2005, UNEP 2005). In total, it is estimated that 8,712 tonnes of packaging litter enters the marine environment each year, just over half of all marine litter.

Table 17: Estimate of marine packaging litter

'Bottom up' marine litter estimate drawing on NLI data	
Land based litter annual (tonnes)	67,269
Beach litter as a proportion of land based litter	2.7%
Estimated beach litter (tonnes)	1,791
Beach litter as a proportion of marine litter	15%
Annual marine litter (tonnes)	***11,937***
'Top down' marine litter estimate drawing on UNEP data	
Annual quantity of marine litter globally	6,400,000
Annual marine litter (tonnes)	***20,571***
Marine litter as packaging	
Marine litter (mid-point estimate) (tonnes)	***16,254***
Proportion as land-based	48%
Proportion as sea-based	52%
Proportion of land-based as packaging (principally plastics)	90%
Proportion of sea-based as packaging	20%
Land based litter as packaging (tonnes)	***7,022***
Sea based litter as packaging (tonnes)	***1,690***
Total packaging litter entering marine environment (tonnes)	**8,712**

Sources: Hardesty & Wilcox 2011; Macgregor Tan research 2012; Taffs & Cullen 2005; UNEP 2005

11 The UNEP notes that this estimate is highly uncertain.

12 There are arguments in favour of Australia having higher per capita rates or lower per capita rates of marine litter than the global average. Arguments in favour of Australia having higher rates include relatively high per capita consumption levels and a lengthy coastline. Arguments in favour of Australia having lower than average rates include relatively advanced waste management and litter control practices in Australia and low population density along large stretches of its coast.

Total litter rate (QL)

Drawing on the data presented above, the total litter rate is estimated currently to be 75,981 tonnes per year, comprising 67,269 tonnes of land based litter and 8,712 tonnes of packaging marine litter (of which 7,022 tonnes is littered on land but ends up in the marine environment). This total is used as the baseline figure for the purpose of estimating future litter rates in Australia under the base case and options.

The data presented above also provides the following summary information on the status of litter stocks and flows in Australia:

- Of the 67,269 tonnes of land based litter flowing into the environment in a year, 67,706 tonnes are cleaned up each year. This means that the total stock of land based litter is falling gradually from one year to the next.
- On the other hand, little if any of the marine litter is cleaned up (except for the litter that is washed ashore and counted in the land based litter clean up). This means that the stock of marine litter is likely to be increasing substantially from one year to the next.

It is acknowledged that the litter data presented here has a high degree of uncertainty. Even so, because this uncertainty applies both to base case litter rates and litter rates under options, it should be feasible to develop reasonably robust estimates of the impact of options on litter rates *relative to the base case*.

Nevertheless, the uncertainty points to the desirability of improving information on land and marine litter rates, clean up and stocks in Australia.

Step 2 – Propensity to litter, base case

CRIS estimate

Table 18 outlines the approach used in the CRIS to estimate waste littered as a proportion of total packaging waste (6%). How this estimate is used to derive estimates of litter reductions under the base case and each of the options is unclear. Nevertheless, the CRIS appears to be on the right track in using changes to the 'quantity of material available to be littered' as the basis for estimating 'propensity to litter' under the base case.

Table 18: CRIS approach to estimating litter (tonnes)

CRIS approach to estimating litter and litter reductions	
Packaging consumption (tonnes)	**4,428,224**
less total recycled	2,764,407
Waste landfilled or littered (tonnes)	**1,663,817**
less distribution packaging	663,817
Packaging available to be littered (tonnes)	**1,000,000**
Annual litter	60,000
Propensity to litter (packaging littered as a proportion of total packaging available to be littered)	**6.0%**

DRIS estimates

Rather than deriving estimates of the quantity of material available to be littered from total packaging consumption and total recycling, we suggest that this estimate would be better derived by differentiating 'public place' packaging consumption from packaging consumption in other places, with available evidence indicating that it is public place packaging consumption that is the principal source of litter (Beverage Industry Environment Council 2004).

Public places are defined in the material flows analysis for this project to include:

- **LGA public places** including public parks, gardens, public recreational facilities and streets; and
- **commercial public places** including shopping centres, commercial recreational facilities and commercial venues open to the public (e.g. hotels and restaurants).

Transfer of flexible paper and cardboard packaging from 'public place' packaging to 'other' packaging (for the purpose of calculating public place propensity to litter only) is also proposed, since the major sources of this type of packaging (e.g. cardboard boxes used for storing consumer items sold at shopping centres) are likely to be the back of shops, hotels etc., meaning that very little of it is likely to be littered.[13]

Estimates of the propensity to litter for 'public place packaging' and 'other packaging' are presented in Table 19 and Table 20 respectively.

The public place propensity is derived by estimating the total amount of public place packaging available to be littered (excluding paper and cardboard flexible packaging - approximately 244,000 tonnes) and the proportion of this waste that is actually littered (approximately 59,000 tonnes), producing a propensity to litter estimate for public place packaging consumption of 24.2%.[14] The litter rate used to calculate the propensity to litter estimate is derived from the total annual litter rate previously described (75,981 tonnes), with a proportional breakdown between public place and other litter derived from National Litter Index data (see Table 21).

The propensity to litter for other packaging consumption is calculated using the same approach, producing an estimate of 1.3%.

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13 It is acknowledged that this approach leaves out paper and cardboard containers used in fast food outlets, which are a significant source of public place packaging litter. Therefore, the estimate of 'propensity to litter, public place packaging consumption' (Table 19) is likely to be slightly understated. It is not feasible to separate out paper and cardboard food containers from other public place paper and cardboard in the material flows analysis though, and including all paper and cardboard in the public place propensity to litter estimates is likely to be a greater source of error than overlooking paper and cardboard food containers. Importantly, public place paper and cardboard packaging is included in the estimate of 'propensity to litter other packaging consumption' (see Table 20), with the result that the estimate of 'propensity to litter other packaging' is likely to be slightly overstated.

14 Note this estimate is consistent with observational data of littering behaviour undertaken for the Victorian Litter Report between 2003 and 2010 (Sustainability Victoria 2011b). In most years between 2003 and 2010 25% to 30% of people consuming items in public places were observed to litter (with the remainder disposing of waste correctly in bins). In one of the years the observed littering rate was significantly higher than this range (35%), and in another of the years it was significantly lower (16%). It is also consistent with earlier surveys undertaken as part of the Littering Behaviour Study (Curnow & Spehr 2005). These found that just under a third (33%) of people littered in public places in 2004, with littering rates falling slowly but steadily over the 1997-2004 period.

Table 19: DRIS propensity to litter, public place packaging (base case)

Propensity to litter, public place packaging	
Public place packaging consumption excluding flexible paper (tonnes)	(tonnes)
Beverage	255,548
Non Beverage	82,532
Flexible	25,020
Total	**363,100**
Recycling of public place packaging excluding flexible paper (tonnes)	
Beverage	86,484
Non Beverage	24,017
Flexible	8,934
Total	**119,434**
Public place packaging available to be littered (tonnes)	
Beverage	169,064
Non Beverage	58,515
Flexible	16,087
Total	**243,666**
Annual packaging litter (public places)	**58,862**
Propensity to litter, public place packaging consumption	**24.2%**

Table 20: DRIS propensity to litter, other packaging (base case)

Propensity to litter, other packaging (including public place paper and cardboard)	
Other packaging consumption	(tonnes)
Beverage	1,095,424
Non Beverage	280,071
Flexible	2,784,733
Total	**4,160,228**
Recycling of other packaging	
Beverage	658,170
Non Beverage	120,274
Flexible	2,045,408
Total	**2,823,852**
Other packaging available to be littered (tonnes)	
Beverage	437,254
Non Beverage	159,797
Flexible	739,325
Total	**1,336,376**
Annual packaging litter (other locations)	**17,119**
Propensity to litter, other packaging consumption	**1.3%**

Note: All tonnages in Tables 19 and 20 are for 2013 and have been derived from the material flows model developed for this study.

Table 21: National Litter Index, estimated sources of litter across survey sites

Source	percentage
Public place	
Beach	2.7%
Car park	10.3%
Highway (excludes illegal dumping)	52.5%
Recreational park	5.6%
Retail	3.6%
Shopping centre	2.8%
Total public place	***77.5%***
Other	
Residential	8.7%
Industrial	13.9%
Total other	***22.5%***

Source: Macgregor Tan Research 2012

Step 3 – Propensity to litter, options

As indicated in Table 19, beverage containers represent a major share of public place packaging consumption (approximately 65%). Thus, options that solely or substantially target recycling of beverage containers will achieve better litter outcomes than options that have a greater emphasis on recycling of other packaging. Significantly increased recycling rates, even of beverage containers, will have only a moderate impact on litter rates though. To achieve more substantial changes to litter rates requires drivers that impact on litter propensities over time. To varying degrees those drivers are in place for the options.

Options 1, 2a, 2b, 2c, 2d, 2e, 3

Options 1, 2b, 2c and 3 all involve investment in litter programs including: litter prevention and education programs (Options 1, 2b, 2c); improving the approach to counting litter (Option 1); financial incentives for litter clean-up (Options 2b, 2c); and improved litter enforcement (Options 2b, 2c). Options 2a, 2d and 2e refer to litter prevention programs but do not provide details on investment levels in those programs. Litter program investments are therefore assumed to match program investments for Options 2b, 2c and 3 (see section 4.7.2).

The key question is 'what impact if any these programs will have on packaging consumers' propensity to litter?' Financial incentives for litter clean-up and improved litter count methodology are assumed to have little direct impact on propensity to litter. With respect to litter prevention and education programs though, it is difficult to answer the question, since minimal ex-ante and ex-poste data on the impact of past litter programs is available. Uncertainty about the effectiveness of litter programs is highlighted by behavioural theory, which indicates that the success of public policy in achieving sustained behavioural change is influenced by a multiplicity of factors including social and personal norms and facilitating conditions (Nyborg 2003, Triandis 1977). Furthermore, evidence from waste and other environmental programs and policies indicates that while information and education can play a significant complementary role in facilitating behavioural change, incentives are needed to spur behavioural change (Gardner & Stern 2002, OECD 2008, 2011). Without the right incentives, (with well-designed economic incentives and/ or investments in services and capacity building being regarded as vital), behavioural change tends be spasmodic or short lived.

Bearing these points in mind it is useful to examine available evidence on the outcomes of litter programs (noting an earlier point that this information is limited).

The report 'Educating the Community about Litter' (Department of Environment and Conservation (DEC) NSW 2005) provides perhaps the most comprehensive relevant review. It examined the outcomes of the NSW Government's 2000 to 2003 program of litter education program and fines in the context of earlier litter education programs and research into litter and disposal behaviour. The review found that the campaign lead to strong growth in people's awareness about the impacts of litter, an increase in the social unacceptability of littering and a significant increase in awareness of fines for littering, including beyond the end of the program. The review also found that there was an increase in the proportion of people in NSW who say they never litter from just over 50% before the program commenced to just over 60% at the end of the program. If responses could be taken at face value this would represent a substantial 20% reduction in respondents' propensity to litter. However, the report correctly notes that "self-reported non-littering behaviour is not a reliable indicator of people's actual behaviour" (DEC NSW 2005, p.25). Furthermore, the number of people who said they made changes to reduce littering, which rose from 9% to 16% from the beginning to the middle of the program, fell again to pre-program levels after the program concluded. The program collected insufficient ex-poste and ex-ante litter and littering behaviour data to get a reliable estimate of the impact of the program on actual littering behaviour.

The Littering Behaviour Study (Curnow & Spehr 2005) provides comprehensive surveys of littering behaviour over the period 1997 to 2004 and also examines factors influencing littering behaviour, including bin numbers, placement and signage, education and awareness campaigns and site factors (i.e. their appearance, cleanliness and how well cared for they are). Little information is provided on the impacts of specific programs and campaigns though, other than indicating a gradual but generally steady decline in littering rates over the period. Survey data also indicated that community awareness of litter prevention and education campaigns declined substantially once the campaigns had concluded.

Finally, the Environment Protection and Heritage (EPHC) report 'Litter Management in Australia' (EPHC 2008) provides information on the legislative, administrative and enforcement arrangements for littering in each jurisdiction including data on littering fines and revenue collected through those fines. The main picture to emerge from this information is that fines, enforcement (number of fines issued) and revenue collected through litter fines increased substantially in most jurisdictions between the late 1990s and 2007. Jurisdictions also made significant (and generally ongoing) investments in litter awareness and educations campaigns, complementing campaigns and programs provided by non-government organisations such as Keep Australia Beautiful and Clean Up Australia. Information is not provided however, on the effectiveness of fines, enforcement regimes, campaigns and programs on packaging litter propensities or rates. Information is provided on the impact of the Butt Littering Trust campaign though, which combined a national media campaign with the distribution of personal ashtrays and public cigarette butt litter bins. Averaged nationally, there was a reduction in cigarette butt littering of 15.6% over the course of the program.

Taken together, the information presented above suggests that the impact of litter prevention and education programs on propensities to litter will depend significantly on the design of the programs including on whether they are integrated with incentives and initiatives aimed at improving the capacity of the community to avoid littering. The longevity of the programs is also an important factor. With these factors in mind, the following impact of litter investments on propensities to litter are assumed for Options 1, 2b, 2c and 3 (noting that the impacts of recycling investments, such as the National Bin Network, are already factored into the estimates of litter rates):

- Option 1. Propensities to litter (public place and other) are assumed to decrease steadily to 5% less than the base (i.e. 5% of 24.2% in the case of public place) from 2016 to 2020 and then remain at that level for the entire period of the study, assuming ongoing program investments under this option.
- Option 2a-2e, 3. Propensities to litter are assumed to decrease steadily to 12.5% less than the base case from 2016 to 2020, noting that litter education and prevention program investments are substantially greater than for Option 1 and that Options 2a-2e and 3 also include improved litter enforcement.

Outcomes of these assumptions are presented in Table 22 and Table 23 below.

Table 22: Propensity to litter Option 1

Option 1	2013	2015	2020	2025	2030	2035
Public place						
Propensity to litter, base case	24.2%	24.2%	24.2%	24.2%	24.2%	24.2%
Assumed reduction in propensity to litter	na	na	5%	5%	5%	5%
Adjusted propensity to litter	**24.2%**	**24.2%**	**22.9%**	**22.9%**	**22.9%**	**22.9%**
Other						
Propensity to litter, base case	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Assumed reduction in propensity to litter	na	na	5%	5%	5%	5%
Adjusted propensity to litter	**1.3%**	**1.3%**	**1.2%**	**1.2%**	**1.2%**	**1.2%**

Table 23: Propensity to litter Options 2a-2e, 3

Options 2a -2e, 3	2013	2015	2020	2025	2030	2035
Public place						
Propensity to litter, base case	24.2%	24.2%	24.2%	24.2%	24.2%	24.2%
Assumed reduction in propensity to litter	na	na	12.5%	12.5%	12.5%	12.5%
Adjusted propensity to litter	**24.2%**	**24.2%**	**21.1%**	**21.1%**	**21.1%**	**21.1%**
Other						
Propensity to litter, base case	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Assumed reduction in propensity to litter	na	na	12.5%	12.5%	12.5%	12.5%
Adjusted propensity to litter	**1.3%**	**1.3%**	**1.1%**	**1.1%**	**1.1%**	**1.1%**

Options 4a, 4b, 4c

As discussed earlier, past studies indicate that financial incentives play an important role in spurring behavioural change with respect to environmental programs (Gardner & Stern 2002, OECD 2008, 2011). Evidence from overseas indicates that the financial incentive provided by containers refunds can have a significant impact on propensity to litter under container refund schemes, with beverage container litter rates falling substantially following the introduction of deposit/ refund schemes in Germany and some states in the USA (Albrecht et al. 2011).

A detailed breakdown of NLI data from two years (2011 and 2012) was undertaken for this study separating beverage container[15], non-beverage container packaging and non-packaging litter data for South Australia and the rest of Australia. That data was used to develop estimates of beverage container and other packaging litter rates in South Australia compared to the rest of Australia. The estimates, presented in Table 24, indicate that the over the two years for which disaggregated data is available beverage container litter rates were only 41% of beverage container litter rates Australia wide (on a weight basis)[16]. Litter rates of other packaging were similar in South Australia to the rest of Australia.

Table 24: Packaging litter by volume and tonnes, NLI sites South Australia and Australia, 2011-2012

	Volume (litres)			Weight (tonnes)		
	Beverage containers	Other packaging	Total	Beverage containers	Other packaging	Total
Australia						
Glass	1109.7	129.4	1239.1	385.1	44.9	430.0
Metal	2083.1	422.7	2505.8	81.2	16.5	97.7
Paper	555.0	3393.9	3948.9	55.5	339.4	394.9
Plastic	2734.9	2366.5	5101.4	35.6	30.8	66.3
Total	**6482.7**	**6312.5**	**12795.2**	**557.4**	**431.5**	**988.9**
South Australia						
Glass	79.6	22.2	101.8	27.6	7.7	35.3
Metal	125.9	59.5	185.4	4.9	2.3	7.2
Paper	30.9	482.1	513.0	3.1	48.2	51.3
Plastic	144.1	551.3	695.4	1.9	7.2	9.0
Total	**380.5**	**1115.1**	**1495.6**	**37.5**	**65.4**	**102.9**
National survey area (m^2)	1,499,791	1,499,791	1,499,791	1,499,791	1,499,791	1,499,791
South Australian survey area (m^2)	247,052	247,052	247,052	247,052	247,052	247,052
Ratio of litter South Australia/ Australia - survey area weighted	**36%**	**107%**	**71%**	**41%**	**92%**	**63%**

Source: Reworked from Macgregor Tan Research 2011, 2012

This data has been used to derive adjusted propensity to litter rates for Options 4a, 4b and 4c. The adjusted propensity to litter rates assume that beverage container littering will approximate the littering rates in South Australia (with an adjustment for beverage container recycling rates), but that litter rates of other packaging will be the same as under the base case (i.e. as for the rest of Australia currently). The adjusted rates are presented in Table 25 and Table 26.

15 Beverage containers as defined under the SA container refund scheme.

16 Beverage container litter were also compared between South Australia and individual jurisdictions. Beverage container litter rates in South Australia are lower than all other jurisdictions.

Table 25: Propensity to litter Options 4a, 4b

Options 4a & 4b	2013	2015	2020	2025	2030	2035
Public place						
Propensity to litter, base case	24.2%	24.2%	24.2%	24.2%	24.2%	24.2%
Assumed beverage container litter relative to base case	na	na	41%	41%	41%	41%
Beverage containers proportion of litter (by weight)	na	na	0.56	0.56	0.56	0.56
Other packaging proportion of litter (by weight)	na	na	0.44	0.44	0.44	0.44
Container recycling rate	na	na	0.78	0.83	0.85	0.85
Proportional to current SA rate (80%)	na	na	0.97	1.03	1.06	1.06
Assumed reduction in propensity relative to base case	na	na	31%	35%	37%	37%
Adjusted propensity to litter	**24.2%**	**24.2%**	**16.6%**	**15.6%**	**15.2%**	**15.2%**
Other						
Propensity to litter, base case	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Assumed beverage container litter relative to base case	na	na	41%	41%	41%	41%
Beverage containers proportion of litter (by weight)	na	na	0.56	0.56	0.56	0.56
Other packaging proportion of litter (by weight)	na	na	0.44	0.44	0.44	0.44
Container recycling rate	na	na	0.78	0.83	0.85	0.85
Proportional to current SA rate (80%)	na	na	0.97	1.03	1.06	1.06
Assumed reduction in propensity relative to base case	na	na	31%	35%	37%	37%
Adjusted propensity to litter	**1.3%**	**1.3%**	**0.9%**	**0.8%**	**0.8%**	**0.8%**

Table 26: Propensity to litter Option 4c

Option 4c	2013	2015	2020	2025	2030	2035
Public place						
Propensity to litter, base case	24.2%	24.2%	24.2%	24.2%	24.2%	24.2%
Assumed beverage container litter relative to base case	na	na	41%	41%	41%	41%
Beverage containers proportion of litter (by weight)	na	na	0.56	0.56	0.56	0.56
Other packaging proportion of litter (by weight)	na	na	0.44	0.44	0.44	0.44
Container recycling rate	na	na	0.76	0.80	0.82	0.82
Proportional to current SA rate (80%)	na	na	0.95	1.00	1.03	1.03
Assumed reduction in propensity relative to base case	na	na	30%	33%	35%	35%
Adjusted propensity to litter	**24.2%**	**24.2%**	**17.0%**	**16.1%**	**15.6%**	**15.6%**
Other						
Propensity to litter, base case	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Assumed beverage container litter relative to base case	na	na	41%	41%	41%	41%
Beverage containers proportion of litter (by weight)	na	na	0.56	0.56	0.56	0.56
Other packaging proportion of litter (by weight)	na	na	0.44	0.44	0.44	0.44
Container recycling rate	na	na	0.76	0.80	0.82	0.82
Proportional to current SA rate (80%)	na	na	0.95	1.00	1.03	1.03
Assumed reduction in propensity relative to base case	na	na	30%	33%	35%	35%
Adjusted propensity to litter	**1.3%**	**1.3%**	**0.9%**	**0.9%**	**0.8%**	**0.8%**

3.3.3 DRIS assumptions, litter rates

Base case

Estimates of litter rates under the base are presented in Table 27. The propensity to litter (both public place and other) is assumed to remain constant under the base case. Litter rates under the base case are therefore a function of consumption and recycling levels, with the trend in litter rates presented in the table reflecting the interaction of two countervailing factors – growth in recycling between 2013 and 2025 that is sufficient to more than offset the growth in consumption, followed by a period (after 2025) when growth in recycling slows to the point that it is no longer sufficient to offset growth in consumption and litter rates start to increase again.

Table 27: Estimated litter under base case (tonnes)

Base case	2013	2015	2020	2025	2030	2035
Public place						
Beverage	40,841	39,743	37,500	36,521	36,527	37,535
Non-beverage	14,135	14,067	14,213	14,457	14,821	15,231
Flexible	3,886	3,545	3,040	2,747	2,617	2,690
Total public place	**58,862**	**57,355**	**54,753**	**53,725**	**53,966**	**55,456**
Other						
Beverage	5,601	5,477	5,256	5,191	5,237	5,381
Non-beverage	2,047	2,029	2,039	2,069	2,118	2,177
Flexible	9,471	8,839	8,083	7,738	7,668	7,880
Total other	**17,119**	**16,344**	**15,378**	**14,997**	**15,023**	**15,438**
Total	**75,981**	**73,699**	**70,131**	**68,722**	**68,989**	**70,894**

Options

Litter rates under each option will be made by applying the same approach as described above for the base case but with the adjusted propensities to litter (where relevant). Results are presented in the CBA and distributional analysis report.

4. Cost assumptions

Cost assumptions in the CRIS are divided into a number of broad categories. The same broad categories will be used in the DRIS:

- scheme design and administration, including avoided costs;
- scheme administration, industry PSOs;
- household participation;
- business participation;
- collection and transport costs;
- processing of recycling at MRFs;
- scheme infrastructure & operating costs; and
- industry compliance costs.

The DRIS will also consider the additional cost category of:

- 'loss of producer surplus'.

Each of these categories is discussed in turn below.

4.1 Scheme design and implementation

The CRIS provided calculations of government costs associated with the introduction and administration of the scheme. These were itemised as:

- regulation design and implementation;
- government participation costs;
- communications; and
- government costs to administer regulations (including compliance and enforcement).

Although government implementation costs in the CRIS are not substantial, it is important that they are carefully considered, particularly as they may form a key component of a request to central agencies for "Departmental" funding. Departmental funding is required to resource the development and administration of the preferred initiative.

Additionally, the CRIS examined avoided regulatory costs, which were assessed as a benefit. These avoided costs are also discussed here.

4.1.1 CRIS assumptions and discussion

Regulation design and implementation

The following table summarises the assumed regulation design and implementation costs.

Table 28: CRIS Regulatory design and implementation costs

Infrastructure Type	Option 1	Option 2A	Option 2B	Option 2C	Option 3	Option 4A	Option 4B
Cost ($m for 2 years)	0.0	0.7	0.7	0.7	1.0	0.7-1.3	0.7-1.3

The legislative development process is complex and challenging. The costs associated with regulatory development, amendment and supporting the government approval process appear to have been significantly under-estimated. These costs need to include:

- policy staff with subject matter expertise, for example in waste data and programs, taxation design and administration, grant programs, competition impacts, etc.;
- consultants with subject matter expertise;
- internal legal advisors; and
- legislative drafting (including regulation policy staff and external legal advice).

The current costs appear to only include allowance for minimal policy staff and limited legal advice. They do not appear to include taxation expertise.

Government participation

The CRIS includes estimates of $140,000 (year 1) and $90,000 (year 2) for government to:

- develop a National Packaging Waste Strategy;
- establish a Compliance Database;
- develop a Cost Recovery Impact Statement; and
- renegotiate municipal kerbside recycling contracts.

These costs appear to be unrealistically low. The development of a National Packaging Waste Strategy will involve considerable development and negotiation time. Likewise, renegotiation of municipal kerbside recycling contracts is likely to take a considerable amount of time as there are likely to be hundreds of contracts.

Communication

The following table summarises assumed communication costs.

Table 29: CRIS communication costs

Infrastructure Type	Option 1	Option 2A	Option 2B	Option 2C	Option 3	Option 4A	Option 4B
First Year Cost ($m per years)	2.2	2.2	4.4	4.4	4.4	8.8	8.8
Ongoing Cost	0.125	0.125	0.5	0.5	0.5	0.5	0.5

The estimates are based on previous analysis of the National Television and Computer Recycling Scheme (which provides for Extended Producer Responsibility). Arguably, high rates of consumer uptake are required for the CDS schemes to achieve its desired outcomes. As a consequence, it would seem likely that the communication costs have been under-estimated as there will need to be ongoing active communication and engagement with all affected parties.

Government costs to implement regulations

The CRIS assumes a flat rate of six hours of labour per liable party (or $380 per annum) associated with Options 2, 3 and 4. The total number of liable parties, based on the NPC, appears to be 272. So the total annual administration cost is around $100,000.

It is not clear why a flat rate has been applied across Options 2, 3 and 4. Depending on the option being considered, the cost of government administration could vary considerably, particularly as the number of parties subject to regulatory compliance will vary by CDS option.

Scheme government implementation costs

The following table summarises the assumed scheme administration costs.

Table 30: CRIS scheme government implementation costs

Infrastructure Type	Base Case	Option 1	Option 2A	Option 2B	Option 2C	Option 3	Option 4A	Option 4B
$m/yr	0.75	0.75	1.13	1.13	1.13	0.75	1.13	1.13

These costs are derived from a previous EPHC regulatory impact statement for the APC, the administration costs for which are approximately $750,000 per annum in 2008-09.

Rather than depending on previous assessment, the robustness of the results would be improved by developing a 'bottom-up' assessment of the likely administration costs, with cost estimates reflecting the functions and number of liable parties. This approach has been adopted by the NEPC Working Group which has provided the estimates detailed in Tables 21 and 22. Our review and discussions with the working group have confirmed these estimates.

Avoided administration and regulatory costs

There is a broad regulatory failure stemming from fragmented and inconsistent resource recovery and litter management frameworks. Each jurisdiction has its own waste minimisation legislation or policies. The CRIS, drawing on the National Waste Policy Regulatory Impact Statement estimated the costs of this duplication at around $50,000 annually for regulatory design & implementation and $2.9 million per annum for direct administration costs, with implementation of a national approach through any of the options avoiding these costs. These estimates were drawn from a comparison of state based co-regulatory approaches to product stewardship for TVs and computers with a nationally co-ordinated approach, in other words by comparing two new product stewardship alternatives. In reality, it is not clear that implementation of any of the options examined in this analysis will significantly reduce waste management costs for individual jurisdictions. For the most part programs initiated under these options will be additional to established state and territory programs. Two exceptions are as follows:

- Options 2a, 2b, 2c, 2e and 3 will effectively replace the current APC thus avoiding annual government administrative and regulatory costs associated with the APC of approximately $1.16 million[17].

[17] Estimate of administration costs undertaken for the mid-term review of the NPC (Allen & Cain 2008) inflated to 2011 values.

- Options 4a, 4b and 4c will replace the South Australian and Northern Territory container refund schemes, thus avoiding annual administrative costs associated with those schemes of approximately $3.7 million. For Options 4a and 4b, all of these avoided costs are assumed to apply to government, whereas for Option 4c, most of the avoided costs are assumed to apply to the scheme coordinator.

4.1.2 DRIS assumptions

Table 31 and Table 32 provide an overview of government implementation costs proposed for inclusion in the DRIS. These costs were provided by the NEPC Working Group, based on internal calculations, but are consistent with our assessment that administration costs in the CRIS were substantially under estimated. The revised estimates reflect:

- revised assumptions regarding numbers of liable parties affected by the various options (noting that the number of liable parties affected by Options 4a, 4b and 4c is estimated to be very substantial - see Section 4.9), which in turn has significant implications for government administration costs; and
- recent experience with implementation of comparable government regulations in Australia, which indicate that most options will entail significant additional administrative effort.

While each one of the itemised assumptions was reviewed, the costs for each option have been aggregated into a 'development' component (which includes legislative drafting as well as preparation, education, system-creation costs for the year prior to the first year of the option's substantive operation) and an 'ongoing administration' component. This is a sufficient level of aggregation for the purposes of the DRIS. Development costs (Table 31) are assumed to occur over two years (Option 1) or three years (Options 2, 3 and 4).

Government costs associated with Options 4a, 4b and 4c are assumed to include the following:

- Option 4a. Cost of revenue collection, maintaining a container registry, regulation enforcement/ compliance, contract management and grants program administration.
- Option 4b. Cost of revenue collection, maintaining a container registry, and regulation enforcement/ compliance. Contract management costs are borne by the single coordinator (industry PSO) under this option (see Section 4.2).
- Option 4c. Maintaining a container registry, regulation enforcement/ compliance and approving super collectors. Cost of collecting fees and managing contracts are borne by the super collectors (industry PSOs) under this option (see Section 4.2).

Under Option 4a all costs associated with scheme administration are assumed to reside with government. Even though Option 4a involves a CDS coordinator, its costs are all passed through to government. Total annual administration costs of $42.6 million are equivalent to approximately 0.4c/ container over the life of the scheme.

Government administration costs of Options 4b and 4c are lower than for Option 4a because costs associated with depot contract management are borne by the coordinator or super collector (in the case of Options 4b and 4c) and revenue collection costs are borne by the super collector (in the case of Option 4c). See following section.

As previously noted, avoided annual administration costs are assumed to be as follows:

- $ -1.16 million associated with administering the APC, avoided for Options 2a, 2b, 2c, 2e and 3;

- $ -3.7 million associated with administering the South Australian and Northern Territory container refund schemes, avoided for Options 4a, 4b;
- $ -0.8 million associated with administering the South Australian and Northern Territory container refund schemes, avoided for Option 4c.[18]

Table 31: Proposed DRIS scheme government implementation - design and preparation costs

Sub-category	Data variable	Application	CRIS assumption	DRIS assumption	Unit
Government administration (design & implementation)	Development costs	Option 1	0	1.2	$ million
	Development costs	Option 2a	0.7	4.0	$ million
	Development costs	Option 2b	0.7	4.0	$ million
	Development costs	Option 2c	0.7	4.0	$ million
	Development costs	Option 2d	na	2.6	$ million
	Development costs	Option 2e	na	0.8	$ million
	Development costs	Option 3	1	4.0	$ million
	Development costs	Option 4a	0.7	47.1	$ million
	Development costs	Option 4b	0.7	31.6	$ million
	Development costs	Option 4c	na	14.2	$ million

Table 32: Proposed DRIS scheme government implementation - ongoing costs

Sub-category	Data variable	Application	CRIS assumption	DRIS assumption	Unit
Government administration (ongoing)	Ongoing administration costs	Option 1	0	1.0	$ million/ year
	Ongoing administration costs	Option 2a	0.14	3.8	$ million/ year
	Ongoing administration costs	Option 2b	0.14	4.7	$ million/ year
	Ongoing administration costs	Option 2c	0.14	5.6	$ million/ year
	Ongoing administration costs	Option 2d	na	2.5	$ million/ year
	Ongoing administration costs	Option 2e	na	3.2	$ million/ year
	Ongoing administration costs	Option 3	0.14	11.2	$ million/ year
	Ongoing administration costs	Option 4a	0.14	42.6	$ million/ year
	Ongoing administration costs	Option 4b	0.14	34.2	$ million/ year
	Ongoing administration costs	Option 4c	na	11.3	$ million/ year

[18] An additional $2.9 million of avoided annual PSO administration costs are included in the following section for Option 4c.

4.2 Scheme administration, industry PSOs or equivalent

4.2.1 CRIS assumptions

This cost item relates to administrative costs of an industry-run Product Stewardship Organisation (PSO) that is assumed to administer the program initiatives in all schemes except for Option 3 and 4a (where the Australian Government will fulfil this function).

Option 1 assumes the establishment of a national body made up of representatives from Commonwealth, State, Territory and local governments. It is envisioned that the body would operate in a broadly similar manner to the APC Industry Association, with comparable administration costs.

For each co-regulatory sub-option (Options 2a to 2c), it is envisioned that industry would establish a body responsible for administering an approved co-regulatory arrangement (often referred to as a PSO). The PSO(s) are assumed to be responsible for implementing and directing initiatives that would be designed to meet the specified outcomes. Scheme regulations are likely to permit multiple approved parties to act as PSOs, which is likely to involve the duplication of fixed costs and increase the scheme administration costs. For these options, scheme administration costs are assumed to increase by 50% when there are multiple PSOs operating.

Option 3 is assumed to involve the government placing a mandatory ADF on packaging. The CRIS expressed uncertainty regarding the costs implications of government administration of this option.

The CDS (Options 4a and 4b) options are assumed to be administered by a PSO(s), with regulations permitting multiple approved parties to act as PSOs, in the same manner as the co-regulatory sub-options.

4.2.2 Discussion

As with government administration costs, PSO administration costs appear, in many cases, to have been understated in the CRIS. The administration and coordination roles of PSOs under the various options are as follows.

Option1. This option does not involve any additional regulatory requirements. All administration is undertaken by a national body coordinated by governments.

Options 2a to 2d will entail a single or (more likely) multiple co-regulatory arrangements (CAs) to facilitate and administer the designated scheme. Administration costs for each CA are therefore expected to be broadly similar as follows.

- Option 2a. Costs for each CA will include overseeing development of recycling and litter action plans by members, record keeping and auditing of consumption and recycling levels against targets, and government reporting.
- Option 2b. Similar to Option 2a, but with additional planning and record keeping associated with beverage containers.
- Option 2c. Similar to Option 2b, but with strengthened targets and additional program planning required.
- Option 2d. Similar to Option 2b, but with a sole focus on beverage containers.

Option 2e is not delivered under the co-regulatory provisions of the *Product Stewardship Act 2011*. Instead, it builds on existing coordinated arrangements established through the APC, with an industry organisation established to collect and expend member funding contributions.

As a government administered scheme, the costs of administering Option 3 are assumed to be included in the government administration costs for that option, as set out in Table 22.

Options 4a, 4b and 4c are all regulatory options with centrally managed container deposit or container refund schemes and requirements therefore for careful coordination and stringent record keeping and reporting arrangements.

In the CRIS, PSO administration costs associated with Option 4a and 4b were shared between this category and infrastructure and operating costs. All non-government administration costs associated with Options 4a, 4b and 4c are included in this section however, so as to provide a more meaningful comparison of administrative costs between the regulatory options. We note however, that differences in responsibility for administering Options 4a, 4b and 4c between government and the system coordinator mean that a comparison of overall administration costs between the options should also take into account government administration costs (see previous section).

Because Option 4c will replace the SA container refund scheme, coordinator costs associated with administering that scheme, estimated at - $2.9 million/ year, will be avoided.

4.2.3 DRIS assumptions

Table 33 provides an overview of scheme administration cost estimates. Assumptions underpinning the costs estimates are as follows.

- Option 1. All additional costs associated with this option are assumed to be covered in government administration costs.
- Option 2a. Costs of approximately $1 million per annum for each CA, with an estimated four CAs in place.
- Option 2b. Cost of approximately $ 1.25 million per annum for each CA, with an estimated four CAs in place. Added costs relative to 2a reflect additional planning, program development and coordination required to meet beverage targets.
- Option 2c. Cost of approximately $ 1.5 million per annum for each CA, with an estimated four CAs in place. Added costs relative to 2b reflect additional planning and program development costs.
- Option 2d. Costs of approximately $1.5 million per annum for each CA, with an estimated two CAs in place.
- As previously noted, scheme administration costs for Option 3 are assumed to be subsumed into government administration costs for that option.
- Option 4a. Costs borne by the single CDS coordinator include managing and coordinating the collection network, achieving service and system efficiency targets, receiving and verifying collection data from redemption points, making refund, handling and other payments to redemption points, managing the sale of recovered materials, and making incentive payments to retailers. All of those costs are passed through to government and are reflected in government administration costs of $42.6 million per annum.

- Option 4b. A single scheme coordinator is responsible for contracting with collection points (165 consolidation depots and 1500 other collection points), managing and coordinating the collection network, achieving service and system efficiency targets, receiving and verifying collection data from redemption points, making refund, handling and other payments to redemption points and managing the sale of recovered materials. These costs are estimated at $8.25 million per annum. Total administration costs, including government and coordinator costs, are assumed to be $42.5 million per annum.
- Option 4c. Multiple super collectors will be required to report to the Government on return rates. Their functions will also include contracting with collection points (165 consolidation depots and 1500 other collection points, each potentially with multiple super collectors), managing and coordinating the collection network, achieving service and system efficiency targets, receiving and verifying collection data from redemption points, making refund, handling and other payments to redemption points and managing the sale of recovered materials. Costs of $39.5 million per annum cover these functions. Total administration costs, including government and super collector (coordinator) costs, are assumed to be $50.8 million per annum, with the higher costs relative to Options 4a and 4b largely reflecting the multiple super collectors and potentially more complex contractual arrangements.

Table 33: Proposed DRIS industry (PSO or equivalent) administration costs

Sub-category	Data variable	Application	CRIS assumption	DRIS assumption	Unit
Ongoing administration (PSOs or equivalent)	Annual administration costs	Option 1	0	0	$ m/year
	Annual administration costs	Option 2a	0.375	4	$ m/year
	Annual administration costs	Option 2b	0.375	5	$ m/year
	Annual administration costs	Option 2c	0.375	6	$ m/year
	Annual administration costs	Option 2d	na	3	$ m/year
	Annual administration costs	Option 2e	na	1.5	$ m/year
	Annual administration costs	Option 3	0	0	$ m/year
	Annual administration costs	Option 4a	1.125	0	$ m/year
	Annual administration costs	Option 4b	1.125	8.25	$ m/year
	Annual administration costs	Option 4c	na	39.5	$ m/year

As previously noted, coordinator costs associated with administering the South Australian container refund scheme will be avoided with the implementation of Option 4c. These avoided costs are estimated at - $2.9m/ year.

4.3 Household participation costs

4.3.1 CRIS assumptions

Households face participation costs due to the time it takes to accumulate packaging and transport it to collection infrastructure points. The CRIS divides these costs into four main sub-categories – accumulation time, vehicle operating costs (VOCs), in-vehicle travel (IVT) time and container deposit redemption time. The nature of these cost categories and the options that they are potentially related to are outlined in the table below.

Table 34: Summary of possible household participation costs

Cost	Definition	Function of	Relevant Option
Accumulation time	value of time to physically transfer packaging to accumulation points such as kerbside recycling bins / CDL deposit points. Includes time to sort packaging or containers, walk to the accumulation point and transfer the packaging	Increased sorting time; additional trips per week; walk time per trip; time to transfer contents; behavioural change by households	All options
VOCs	involved in transporting packaging to collection infrastructure	VOC per km; distance to infrastructure; trips per week; no. of trips by infrastructure type; proportion of new trips	Options 4a, 4b (and 4c)
In-vehicle travel time	time to transport packaging to collection infrastructure by vehicle	distance travelled converted into hours using average vehicle speed; multiplied by value of time	Options 4a, 4b (and 4c)
Container deposit redemption time	time to walk from vehicle to container deposit collection infrastructure and conduct the transaction	walk time (distance from vehicle to CD infrastructure x average walk speed) and transaction time (to redeem the deposit)	Options 4a, 4b (and 4c)

Source: CRIS.

4.3.2 Discussion

Value of time

In the CRIS, time spent sorting waste, in-vehicle travel and redeeming containers was valued at $13.01/hour. This figure was based on the value of private vehicle passenger time determined by Austroads, and was deemed to be approximately equivalent to the minimum wage.

A review of literature was undertaken for the DRIS to determine an appropriate value for time spent on private/ non-business activities of this nature (Bockstael et al. 1992, Feather & Shaw 1998, Lake & Ferreira 2002, Larson & Shaikh 2004). A wide span of values was suggested by the literature, linked to average or median wage rates, ranging from 0 to 100%. The range of values most commonly applied to non-business or leisure time however was 10% to 50% of the average wage rate. Applying a mid-point estimate of 30% to the average wage rate for all employees in Australia in 2011 of $25.66/ hour (ABS 2013) provides an estimate of $7.67/ hour for estimating the main components of household participation costs in the DRIS[19].

Accumulation costs

In the CRIS, it was assumed that household participation costs for all packaging options included "accumulation time" for both at-home and away-from home recycling. This accumulation time consists of the additional time required to sort recyclables, deliver the recyclables to an "accumulation point" and transfer the contents. For the portion of the community deemed to take additional, that is recycling 'purpose-specific' trips. For the purposes of the DRIS, we are recommending that accumulation time effectively be costed at zero. There are two reasons for this recommendation:

- First, substantial evidence was proffered by a range of stakeholders, drawing on overseas and Australian experience, that accumulation time stemming from implementation of options, either CDS options or programs through other options (e.g. the National Bin Network) would be no greater than the time that is already involved in current waste management practices, whether kerbside recycling or disposal through waste disposal channels.

  It is not clear that the CRIS considered accumulation time on a net basis. Further, many of the components of accumulation regarding sorting time, walk time and the proportion of purpose-specific trips are extremely difficult to accurately quantify, and for the CRIS required the use of 'intuitive'/arbitrary estimates that in many cases were measured in seconds.
- Second, there is a legitimate question mark over whether, for a significant portion of the community, participation in waste sorting and recycling involves a private cost. As noted by the Productivity Commission (2006), the personal benefit that many members of the community derive from taking part in recycling exceeds the cost to them of the additional effort required. Even if some initial "inconvenience costs" were incurred, it is highly likely that, for a large proportion of the population, inconvenience would decline substantially over time, as people became habituated to the new practice.

Vehicle operating costs and in-vehicle travel time

For Options 4a and 4b (and 4c), key variables underlying vehicle operating costs and in-vehicle travel time costs are the number of trips made per household and the proportion of those trips that are new.

In the CRIS, it was assumed that households undertook 0.04 trips per week, equivalent to 2.0 trips per year, to CDS infrastructure (for both Options 4a and 4b). Of these trips, 10% of trips were assumed to be new (and therefore of relevance to the CBA) in the case of RVMs and regional/remote CDS infrastructure, and 50% of trips were assumed to be new for urban non-RVM CDS infrastructure.

We are recommending that, for the DRIS, the number of trips be altered to reflect the different types of CDS infrastructure (RVMs versus other CDS infrastructure) and the different proportions of CDS infrastructure under each option. Further, we recommend that assumptions about the proportion of new trips should be altered to reflect the different infrastructure types.

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[19] This value of time is also applied to other non-business time costs used elsewhere in the study, notably the value of voluntary labour used in litter clean up (see section 5.3.2).

There is evidence, based on overseas experience, that trips to RVMs are much more frequent than to other types of CDS infrastructure, but that the vast majority of such trips are not purpose specific (i.e., not new trips). Conversely, most households will visit non-RVM infrastructure only rarely, as is assumed in the CRIS, but it is more likely that such trips will be purpose specific. In other words, there is an inverse correlation between the propensity of householders/ consumers to undertake purpose specific trips and the frequency with which they will take those trips.

Proposed revised assumptions for the number of trips are as follows:

- trips to non-RVM CDS infrastructure: 3.55 times per year (equivalent to the assumption in the CRIS of 2 trips per year, but based on updated South Australian data);[20] and
- trips to RVMs: 26 trips per year (1 per fortnight).

These revisions aimed to address comments from stakeholders that (a) the number of trips to hubs in the CRIS is too high, whereas those to RVMs were too low; and (b) that the proportion of recycling specific / new trips is too high. Because they vary by infrastructure type and for the packaging /CDS options, depending on the types of infrastructure involved, the proposed new assumptions for the DRIS, we believe, more closely reflect household behaviour/ likely household behaviour.

Container deposit redemption time

Container deposit redemption time is the walk time from a vehicle to CD infrastructure (a function of distance and walk speed) plus the transaction time involved in redeeming containers. The main assumptions that we recommend be altered for container deposit redemption time relate to the number of trips and the proportion of new trips. We are recommending that for the DRIS, the assumption changes suggested for the vehicle-related costs also be applied to the container deposit redemption time - that is, the number of trips be altered to reflect the different types of CDS infrastructure (RVMs versus other CDS infrastructure) and the different proportions of CDS infrastructure types under each option.

We also recommend that assumptions regarding CD redemption time should be changed compared to the CRIS estimates of 1.7 minutes/ trip (RVMs) and 5 mins/ trip (non-RVMs/depots). The revised assumptions recommended for the DRIS are approximately 1.6 minutes for RVMs and 10 minutes for non-RVMs. The RVM time estimate is based on RVM throughput data estimated for this study. This indicates that an average household will redeem about 30 containers per trip, assuming 26 trips per year and 3 seconds per container including queuing time. The non-RVM time estimate takes account of queuing time and the large average number of containers being redeemed in a single trip. It aligns with the estimate in the recent Harrison survey report for EPA South Australia, in which 66% of persons surveyed reported transaction times of less than 15 minutes for CD depots.

Other assumptions relating to walk distance (50m for RVMs, 10m for other urban CDS infrastructure and for rural CDS infrastructure) and walk speed (1.35 m/s) were considered to be reasonable and unlikely to vary significantly between jurisdictions or on a metro/non-metro basis and, therefore, we have not recommended altering them.

[20] The most recent South Australian data indicates that 46% of households visit CD infrastructure 2-3 times or more per year; 19% visit 1-2 times per year, 14% visit monthly, 2% visit fortnightly, 1% visit less than yearly and 17% are non-participants. Taking a weighted average of these trips, results in an estimate of 3.55 trips per household per year, which is applied across 100% of households.

Assumptions not revised

In the Data Assumptions Report, it was noted that the assumptions re average distance to each unit of collection infrastructure did not vary by jurisdiction, but were assumed to be 2.0 km (urban trips) and 11.6 km (regional/remote trips) across jurisdictions. While it was flagged that these distances, particularly the rural distance, should vary by jurisdiction, altering these assumptions had virtually no impact on the level of household costs. Therefore, these assumptions were not altered for the DRIS. We recommend that all other assumptions in the CRIS relating to VOCs and IVT are retained in the DRIS (i.e., value of travel time, average vehicle speeds and distances to infrastructure).

4.3.3 DRIS assumptions

Table 35 outlines proposed DRIS assumptions on frequency of trips and proportions of new trips under Options 4a, 4b and 4c, which is relevant to the estimation of vehicle-related costs and container deposit redemption time components of household participation costs.

The 30% assumption for new trips to non-RVMs is in line with previous literature (Nolan ITU 2003, ISF 2001). The 10% assumption for new rural trips has been retained from the CRIS. The proportion of new trips for RVMs has been revised downwards from 50% to 5%, reflecting the nature of this infrastructure and usage patterns overseas – noting the trade-off, in that many more such trips take place compared to other types of infrastructure (26 per year, rather than 3.55 per year).

The impact of revised assumptions on the CDS options varies depending on the proportions of infrastructure assumed for each option. For example, under Option 4a 84.9% of redemption trips are assumed to be to RVMs. Thus 84.9% of trips occur 26 times per year (assumption for trips per year for RVMs) but only 5% of these are new trips. For Option 4c, by contrast, 72.5% of redemption trips are to non-RVM infrastructure. Thus 72.5% of trips are taken 3.55 times per year, but 30% of such trips are assumed to be new trips.

Table 35: DRIS assumed frequency of household trips and proportion of new trips to container deposit infrastructure (average of participating and non-participating households)

		Proportion of trips by infrastructure types for each CDS option		
Type of trip	**No. of trips per year (% of new trips)**	**4a**	**4b**	**4c**
Metro and non-metro trips to non-RVM infrastructure	3.55 (30%)	13.3%	49.8%	72.5%
Metro and non-metro trips to RVMs	26 (5%)	84.9%	48.4%	25.7%
Remote trips to all CDS infrastructure	3.55 (10%)	1.8%	1.8%	1.8%

DRIS estimates of household participation costs

Table 36 outlines the resulting household participation costs, taking into account variations in the assumptions outlined above. Costs are presented for each jurisdiction, as well as nationally, for Options 4a, b and c. In the case of the Northern Territory and South Australia, adjustments to the proportions of trips have been made to reflect the fact that both jurisdictions have existing CDSs in the base case.[21] The tables also distinguish metro and non-metro costs for each option.

Costs are greatest in jurisdictions with the greatest numbers of households (i.e. NSW and Victoria), but on a per household basis are greatest in jurisdictions that have higher proportions of households in non-metropolitan areas. This reflects the fact that costs are greater for households in non-metropolitan areas than in metropolitan areas because it is assumed that they have to travel greater distances to CDS infrastructure (11.6 km in non-metropolitan areas compared to 2.0 km in metropolitan areas). In addition, non-metropolitan areas are assumed to have different recycling infrastructure configurations compared with metropolitan areas, which affects travel frequency and costs. Total household participation costs are similar between all three options: Option 4a totals $64.3 million for household participation costs in 2035. Option 4b is slightly lower at $60.9 million and Option 4c lower again at $58.5 million.

Table 36: Options 4a, 4b and 4c: DRIS household participation cost estimates aggregated ($m)

Option 4a	Metro				Non-metro			
	2020	2025	2030	2035	2020	2025	2030	2035
NSW	$9.58	$11.65	$13.05	$13.54	$5.89	$7.06	$7.75	$7.96
Victoria	$8.84	$10.86	$12.28	$12.82	$3.25	$3.87	$4.20	$4.31
Queensland	$4.52	$5.71	$6.55	$6.92	$5.94	$7.46	$8.59	$9.08
South Aust.	$0.05	$0.06	$0.06	$0.06	$0.02	$0.02	$0.02	$0.02
Western Aust.	$3.93	$4.98	$5.73	$6.05	$1.35	$1.65	$1.86	$1.94
Tasmania	$0.48	$0.56	$0.65	$0.67	$0.64	$0.75	$0.80	$0.82
N. Territory	$0.00	$0.01	$0.01	$0.01	$0.00	$0.00	$0.00	$0.00
ACT	$0.08	$0.10	$0.11	$0.11	$-	$-	$-	$-
Australia	**$27.47**	**$33.92**	**$38.43**	**$40.17**	**$17.10**	**$20.82**	**$23.23**	**$24.13**

21 For Option 4c, which is equivalent to the existing SA system, additional trips were assumed to be zero for SA and NT; other options were adjusted depending on the proportions of RVMs and metro and non-metro non-RVM infrastructure compared with the SA system.

Option 4b	Metro				Non-metro			
	2020	**2025**	**2030**	**2035**	**2020**	**2025**	**2030**	**2035**
NSW	$9.04	$10.99	$12.31	$12.77	$5.57	$6.67	$7.32	$7.52
Victoria	$8.34	$10.25	$11.59	$12.09	$3.07	$3.66	$3.97	$4.07
Queensland	$4.26	$5.39	$6.18	$6.53	$5.61	$7.05	$8.11	$8.57
South Aust.	$0.16	$0.19	$0.19	$0.20	$0.06	$0.07	$0.07	$0.07
Western Aust.	$3.71	$4.70	$5.40	$5.71	$1.27	$1.56	$1.76	$1.83
Tasmania	$0.45	$0.53	$0.61	$0.63	$0.61	$0.71	$0.76	$0.77
N. Territory	$0.02	$0.02	$0.02	$0.02	$0.01	$0.01	$0.01	$0.01
ACT	$0.07	$0.09	$0.10	$0.10	$-	$-	$-	$-
Australia	**$26.05**	**$32.15**	**$36.41**	**$38.06**	**$16.20**	**$19.72**	**$22.00**	**$22.85**

Option 4c	Metro				Non-metro			
	2020	**2025**	**2030**	**2035**	**2020**	**2025**	**2030**	**2035**
NSW	$8.84	$10.62	$11.85	$12.30	$5.45	$6.45	$7.05	$7.25
Victoria	$8.16	$9.90	$11.15	$11.64	$3.00	$3.54	$3.82	$3.92
Queensland	$4.17	$5.21	$5.95	$6.28	$5.50	$6.81	$7.81	$8.26
South Aust.	$-	$-	$-	$-	$-	$-	$-	$-
Western Aust.	$3.63	$4.54	$5.20	$5.50	$1.25	$1.51	$1.69	$1.76
Tasmania	$0.44	$0.51	$0.59	$0.61	$0.60	$0.69	$0.73	$0.74
N. Territory	$0.08	$0.09	$0.10	$0.11	$-	$-	$-	$-
ACT	$0.07	$0.09	$0.10	$0.10	$-	$-	$-	$-
Australia	**$25.39**	**$30.96**	**$34.95**	**$36.54**	**$15.79**	**$18.99**	**$21.11**	**$21.93**

Notes: ACT non-metro costs are zero, reflecting the very small non-metro population (less than 260 persons according to the ABS). SA and NT costs have been adjusted downwards to reflect the fact that both jurisdictions have existing CDSs in the base case. Costs were calculated for 2035 based on the assumptions outlined, with costs for earlier years based on (updated) recycling quantities for each option proportionate to 2035 levels.

4.4 Business participation costs

4.4.1 CRIS assumptions

Business / workplace participation costs are defined as costs incurred by employees taking packaging to temporary storage infrastructure and cleaners/other staff consolidating packaging in larger storage infrastructure such as skip bins. Cost items and CRIS assumptions are shown in Table 24.

4.4.2 Discussion

Concerns about the uncertain and potentially arbitrary nature of costs, raised in relation to household accumulation costs also apply to business participation costs. In particular, estimates of the number of trips and transfer times are subject to uncertainty because they are based on what the CRIS acknowledges are "intuitive assumptions". Other concerns include that estimates of the number of employees are assumption based and subject to uncertainty - only full-time employees counted for estimates of number of employees; and the value of time is much higher than household participation time and does not vary between general employees and cleaners, which may lead to understatement of employee costs. In any case, however, there is a strong argument that the employee costs (incurred in taking packaging to temporary storage infrastructure) should not be included in the DRIS, on the grounds that:

- there is a significant rationale supporting the insignificance of these costs, as discussed in relation to the accumulation time component of household participation costs - that is, these employee costs are likely to be no greater than the time that is already involved in current waste management practices, are likely to decline significantly over time as employees habituate to the recycling practice, and may in any case be less than the personal ('feel good') benefits that employees derive from taking part in recycling; and
- to the extent that any such employee costs are significant, they are likely to have been captured in the MRCCs for Options 2a-e (the industry-run options for which such costs are likely to be greatest), and to calculate them separately under business participation costs therefore risks double-counting.

Therefore, it has been proposed for the DRIS, that the employee costs category of business participation costs is excluded.

The other component of business participation costs in the CRIS is cleaner/other staff costs, which involve transferring the contents of temporary storage infrastructure to large accumulation points (e.g. skip bins). Concerns in relation to the CRIS assumptions for cleaner /other staff costs include:

- the assumed additional time spent by cleaners transferring the contents of temporary storage infrastructure to large accumulation points (assumed in the CRIS to be 5 seconds/trip) appears to be too low, with a guide produced by Resource NSW (2002) on calculating waste reduction costs in office buildings estimating this time to be between 1 and 5 minutes/trip;
- the employee and cleaner costs are calculated for Option 2c and 3, which yield the highest recycling quantities under the CRIS, with these costs for being proportionate to the total recycling quantities compared with 2c and 3 - however, the quantity of C&I recycling rather than the total quantity of recycling would be a more relevant benchmark.

While it would be desirable to obtain a grounded basis for the estimates of number of trips and transfer times in particular, this would probably require well designed business surveys to obtain. Given this, and the fact that business / workplace participation costs are less material to the overall results of the assessment than, say, household participation costs, (accounting for less than 10% of total costs for any of the options – Table 27), we propose to adjust the CRIS assumptions on business participation costs in relation to the time taken for each trip to a midpoint in the range of estimates assumed in the NSW guide (Resource NSW 2002). We also propose to make the costs for the various options proportionate to C&I recycling quantities (rather than total recycling quantities).

Table 37: Business participation costs as a % of total costs in CRIS (PV basis)

Option	PV Business participation costs ($m)	% of total	PV Total costs ($m)
Option 1	$20	6.4%	$311
Option 2a	$20	7.8%	$258
Option 2b	$37	6.7%	$552
Option 2c	$61	6.2%	$982
Option 3	$61	6.2%	$979
Option 4a	$7	0.3%	$2,125
Option 4b	$7	0.3%	$2,471

4.4.3 DRIS assumptions

As noted above, the employee costs in the CRIS relating to business participation costs are proposed to be excluded in the DRIS; adjustments to the assumptions in relation to cleaner/other staff costs are outlined in Table 38. Key changes to the assumption are:

- Employee costs are excluded from the analysis.
- The number of trips is still estimated to be 0.5 trips per day, with this estimate based on a weighted average of 0.2 trips/day (i.e. once a week) for 40% of businesses, 0.5 trips/day (i.e. once every two days) for 40% of business, 1 trip/day for 9% of businesses and 20 trips per day for 1% of businesses (e.g. airports, large shopping centres).
- However, the additional time each trip transferring the cleaners / other staff are involved in transferring the contents of recyclate from temporary storage infrastructure to large accumulation points is assumed to 2.5 minutes/ trip.
- The value of time for cleaning has been reduced from $42.75/ hour to $35/ hour. This adjustment follows a review of award rates and charges for commercial cleaning services.

> The national award rate for cleaners is currently about $17/ hour but once allowances, benefits, insurance and normal profits are added to these costs the typical charge out rate for commercial cleaning services is in the order of $30-40/ hour.

The overall effects of changes are that employee costs are reduced to zero, whereas cleaner/staff costs are substantially increased.

Based on the new assumptions, business participation costs for whichever option yields the highest recycling quantity as determined by the MFA (likely to be 2c), will be in the order of $12 million per year in 2035. Costs for other options will be proportionate to the volumes of C&I recycling.

Table 38: CRIS business participation costs (relevant to all Options)

Cost	Function of	CRIS assumptions	DRIS assumptions
Employee costs	additional trips	1 trip / day for Options 2c and 3, other non-CDS options trips proportional to recycling levels relative to 2c and 3; 0.5 trips / day for CDS	Employee costs are excluded from the DRIS
	sorting time	1 sec / employee / trip	
	no. of employees	8 million FT (ABS Labour Force Stats)	
	value of time	$42.75/hour (Austroads value of time for business vehicles)	
	employee participation	50% for options 2C and 3 10% for CDS	
	additional walk time	zero - temporary waste and recycling bins assumed to be co-located in workplaces	
Cleaners / other staff	no. of businesses that employ cleaners	1/2 of the 125,000 businesses with a turnover of more than $2M/a (ABS data)	retained
	additional trips	1 trip every 2nd day for Options 2c and 3 by 2035, other non-CDS options, time proportional to recycling quantities relative to 2c and 3	0.5 trips per day based on weighted average of 0.2 trips/ day for 40% of businesses, 0.5 trip/ day for 40% of businesses; 1 trip/ day for 9% of businesses and 20 trips/ day for 1% of businesses (e.g. airports, large shopping centres)
	additional transfer and walk time	5 seconds per trip	150 seconds (2.5 minutes) per trip
	value of time	$42.75/hour	$35/ hour

Note: cleaners / other staff are involved in transferring the contents of temporary storage infrastructure to large accumulation points, whereas employee costs relate to taking packaging to temporary storage infrastructure.

4.5 Collection and transport costs

4.5.1 CRIS: Assumptions

The CRIS cost-benefit assessment assumes the following collection costs:

- Household kerbside: $187 per tonne; and
- Commercial and industrial: $26 per tonne.

These collection types are assumed to occur in all options, although to varying extents based on recycling projections. As a result the CBA assumes that in the base case all recycled packaging is recycled using either kerbside or C&I services; and in the CDS option cases, 7.1% of recycled beverage containers are recycled via kerbside recycling, 10.1% via C&I recycling and 82.8% at CDS infrastructure.

Finally, the CRIS cost-benefit assessment assumes that the CDS will reduce the number of times the kerbside collection trucks have to "return a load to the MRF", the avoided cost is up to $10 million per year (by 2035). This is calculated as a function of:

- projected at home recycling with a CDS: 7%;
- truck capacity: 10 tonne capacity per truck;
- estimated time of average return trip: 1.5 hours; and
- truck operating cost: $120 per hour.

4.5.2 Discussion

Introducing a container deposit or refund scheme will reduce the yield of recyclate through household kerbside systems. It is possible that, as a consequence of this reduced yield, councils could decide to reduce the frequency of their kerbside collection services if practical and had the effect of reducing kerbside collection costs. This would only be the case if the reduced service frequency did not lead to substantially increased yield/household/collection relative to the current situation[22]. To test this estimates have been made of the impact of a container deposit or refund scheme on the yield of recyclate through the kerbside system, comparing yields relative to the base case and also on a per household basis relative to the base year (2013).

These estimates are presented in Table 39. The estimates indicate that although the introduction of a CDS will reduce the throughput of recyclate through the kerbside system, the change relative to the base year (2013) is unlikely to be substantial enough for councils to reduce the frequency of the kerbside collection service in a practical and cost effective manner. Indeed, reducing the frequency of the service from fortnightly (the most common frequency of service around Australia) to monthly in conjunction with the introduction of a CDS would lead to a 53% increase in the recyclate yield/household/collection by 2020 and 73% by 2035. This is unlikely to be a practical or cost effective outcome. Reducing the frequency of service from fortnightly to three weekly would still lead to a significant increase in recyclate yield/household/collection also raising a question mark over its feasibility.

[22] If this were to happen reduced service frequency is unlikely to be practical or cost effective since it would require larger recycling bins and an increase in the size and/or number of collection vehicles.

Table 39: Impact of Options 4a and 4b on kerbside recycling (tonnes)

	2015	2020	2025	2030	2035
Total kerbside collection base case (including packaging & non-packaging)	1,460,720	1,640,929	1,736,628	1,816,799	1,866,967
Kerbside recycling with CDS	1,460,720	1,155,294	1,183,699	1,217,817	1,251,445
Percentage change in kerbside collection with CDS relative to base case	0.0%	-29.6%	-31.8%	-33.0%	-33.0%
Percentage change per household, relative to base year(2013)	**0.0%**	**-22.7%**	**-22.1%**	**-20.7%**	**-18.6%**
Impact of change in service frequency to kerbside recyclate yield/household/collection (with CDS system)					
Reduce frequency of service from fortnightly to monthly, relative to base year (2013)	152.9%	159.2%	167.1%	174.0%	152.9%
Reduce frequency of service from fortnightly to three weekly, relative to base year (2013)	114.7%	119.4%	125.3%	130.5%	114.7%

4.5.3 DRIS: Assumptions

For the purpose of the DRIS, we propose that a number of these assumptions be varied.

Regarding collection costs, based on the Sustainability Victoria (2011) Annual Local Government Survey, the DRIS will use the following collection and transport cost estimates:

- Recyclables: $97.48 (metro) and $172.84 (non-metro) per tonne.
- Garbage: $132.18 (metro) and $176.62 (non-metro) per tonne.

Additionally, we propose to adjust collection and transport cost estimates to reflect the fixed component of these costs. This is estimated to be approximately 15% based on a review of information on the breakdown of municipal waste collection and transport costs (DEC NSW 2004, Nolan ITU et al. 2001, Victorian Jurisdictional Recycling Group 2002). For example, instead of assuming that an increase or decrease in metro household kerbside recycling of one tonne leads to a corresponding increase or decrease of $97.48, the model will assume that the change in costs is only 85% of this amount (i.e. $82.86). The effect of this change is to increase the average unit cost of kerbside collection and transport where options result in reduced yields through kerbside recycling or garbage collection systems.

Regarding the cost of returning a load to the MRF, the DRIS will use the following assumptions:

- projected at home recycling with a CDS: 7%;
- truck capacity: 5 tonnes capacity per truck, with sensitivity range of 4 to 6.5 tonnes per truck;
- estimate of time of average return trip: 1 hour (metro) and 1.5 hours (non-metro), with sensitivity range of 0.75 to 2 hours; and
- truck operating costs: $120 per hour.

Truck capacity has changed from 10 tonnes to 5 tonnes per truck. This change was derived both through top down (industry consultation) and bottom up (compaction and vehicle mass limits) assessments. The bottom-up assessment assumes that with an R12 (single axle front and dual axle rear) with vehicle capacity of 29 metres cubed and tare weight of 13 tonnes, the load capacity of the vehicle under different compaction scenarios is 4.4 tonnes (150 kg/m3), 5.1

tonnes (175 kg/m3) and 5.8 tonnes (200 kg/m3). Discussions with industry confirmed that a R12 truck type is most common and the load is typically around 5 tonnes per vehicle. Also, trucks do not operate at maximum capacity as they run the risk of exceeding vehicle mass limits, which would mean they could incur fines and demerits penalties.

Estimated average return trip times also differentiate between metropolitan and non-metropolitan locations. In metropolitan locations, it assumed that vehicles travel to centrally located waste resource facilities (transfer stations or landfills). In non-metropolitan locations, it is assumed that vehicles travel to waste facilities that are located outside of town in abandoned mines pits or construction sites. In this analysis we have used averages, however, we acknowledge that these values will not reflect regional locations that are very long distances from metropolitan regions where recycling services are provided. For instance, stakeholder feedback noted that there are some locations (e.g. Broome) where transport distances for recycles are extremely long (circa 2,000 km to either Perth or Darwin).

Major transport and collection cost assumptions used in the CRIS and proposed for the DRIS are outlined in the table below.

Table 40: CRIS and DRIS transport and collection cost assumptions

Cost item	Application	CRIS assumption	DRIS assumption	Unit
Household Kerbside Collection Cost	All options	187	Recyclables: 97.48 (metro) 172.84 (non-metro)	$/tonne
Commercial and Industrial Kerbside Collection Cost	All options	26	Garbage: 132.18 (metro) 176.62 (non-metro)	$/tonne
% of CDS containers redeemed through kerbside	CDS options	7.1	7.1	%
% of CDS containers redeemed through C&I collections	CDS options	10.1	10.1	%
Load to MRF	All options	10	5	t/truck
Average return trip	All options	1.5	1.5	hours
Vehicle operating cost	All options	120	120	$/hr

4.6 Processing costs at MRF facilities

4.6.1 CRIS assumptions

The CRIS estimated a total cost of processing material at an MRF to be $85 per tonne. The components of this cost are shown in the table below.

Table 41: CRIS processing of recyclate at MRFs cost assumptions

	$ per tonne
Processing cost for material delivered to MRF ($/t)	$45
Assume residual/reject (%)	20%
Assumed cost to landfill residual ($/tonne)	$200
Total MRF processing cost (including residual disposal)	$85

Source: Table 45, Attachment C, CRIS.

4.6.2 Discussion

The $45 per tonne processing cost for material delivered to MRF is consistent with previous studies undertaken by Marsden Jacob, reflecting evidence from a number of jurisdictions. The weighted average reject rate of 20% is also consistent with available evidence from the recycling industry. We do not believe, however, that the average cost to landfill of the residual of $200/ tonne is consistent with jurisdictional evidence, which points to substantial differences in landfill operating costs between jurisdictions and regions. Given this, we propose to derive different rates for different regions in the CBA model.

4.6.3 DRIS Assumptions

For the DRIS, a contamination rate 'assume residual/reject (%)' is applied in the Material Flows Analysis and thus the volume of material representing residual from MRF is explicitly included in tonnes to landfill. Therefore, the CBA model will automatically apply the prevailing assumptions relating to landfill operating costs and externalities for this portion (derived based on region of MRF operation – see Tables 42 to 46, section 5.2). Those cost assumptions are discussed in section 5.2.

Table 42: Processing of recyclate at MRFs cost assumptions

Data variable	CRIS assumption	DRIS assumption	Unit
Processing cost for material delivered to MRF ($/t)	$45	$45	$ / t
Assume residual/reject (%)	20%	Applied in the Material Flows Analysis	%
Assumed cost to landfill residual ($/tonne)	$200	Derived based on region	$ / t

4.7 Infrastructure and operating costs

4.7.1 Option 1

CRIS assumptions

The National Waste Recycling and Litter Strategy is intended to focus on improved use of current infrastructure through increased knowledge, education and information sharing. As such, costs are expected to be primarily in the areas of information, education and co-ordination. Proposed programs and costs assumptions relating to those programs are outlined in Table 43.

Table 43: Option 1 program and cost assumptions

Sub-category	Data variable	CRIS assumption	DRIS assumption	Unit
Option 1 initiatives	Government initiatives including: - National recycling education/ advertising initiative - Information sharing between state and local governments	3	3	$ m/year 2016-2020
	Development of non-regulatory standards for end products and recycling labelling for packaging	2	2	$ m/year 2016-2025
	Investment initiatives including: - National program to improve away from home recycling at mass consumption areas though improved bin labelling - Consistent recycling of recycling bins - Additional initiatives (yet to be defined – based on needs at the time of implementation)	7.5	6.4 (as determined through MRCCs)	$ m/year 2021-2035
	National education program for litter prevention	2	2	$ m/year 2016-2020
	National litter count methodology	1	1	$ m 2015
	Additional litter initiatives (undefined)	2	2	$ m/year 2021-2035

Discussion and DRIS assumptions

The cost estimates provided in the CRIS for Option 1 programs appear, on face value, to be reasonable. Rather than accept them at face value however, we tested their veracity and their capacity to deliver the assumed recycling rates (see Tables 10 and 11) through application of marginal recycling cost curves as they apply to Options 2a-2e (see following section). As a result of this application program cost estimates have been revised as set out in Table 43.

4.7.2 Options 2a to 2e and 3

CRIS assumptions

Options 2a to 2e and 3 are all based on the implementation of a range of recycling infrastructure and non-infrastructure programs. Table 44 provides an overview of programs under each of the initiatives and (Options 2a, 2b, 2c and 3 only) cost estimates used in the CRIS.

Table 44: Program and cost assumptions for options 2a-2e, 3

Sub-category	Data variable	CRIS assumption	DRIS assumption
Option 2a initiatives	Additional recycling initiatives	$2m/year	~ $10.1m/ year over project life (approximating $13.5m/year 2016-2020)
	Litter initiatives	$5m/year	$5m/year
Option 2b initiatives	Range of initiatives designed to increase recycling and reduce litter including: - public place recycling - kerbside recycling	$15m/year	~38.9m/ year over project life (approximating $75.5.m/year 2016-2020)
	Litter initiatives	$5m/year	$5m/year
Option 2c initiatives	Recycling and litter initiatives as proposed for Option 2b plus: - improved regional and remote beverage container recovery through organised backload arrangements; - extension of recycling opportunities in regional LGAs; - end market development support to create new markets; and - litter enforcement and financial incentives to reduce litter.	$27.1-37.4m/year	~54.9m/ year over project life (approximating $115.2m/year 2016-2020)
	Litter initiatives	$5m/year	$5m/year
Option 2d	Initiatives required to meet beverage container recycling targets	na	~39.9m/ year over project life (approximating $71.7m/year 2016-2020)
	Litter initiatives	na	$5m/year
Option 2e	Grants based program at three different levels of investment: $20m; $35m; $50m	na	$20m/year 2016-2020 (~13.2m/ year over project life) $35m/year 2016-2020 (~19.3m/ year over project life) $50m/year 2016-2020 (~25.5m/ year over project life)
	Litter initiatives	na	$5m/year
Option 3 initiatives	Undefined recycling and litter programs, similar in scale to Option 2C	$27.1-37.4m/ year	~54.9m/ year over project life (approximating $115.2m/year 2016-2020)
	Litter initiatives	$5m/year	$5m/year

Discussion and DRIS assumptions

Little evidence is provided in the CRIS to substantiate programs and associated costs necessary to achieve recycling levels assumed for Options 2a to 2c and 3. It was therefore necessary to test the veracity of program and cost assumptions by developing and applying marginal recycling cost curves (MRCCs). A similar approach is proposed for the new options 2d and 2e. The method used to develop and apply the MRCCs is discussed below. Costs associated with each of the options estimated through the application of this approach are included in the Regulatory Impacts report.

Application of Marginal Recycling Cost Curves (MRCC)

Marginal Recycling Cost Curves (MRCCs) were constructed by analysing data from the project performance monitoring data supplied by the Product Stewardship Forum (PSF), estimates of cost and recycling outcomes achieved by projects funded under the Australian Packaging Covenant (APC) and estimates of the cost and recycling volumes through implementation of a National Bin Network (NBN) and other initiatives. In the MRCC's, costs are calculated on a 'levelised cost' basis. That is, for each recycling opportunity in the MRCC, the total (capital and operating) costs of that project are apportioned equally over each tonne of recycling achieved over the life of the project. Measuring industry costs in this manner provides a 'smoothed' profile of costs to industry with costs increasing (decreasing) as recycling target tonnes increase (decrease) over time.

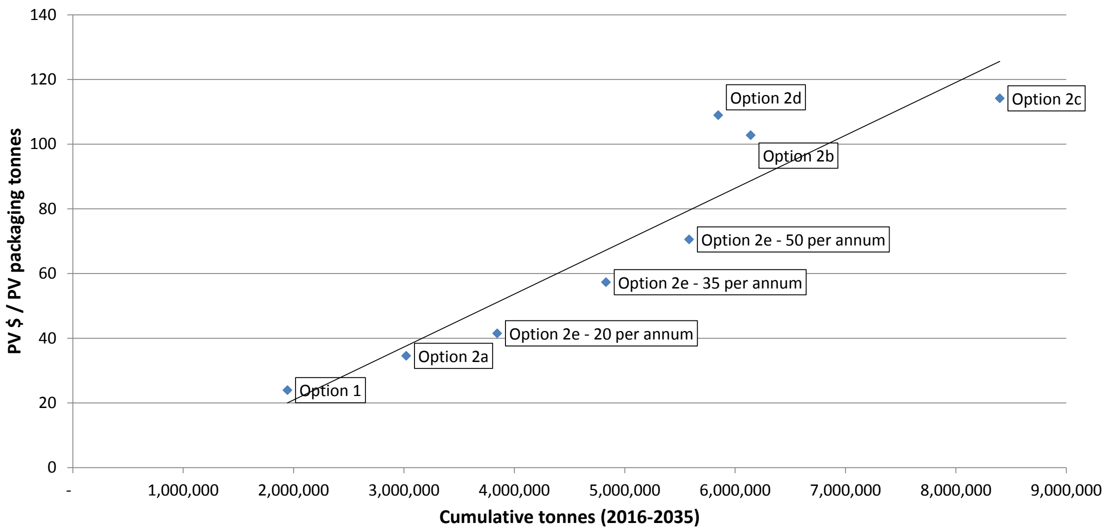
In practice, industry may fund the total cost of project in a number of ways. Industry participants may use spare capital from their reserves or finance the project through bank debt, with repayments being paid back over the life of the project. However, the CBA analysis does not make assumptions about the profile of spend, or type of financing undertaken by the industry. Rather, the levelised cost approach provides an 'annual equivalent' amount that is required by industry for each year of the study period. Doing so, ensures that all of the costs (capital and operating) associated with the target are accounted for in the CBA analysis and if, for example, further investment is required towards the later years of the analysis (due to higher targets in later years), the capital associated with the additional tonnages is adequately accounted for.

Further details of the approach used to develop the MRCCs are provided in Box 2.

Results

Results of the MRCC analysis are summarised in Figure 2, which maps the present value (PV) of costs against additional recycling above the base case (cumulative tonnes) for each option after adjusting for a risk premium. Resulting values are expressed as $/ tonne. The figure indicates that Option 2c achieves the greatest level of recycling of the options, but at highest average cost ($ 114/ tonne). Options 2b, 2d and 2e ($50m), achieve similar overall recycling outcomes, but Option 2e ($50 m) is more cost-effective ($75/ tonne) than either 2b ($103/ tonne) or 2d ($109/ tonne). This is to be expected given that Options 2b and 2d both involve beverage container targets (as well as overall targets), whereas Option 2e has no such constraints.

Figure 2: MRCC recycling and cost outcomes, Options 1 and 2a to 2e



Results Options 2a to 2d

Based on application of the MRCC, achieving the recycling outcomes and targets estimated for Option 2a (see Table 12) will require annual investment of approximately $10.1 million/ year averaged over 20 years from 2016 to 2035. These investment amounts include allowance for additional investment required in later years to upgrade or replace recycling infrastructure (assuming an average life of approximately 15 years for the initial investments).

Achieving the recycling outcomes and targets estimated for Option 2b (see Table 12) will require annual investment of approximately $38.9 million from 2016 to 2035. As with Option 2a, these investment amounts include allowance for additional investment required in later years to upgrade or replace recycling infrastructure.

Achieving the recycling outcomes and targets estimated for Option 2c (see Table 12) will require annual investment of approximately $54.9 million from 2016 to 2035, including allowance for additional investment required in later years to upgrade or replace recycling infrastructure.

Achieving the recycling outcomes and targets estimated for Option 2d (see Table 12) will require annual investment of approximately $39.9 million from 2016 to 2035, including allowance for additional investment required in later years to upgrade or replace recycling infrastructure. Although Option 2d achieves less additional recycling overall than Option 2b (see Figure 2), the greater investment cost reflects constraints associated with slightly more stringent beverage container recycling targets.

Results Option 2e

Application of the MRCC to Option 2e was essentially the reverse of the approach used for Options 2a to 2d. It involved simulating the investments that are expected to occur if additional funding above what is already planned under the Australian Packaging Covenant (APC) is invested. For the DRIS, three levels of additional funding will be modelled, being $20 million per annum for five years from 2016 to 2020; $35 million per annum; and $50 million per annum.

While the target is expressed as a certain amount per year (e.g. $35 million), it is assumed that the total amount available (e.g. $175 million in the case of $35 million per year) to be invested is gradually ramped until the pool funding is exhausted. The principle applied to determine this trajectory is the same that would apply to depreciating an asset of the same value (e.g. $175m) over the given term (e.g. 5 years), using a 'straight line' depreciation method. In the example of $35m per year, this provides the following investment profile.

Table 45: Profile of investment for option 2e (assuming $35m per year)

	2016	2017	2018	2019	2020
New investment ($m)	11.7	23.3	35.0	46.7	58.3

It is also assumed that this funding is predominantly used for capital subsidy for projects that remain active during the modelling period (until at-least 2035) and that under the scheme the optimal (defined as the set of projects that maximise overall tonnes of recycling (not just packaging)) set of projects will be selected through a collaborative industry-government committee.

The estimated additional tonnes of recycling results of applying the MRCC logic to Option 2e are shown in Figure 3 to Figure 5. The data in the figures represent thousands of additional tonnes above the base case each year, for each of the three investment levels of $20m per annum, $35m per annum and $50m per annum. These have been translated into recycling rates, which are shown in Table 12.

Figure 3: Recycling outcomes for Option 2e (above base case, assuming funding of $20m per year)

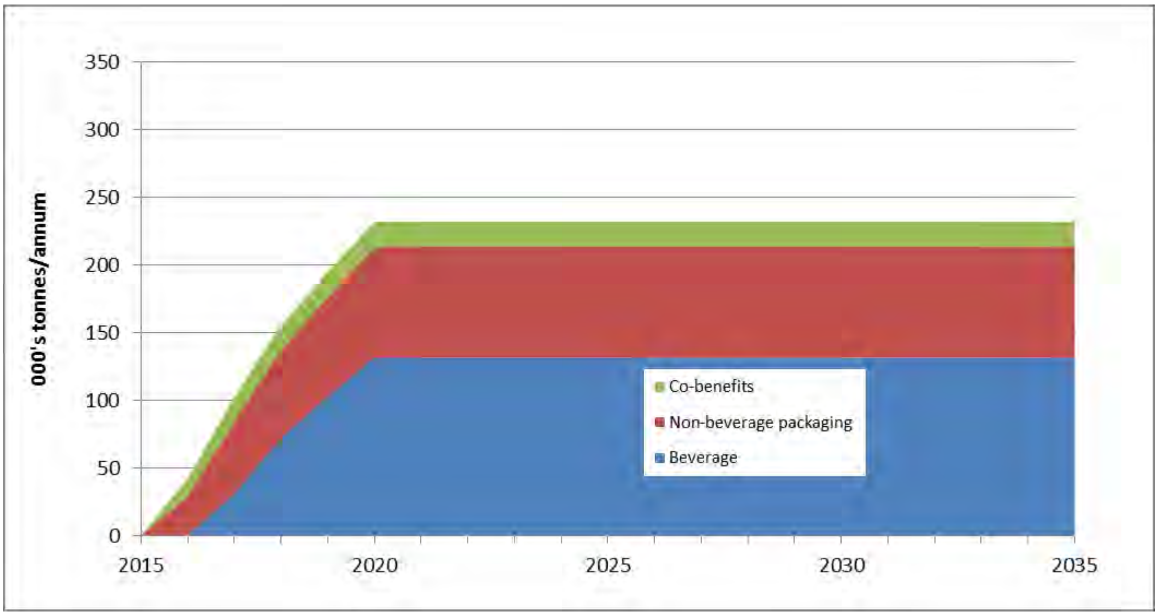


Figure 4: Recycling outcomes for Option 2e (above base case, assuming funding of $35m per year)

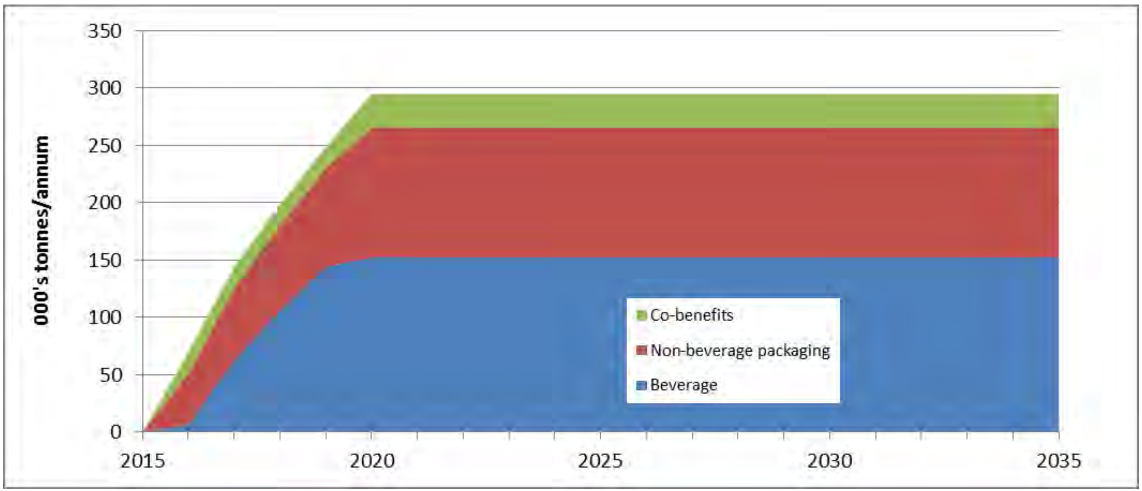
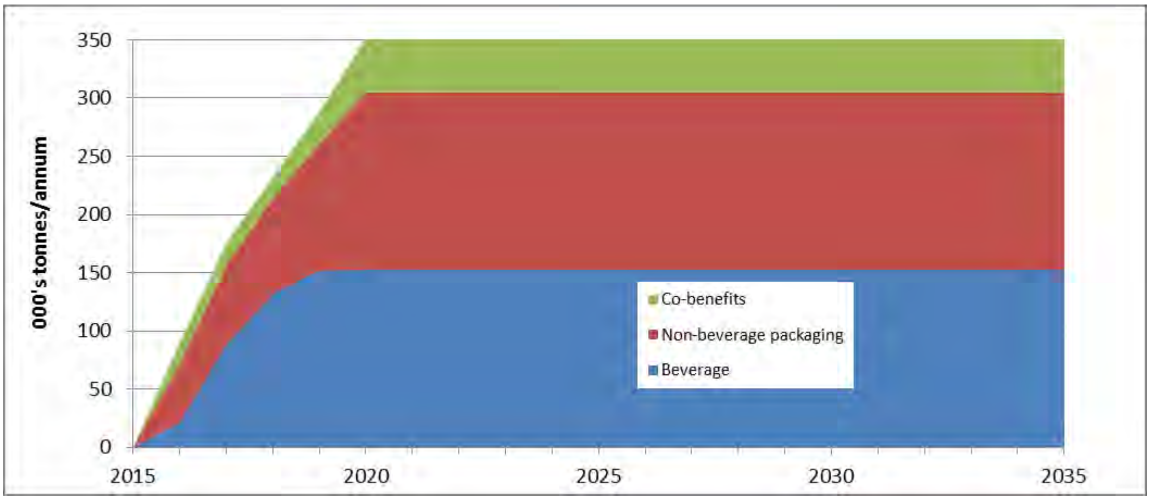


Figure 5: Recycling outcomes for Option 2e (above base case, assuming funding of $50m per year)



Application of a risk premium

Numerous Australian and overseas behavioural studies have examined factors influencing recycling (e.g. De Young 2000, Gamba and Oskamp 1994, Hornik et al. 1995, Osbaltson & Schott 2012). Studies indicate that while the 'convenience' of recycling is a very important factor influencing levels of recycling (e.g. the number and location of recycling bins), other factors relating to personal behaviour are important complimentary influences. Barriers to recycling linked to personal behaviour include:

- inadequate instructions to consumers about what can be recycled, where and how;
- insufficient or inappropriate prompts reminding consumers about what, where and how to recycle;
- (for some groups) a lack of justification on why to recycle; and
- social norms and perceptions (e.g. recycling in public places may not yet be 'standard practice').

Recycling investments identified through the MRCCs and proposed for implementation through the co-regulatory options (2a-2e) will target significant barriers to public place and C&I

recycling, notably the 'convenience' factor. It is apparent however, that even where investments provide substantially improved levels of recycling infrastructure and services there is a significant risk that recycling targets will not be met due to the barriers linked to personal behaviour described above. This risk is evident for all options, but more so for the co-regulatory options because (unlike CDS options) the co-regulatory options do not provide consumers with an external financial incentive to recycle or not to litter. The risk is especially evident for Options 2b, 2c and 2d because they require high beverage container recycling rates to be achieved – rates that approach theoretical upper limits – while relying on standard, co-mingled recycling systems[23] (e.g. away from home glass and steel beverage containers are required to achieve beverage recycling rates of over 80%, a difficult proposition considering typical contamination rates of 20% for co-mingled recycling systems).

In the absence of an external incentive therefore, it is assessed that substantial and sustained investment in education and information programs will be required to facilitate behavioural change, thereby reducing the risk of co-regulatory options not meeting recycling and litter targets to a level that is comparable with the CDS options. Education and information programs will need to focus on improving knowledge and understanding of away from home recycling facilities and practices and to provide the necessary prompts to consumers to recycle packaging materials that are consumed away from home. Programs are likely to include (but not be limited to):

- a mass media advertising campaign;
- information packages presented in variety of formats; and
- on the ground staff providing audits, education and follow-up monitoring at targeted locations.

The proposed education and information programs will need to be additional to the nominal levels of information and education implemented as part of the infrastructure and service investments identified through the MRCCs. As such, the programs can be regarded as a 'risk premium'.

It is estimated that up to $20 million/year nationally will be needed for the highest risk options - to be scaled up in early years in line with infrastructure investments, scaled down again after 2025, but still maintained at level necessary to maintain an ongoing education and information program. The premium would be applied in full to the co-regulatory options that have very high beverage container recycling targets for 2025 (i.e. 80% - Options 2b, 2c and 2d). The premium would be applied to other co-regulatory options in proportion to their beverage container recycling rates in 2025, but only if their overall beverage container recycling rates exceed a threshold of 70%[24]. Thus Option 2a would not attract a risk premium and Options 2e-20, 2e-35 and 2e-50 would attract a premium but at a relatively low level.

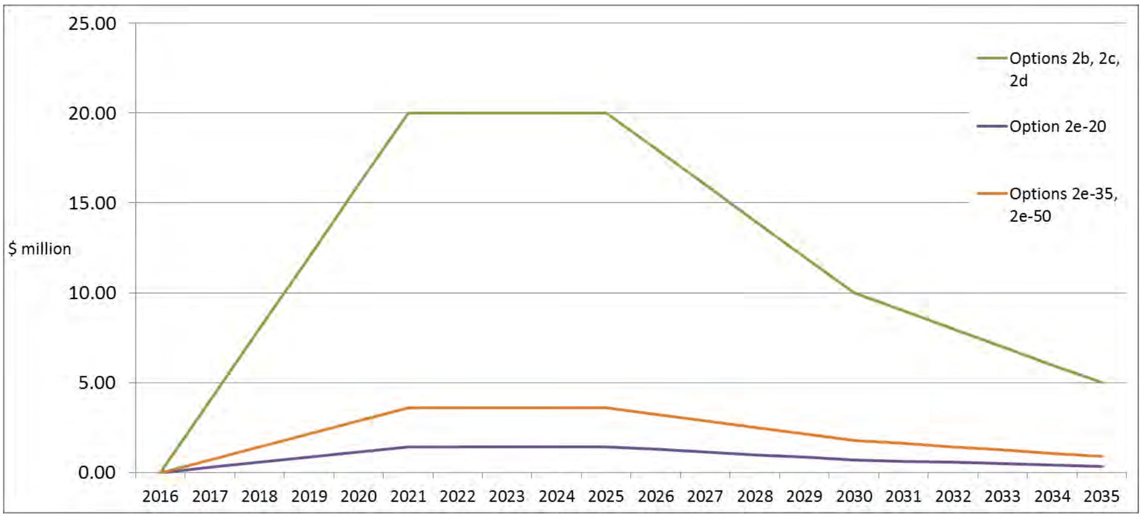
The proposed premiums for the each of the co-regulatory options are presented in Figure 6. The premiums are applied externally to the MRCC process as they are assumed to have no

23 In practice, recycling rates are constrained to much less than 100% because of practical difficulties of recovering all packaging waste. Indeed it may be difficult to achieve a recycling rate much greater than 80% for some material types and waste streams due to the relatively high contamination rates associated with most co-mingled recovery systems (assumed to be 20%). Certainly, it will be difficult to achieve a beverage container recycling rate of much more than 80% when the system relies predominantly on co-mingled recovery.

24 To achieve an overall beverage container recycling rate of 75% or greater requires recycling rates for some materials to approach or exceed 80% from some sources (e.g. public place) or in some regions. Once the overall beverage container recycling rate reaches 80% exceedances become far more common.

additional impact on recycling levels, but are necessary to provide a high level of confidence that each of the options meets its intended/ targeted beverage container recycling rate (see Table 9).

Figure 6: Education and information 'risk premium' applied to co-regulatory options



Box 2. Application of Marginal Recycling Cost Curves to derive estimates of costs

Under the base case, it is assumed that investments in recycling infrastructure are adopted by industry where it is financially viable for them to do so. A corollary of this is that if recycling rates over and above the base case are desired then this would require a financial outlay from industry which may be in the form of financial incentives (e.g. grants, subsidies etc.) or through mandates (e.g. obligations to invest in measures to achieve a certain recycling target).

In the latter (which is the model adopted in Options 2a to 2d) the industry would seek to meet their obligations at least cost. This is consistent with economic theory for profit maximising firms. Also consistent with economic theory (law of diminishing returns), the greater the volume of recycling desired, the greater the marginal cost (cost for an additional tonne of recycling) and determining the total cost of meeting a given target may be estimated by calculating the area under a marginal cost curve.

To facilitate this analysis, MRCCs (reflecting the marginal financial cost to industry[25] for cumulative volumes of recycling) were constructed using the following sources:

- Estimates of the cost and recycling volumes through implementation of a National Bin Network provided by the Product Stewardship Forum (PSF);
- Project performance monitoring data supplied by the PSF; and
- Estimates of cost and recycling outcomes achieved by projects funded under the Australian Packaging Covenant (APC).

The project data from these sources were analysed to produce data points for the MRCC. As the data was not available in a standardised format and included gaps and uncertainties, the project team undertook a process to 'cleanse' and standardise the data base. This involved excluding projects where there was significant uncertainty as to cost, recycling outcomes and/or projects that may not actually lead to incremental recycling outcomes (referred to as 'additionality') and adjusting the estimated cost of some projects to reflect a likely 'actual' cost (based on outcomes of other projects of a similar nature) as opposed to a 'projected' cost. It also involved making assumptions about the characteristics of the project (e.g. sector targeted, lifetime, annual operating expenditure etc.) where this data was not provided. A final list of projects was then extrapolated to provide a list of potentially national scale projects, including commercial and industrial (C&I), public place (LGA or commercial), kerbside or mixed. In undertaking the extrapolation the following factors were taken into account:

- the feasibility of implementing projects in different jurisdictions including, for example, that the relevant packaging consumption sources (C&I, public place etc.) are available and that similar initiatives are not already being applied in those jurisdictions;
- the feasibility of implementing the projects in metropolitan and/or non-metropolitan areas;
- the likely material mix (e.g. glass, plastics, mixed); and
- the potential life of the project.

Through this process, for each project ('measure') the following were estimated.

25 There is a distinction between the financial cost to industry (the funds that industry expend to support recycling activity) and the economic cost to society. The former will only include packaging industry expenditure. The latter includes the full set of economic costs and benefits associated with increased recycling (e.g. benefit of avoided landfill, market value of resources etc.). The 'ranking' of recycling measures on a financial cost curve will be different to their 'economic efficiency' (benefits less costs).

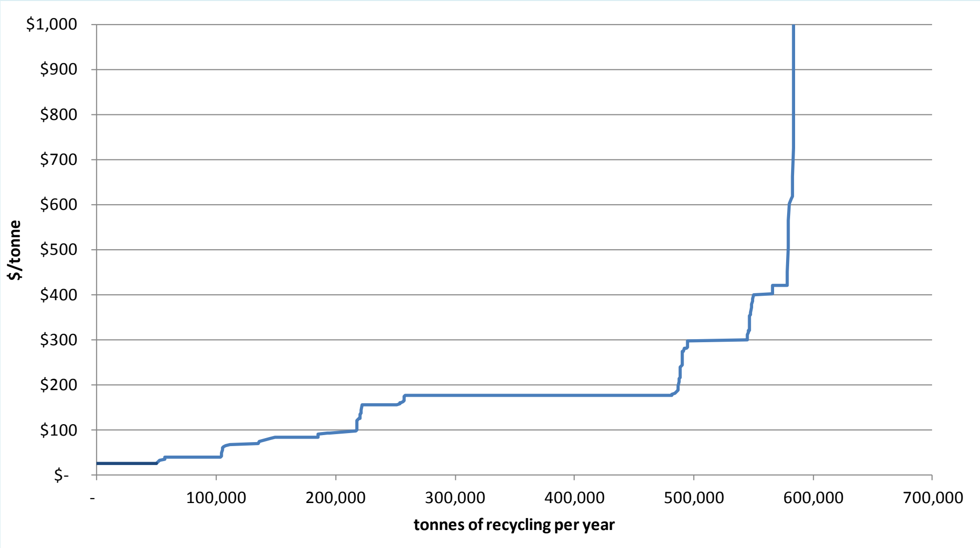
Table 46: Proposed DRIS market value assumptions

	Unit	Method used to estimate
Total for measure		
Cost effectiveness	$/t	Apportionment of capital and operating costs of the project over the total tonnes of recycling delivered by the project over its lifetime (i.e. a 'levelised cost').
Tonnes per annum	t.p.a	Tonnes of recycling achieved per year
Sector		C&I, Public Place or Mix (not focussed on a given sector)
Material composition		Material targeted (or a mix of material)
Container type		Whether the measure targets packaging, beverage containers or any type of material
Metro/Non-metro		Whether the measure may be implemented in metro areas, non-metro areas or all

Finally, a 'cut-off' point on the MRCC was determined, with this point being the point at which projects are likely to be additional to the base case (i.e. it is anticipated that the lower cost projects below this point will be implemented as part of the base case). The cut-off point was determined by considering growth in recycling under the base, net of 'natural growth' in recycling under the base due to growth in consumption.

Figure 6 shows the results of this analysis, with the supply curve of investable opportunities sorted in rank of annualised $/t of total recycling[26]. The expected recycling outcome for a given year is taken as the corresponding x-axis (tonnes per annum) value where the area under the curve is equal to the annualised amount of funding provided ($m).

Figure 7: Investable opportunities for Options 2a to 2e (above base case)



These results have inherently large margins of uncertainty. Due to this uncertainty recycling project infrastructure costs for Options 2a-2e will be an important aspect of sensitivity analysis.

26 There are in fact three versions of the MRCCs as there are varying targets for particular types of material in each option. For options that contain a beverage target (or sub-target) the MRCC ordered by $/t of beverage recycling is used first. Following this step (or if the target is only a packaging target) the MRCC, ordered by $/t of packaging, is used for any residual packaging volumes. Finally, Option 2e uses the MRCC ordered by $/t of total recycling (packaging and non-packaging).

4.7.3 Options 4a, 4b, 4c

CRIS assumptions

The CRIS adopted a widely accepted approach to estimating the cost of CDS arrangements, with estimates made of the various cost elements on a per container basis. Each unit cost provided is fully inclusive of both capital and operating costs.

In developing its cost estimates, the CRIS assessed a Boomerang Alliance (BA) model but ultimately used different estimates for unit costs, which it deemed to be more representative of current unit costs. As outlined in Table 30, the costs adopted in the CRIS for Option 4a are assumed to be 4.5 cents/container, rising to 6.0 cents/container in rural and remote locations. Co-ordination across the system is 0.4 cents/container, baling and transport from collection centres, RVMs and rural and remote collection points to hubs (urban and rural) is 0.72 cents/container, and rural and remote transport from hubs to reprocessors is estimated at $106.30 per tonne.

The handling cost adopted for Option 4b in the CRIS was 5.0 cents/container, reflecting the smaller number of RVMs proposed for this option, and 6.0 cents/container for rural and remote locations. Co-ordination across the system is also assumed to be 0.4 cents/container. Baling for transport is 0.3 cents/ container, transport (rural and remote collection point to consolidation depot) is 0.5 cents/container, allowing for backloading efficiencies. Transport from collection depots and RVMs to consolidation depots is 0.4 cents/container. Remote transport from consolidation depots to reprocessors is estimated at $106.30 per tonne.

Discussion and DRIS assumptions

Similar to the CRIS project team, the DRIS project team was provided with modelling of Option 4a on a confidential basis. However, the model provided to the DRIS team differed from the earlier model, in that it modelled the revised Option 4a, which is based entirely around RVMs as collection points. The model also provided a range of estimates for capital and operating costs, assuming different sizes and configurations of RVM collection points. A key argument advanced through the model is that an RVM-based scheme provides efficiencies relative to a depot-based system, with those efficiencies reflected in lower capital and operating costs. We accepted this argument in part, adopting a capital and operating cost estimate for RVMs of 3.9 c/container in metropolitan areas and 4.5 c/container in non-metropolitan areas. This is at the conservative (high) end of the range of estimates provided by its proponent but is lower than the 4.5c/ container cost assumed in the CRIS for RVMs.

Infrastructure and cost assumptions proposed in the DRIS are set out in Table 47. Other important points to note about these cost estimates are as follows:

- Capital and operating costs estimate for RVMs includes an assumed rental/ incentive payment to retailers of 0.2c/ container in metropolitan areas and 0.3c/ container in non-metropolitan areas.
- Capital and operating cost differences between metropolitan and non-metropolitan areas include assumed higher operating costs in non-metropolitan areas due to smaller scale of operation and, in the case of RVMs, higher rental costs (mentioned above).

- Transport costs are assumed to be lower in metropolitan areas than regional areas, which in turn are lower than transport costs in remote areas.
- System administration and coordination costs are addressed in the section on PSO administration costs (see section 4.2).

Table 47: Options 4a, 4b, 4c CRIS and DRIS cost assumptions

Option	Data variable	CRIS assumption	DRIS assumption	Unit
Option 4a (Boomerang CDS)	Capital and operating costs – Hubs	4.5	4.0 (metro) 4.2 (non-metro)	c/container
	Capital and operating costs – RVMs	4.5	3.9 (metro) 4.5 (non-metro)	c/container
	Capital and operating costs – remote collection points	6	6	c/container
	Baling for transport	0.3	0.3	c/container
	Transport: RVM and collection points to Hubs	0.4	0.5 (metro) 0.7 (non-metro)	c/container
	Transport: remote RVM and collection points to Hubs	0.6	0.9	c/container
Option 4b (Centralised CRS)	Capital and operating costs – Consolidation points	5	4.0 (metro) 4.2 (non-metro)	c/container
	Capital and operating costs – Collection depots	5	4.5 (metro) 5.0 (non-metro)	c/container
	Capital and operating costs – RVMs	4.5	3.9 (metro) 4.5 (non-metro)	c/container
	Capital and operating costs – remote collection points	6	6	c/container
	Baling for transport	0.3	0.3	c/container
	Transport: collection depot and RVM to consolidation depot	0.4	0.5 (metro) 0.7 (non-metro)	c/container
	Transport: remote collection point to consolidation depot	0.5	0.9	c/container
Option 4c (SA CRS)	Capital and operating costs – super collectors	na	0.5	c/container
	Capital and operating costs – collection depots	na	4.5 (metro) 5.0 (non-metro)	c/container
	Capital and operating costs – RVMs	na	3.9 (metro) 4.5 (non-metro)	c/container
	Capital and operating costs – Remote collection points	na	6	c/container
	Baling for transport	na	0.3	c/container
	Transport: collection depot to super collector	na	0.5 (metro) 0.7 (non-metro)	c/container
	Transport: remote collection point to super collector	na	0.9	$/tonne

As discussed in the CRIS, industry practice is to express scheme costs on a unit (i.e. 'per container') basis, but because recycling projections have been estimated on a weight (i.e. 'per tonne') basis, it is necessary to convert unit costs to a weight basis. The approach and assumptions used in the CRIS to undertake this conversion have been applied with the revised cost estimates, revised configurations for Options 4a and 4b and the new Option 4c. Results of this process are set out in Table 48, providing a weighted average of costs for metropolitan and non-metropolitan areas.

The estimated costs of $537/ tonne, $557/ tonne and $648/ tonne respectively for Options 4a, 4b and 4c compare with costs of $689/ tonne and $749/ tonne estimated in the CRIS respectively for Options 4a and 4b.[27] On a per container basis, the weighted average costs of Options 4a, 4b and 4c proposed for the DRIS are 4.5 c/ container, 4.7c/ container, 5.4 c/ container respectively.

As noted, the costs outlined in Table 47 are weighted averages for metropolitan and non-metropolitan areas. However, metropolitan and non-metropolitan cost will be differentiated in the CBA and distributional analysis. Infrastructure and operating costs in metropolitan areas are estimated to be $510/ tonne, $526/ tonne and $608/ tonne for Options 4a, 4b and 4c respectively. This compares with infrastructure and operating costs in non-metropolitan areas of $595/ tonne, $609/ tonne and $692/ tonne respectively for Options 4a, 4b and 4c.

Table 48: Options 4a, 4b, 4c DRIS cost estimates

Option 4a - Weighted infrastructure & handling cost per tonne			
Cost item	**Cost ($/tonne)**	**Proportion of infrastructure (%)**	**Weighted cost ($/tonne)**
Capital and operating costs – Hubs[28]	484.3	21.1%	102.1
Capital and operating costs – RVMs	486.8	70.3%	342.3
Capital and operating costs – Remote collection points	714.2	1.5%	10.7
Baling for transport	35.7	92.9%	33.2
Transport: RVM to Hubs, metro & regional	66.8	70.3%	47.0
Transport: Remote collection point to Hubs	106.3	1.5%	1.6
Total weighted metro & non-metro Option 4a			**536.9**

[27] Note the DRIS costs exclude administration and coordination costs which were estimated at approximately $50/ tonne in the CRIS.

[28] Capital and operating costs Hubs include handling fees (3.7c/ container) and compaction fees (0.4 c/container). Capital and operating costs collection depots include handling fees (4.25c/ container) and compaction fees (0.4c/container). Capital and operating costs RVMs include handling fees (3.5c/ container), compaction fees (0.4c/ container) and retailer incentive payment (0.25c/ container). Capital and operating costs include handling fees (5.6c/ container) and compaction fees (0.4c/ container). Capital and operating costs remote collection points include handling fees (5.6c/ container) and compaction fees (0.4c/ container).

Handling fees are assumed not to apply to material recovered through the kerbside system (7.1%).

Option 4b - Weighted infrastructure & handling cost per tonne			
Cost item	**Cost ($/tonne)**	**Proportion of infrastructure (%)**	**Weighted cost ($/tonne)**
Capital and operating costs – Consolidation points	484.3	21.1%	102.1
Capital and operating costs – Collection depots	554.0	30.2%	167.2
Capital and operating costs – RVMs	486.8	40.1%	195.4
Capital and operating costs – Remote collection point	714.2	1.5%	10.7
Baling for transport	35.7	92.9%	33.2
Transport: collection depot and RVM to consolidation depot, metro & regional	66.8	70.3%	47.0
Transport: Remote collection point to consolidation depot	106.3	1.5%	1.6
Total weighted metro & non-metro Option 4b			**557.2**

Option 4c - Weighted infrastructure & handling cost per tonne			
Cost item	**Cost ($/tonne)**	**Proportion of infrastructure (%)**	**Weighted cost ($/tonne)**
Capital and operating costs – super collectors	53.6	92.9%	49.8
Capital and operating costs – collection depots	554.0	70.1%	388.1
Capital and operating costs – RVMs	486.8	21.3%	103.9
Capital and operating costs – Remote collection points	714.2	1.5%	10.7
Baling for transport	35.7	92.9%	33.2
Transport: collection depot to super collector, metro & regional	66.8	91.4%	61.1
Remote transport: collection point to super collector	106.3	1.5%	1.6
Total weighted metro & non-metro Option 4c			**648.3**

4.8 Business compliance costs

4.8.1 CRIS assumptions

Businesses that exceed the threshold for inclusion in a packaging scheme could incur compliance costs related to preparing action plans and reporting. Drawing on information provided by the Environment Protection and Heritage Council (2010), these costs are estimated to be around $11,000-12,000 annually per medium-sized liable party to the APC.

The CRIS applied costs estimates of this magnitude to parties for Options 2a, 2b, 2c and 3 but assumed that there would only be a very small number of additional liable parties under these options relative to the (estimated) more than 850 liable parties that are currently covered by the APC. The CRIS did not estimate any compliance costs for Options 4a or 4b.

4.8.2 Discussion

Data compiled by the NEPC Working group suggests that, with the exception of Option 1, each of the options will involve compliance costs including plan development, reporting and labelling for substantial numbers of additional parties. As well, a small number of major retailers will face compliance costs associated with a requirement to establish a convenience point in their car park or building for all outlets with a retail floor area of greater than 800m^2.[29]

Table 49 provides an overview of estimated compliance costs.

Compliance costs for Options 2a to 2c, 2e and 3 are based on an estimated weighted average cost of $15,000 per year per liable party for action planning and reporting. It is assumed that there are no additional liable parties under Option 2d compared with the current situation.

Compliance costs for Options 4a, 4b and 4c are estimated to be $5,000 per liable party at startup for labelling. Additionally there are ongoing compliance costs of $3 million per annum for Options 4a and 4b and $1.5 million per annum for Option 4c. Ongoing costs are based on one additional hour per month required for: data reconciliation and reporting to the tax collection agency (4a, 4b) or super collector (4c), checking and processing of those entities' notices of assessment/invoices (4a, 4b, 4c), occasional audit management and dispute resolution (4a, 4b, 4c) and periodic review/renewal of commercial relationship with super collector (4c). Retailer compliance costs, associated with the need to maintain a register of outlets that are required to establish a convenience point, have been estimated at $0.5 million per annum assuming that only major retail chains are liable under the scheme[30].

[29] Note this requirement raises potential competition policy issues that will need to be explored fully in the DRIS.

[30] These costs are only for Option 4a and are additional to the incentive payment to retailers to cover administration and other costs associated with the housing of RVMs in stores. It is possible that other independent retailers would exceed the 800m^2 threshold and also become liable.

Table 49: DRIS proposed compliance costs

Category	Application	CRIS assumption	DRIS assumption	Additional liable parties	Unit
Plan development and reporting	Option 1	0	0	0	$ m/ year
	Option 2a	0.69	2.25	150	$ m/ year
	Option 2b	0.69	2.25	150	$ m/ year
	Option 2c	0.69	2.25	150	$ m/ year
	Option 2d	na	0	0	$ m/ year
	Option 2e	na	2.25	150	$ m/ year
	Option 3	0.69	2.25	150	$ m/ year
Labelling design, plates and printing	Option 4a	0	25.0	5000	$m
	Option 4b	0	25.0	5000	$m
	Option 4c	0	12.5	2500	$m
Data reconciliation and reporting	Option 4a	0	3.0	5000	$ m/ year
	Option 4b	0	3.0	5000	$ m/ year
	Option 4c	0	1.5	2500	$ m/ year
Retailer compliance	Option 4a	0	0.5	5	$ m/ year

4.9 Loss of producer surplus

4.9.1 CRIS assumptions and discussion

The CRIS did not estimate the potential impact to industry (or consumers) from lower sales associated with the price impacts of options. In the DRIS however, these price impacts will be assessed as estimated loss of producer surplus.

4.9.2 Loss of producer surplus, Options 4a, 4b and 4c

Loss of producer surplus for manufacturers of beverage container products is assumed to result from the price impacts of implementing a CDS scheme. The loss results because fewer beverages are assumed to be purchased (due to higher prices faced by customers) and lower sales lead to lower after tax profits for the manufacturers.

Loss of producer surplus is estimated by segmenting the market in two ways and then summing the results of each of the segments to obtain a total. The first segmentation is undertaken by product category, because the responsiveness of items sold to price (price elasticity of demand) and the profit margin per item is estimated to vary across the categories. The product categories are:

- beer manufacturing;
- bottled water manufacturing;
- milk and cream production;
- soft drink manufacturing;
- spirit manufacturing;
- fruit juice drink manufacturing (relevant to Options 4a and 4b only); and
- wine manufacturing (relevant to Options 4a and 4b only).

The second segmentation is undertaken by customer segment. This is required as each of the following segments experiences a different effective price increase (depending on whether they redeem or not):

- customers who redeem their own containers;
- customers who do not redeem - their containers are either redeemed by a third party or are not redeemed at all.

For each of the product and customer segments, the process of estimating loss of producer surplus essentially involves four steps:

1. Estimate an absolute average product price impact per container[31].
2. Determine effective price impact on each customer segment[32] [this is the absolute average produce price impact from step 1 minus refund amount (for customers redeeming their own containers only)].

31 For Option 4a, this is just the deposit rate. For Options 4b and Option 4c, this is the expected costs of refunds (this in turn depends on expectations of redemption rates) plus net costs of the scheme operation, divided by the number of containers.

32 The effective price impact for redeeming customers will be zero under Option 4a and could possibly be negative under Options 4b and 4c.

3. Determine the change in volume (applying the relevant price elasticity of demand) due to the change in price.
4. Determine the change in after tax profit, multiplying change in volume by profit margin.

Average price and profit margin by industry

The assumptions used for price and profit margins are listed in Table 50.

Table 50: Producer surplus assumptions, Options 4a, 4b and 4c

Product Category / Industry	Average price per container ($)	Price elasticity of demand (closer to zero is more inelastic)	Industry revenue ($m)	Gross Margins (% of revenue)
Beer	2.72	-0.27	5,178	21%
Bottled water	1.28		601	21%
Fruit juice	2.87	-0.55 to -0 .98	1,639	11%
Milk	2.08	-0.23 to -0.79	1,965	6%
Soft drink	1.80	-0.33 to -1.24	3,472	20%
Spirits	30.30	-0.60	498	13%
Wine	11.50	-0.24	7,180	14%

Sources: Fogarty 2008; Andreyeva 2010; Nghiem 2011; ACIL Tasman, 2012; IBIS World 2013

Average prices for each product category are based on ACIL Tasman (2012). Industry data published by IBISWorld were used to estimate industry revenue and gross margins (as a proxy for producer surplus[33] expressed as Earnings Before Interest and Tax (EBIT) + Depreciation + Rent) per product category.

Price elasticities of demand are used to determine the change in quantity of beverages sold and are based on a number of Australian and international studies on the demand for food and beverages.

In reality, there may be substitution between product categories (as relative prices change) or even a response towards larger container sizes within the same product category (as larger container sizes experience a smaller percentage price increase), however such effects are not included in our model as this would require far more detailed analysis and data.

Estimating the proportion of customers in each segment

Assumed redemptions rates are shown in Table 41. The proportion of customers that redeem their own containers are shown in the 'Purchaser redemption' row, whereas the proportion in the residual segment is shown in 'total not redeemed by purchaser'.

33 Theoretically this margin should exclude normal profit. However, we assume that capital and fixed costs are not changed (scale of impacts is minimal) and therefore any change to gross margin comes off the bottom line.

Table 51: Assumed redemption rates, Options 4a, 4b and 4c

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2029	2030	2035
Purchaser redemption	*46.9%*	*50.2%*	*53.6%*	*56.9%*	*60.3%*	*61.1%*	*61.9%*	*62.6%*	*63.4%*	*64.2%*	*64.6%*	*65.0%*	*65.4%*	*65.7%*	*66.1%*
3rd party redemption	*13.4%*	*14.3%*	*15.3%*	*16.2%*	*17.2%*	*17.4%*	*17.6%*	*17.9%*	*18.1%*	*18.3%*	*18.4%*	*18.5%*	*18.6%*	*18.8%*	*18.9%*
Total redeemed	60.3%	64.6%	68.9%	73.2%	77.5%	78.5%	79.5%	80.5%	81.5%	82.5%	83.0%	83.5%	84.0%	84.5%	85.0%
Not redeemed	39.7%	35.4%	31.1%	26.8%	22.5%	21.5%	20.5%	19.5%	18.5%	17.5%	17.0%	16.5%	16.0%	15.5%	15.0%
Total not redeemed by purchaser	**53.1%**	**49.8%**	**46.4%**	**43.1%**	**39.7%**	**38.9%**	**38.1%**	**37.4%**	**36.6%**	**35.8%**	**35.4%**	**35.0%**	**34.6%**	**34.3%**	**33.9%**

Notes: The total redeemed estimates are based on beverage container recycling rates as set out in Table 12 for Options 4a and 4b. Although Option 4c has lower beverage recycling rates than Options 4a and 4b, redemptions rates are assumed to be the same but on a smaller range of containers (thus the dairy, wine and fruit juice industries are assumed not to be impacted by Option 4c). 3rd party redemption is assumed to include all redemptions via kerbside (7.1% of total recycling), redemptions via C&I (10.1% of total recycling) and approximately 5% redeemed by other 3rd parties (e.g. community organisations and people sifting through waste bins). The later estimate is drawn from South Australian experience (Harrison Research 2012).

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Estimating impact on industry profits

The change in surplus to industry is estimated as the average price per container multiplied by the change in volume multiplied by the profit margin. The estimated impact on industry (reduced profits) over the period 2016 to 2035 (expressed as a Present Value using a discount rate of 7%) is shown below for Option 4a.

Table 52: Estimated impact on industry profits under Option 4a

Industry	Impact (PV $m)	% of surplus[34]
Soft drinks	59.2	0.98%
Fruit Juice	9.0	0.59%
Milk	8.4	0.84%
Beer	20.3	0.22%
Wine	4.0	0.04%
Spirits	0.2	0.04%
Bottled Water	9.3	0.86%
Total	110.4	0.40%

It should be noted that due to data limitations within these industry categories a somewhat 'broad brush approach' is required to determine the loss of producer surplus to specific industries. That is, average figures (e.g., average product price, average change in product price, gross margins) for each industry are applied to determine the average loss of producer surplus per industry. Therefore, our analysis assumes that all companies are affected equally (i.e., in proportion to their revenue). In reality, this is unlikely to be the case.

The annual profit impact for each industry is expected to decline over time. This is because as redemption rates increase, more consumers are obtaining refunds for redemptions of their own used containers (as opposed to those containers being redeemed by a third party or the container not being redeemed at all). As a segment, self-redeeming customers have the lowest impact on sales as it is assumed that they experience a lower effective price impact.

These impact estimates should be considered ***provisional*** as they are based on the provisional deposit, refund and redemption rates shown in Table 53 below.

Table 53: Deposit, refund and redemption rates under Option 4a

	2016	2020	2025	2030	2035
Deposit (c/container)	10	10	15	15	20
Refund (c/container)	10	10	15	15	20
Redemption rate (%)	58.6%	77.5%	82.5%	85.0%	85.0%

In the final modelling, the deposit rate will be set so as to ensure that the container scheme operator remains financially viable. In this case, the deposit rate can vary from the refund rate in any given year and the ultimate price impact experienced by the consumer will be a function of the two (that is, beverage producers will increase prices based on the deposit rates, whereas consumers will only receive refunds based on the refund rate).

[34] Gross profit margin as a proxy for producer surplus expressed as Earnings Before Interest and Tax (EBIT) + Depreciation + Rent (Source: IBIS World 2013)

Estimates of the impacts of Options 4b and 4c on industry profits will be provided in the CBA report. They are expected to be higher but of a similar order of magnitude to Option 4a.

4.9.3 Loss of producer surplus for other options

Estimates for other policy options cannot be as precisely estimated as for Options 4a, 4b and 4c as the other options have a far more diverse set of product segments. However, the detailed methodology applied to estimate the impact to industry profits under Options 4a, 4b and 4c provide data points that can then be used to estimate the impact of other policy options.

Making the assumption that surplus impact is a function of cost impost to industry, a simple linear regression model can be applied to data points from Options 4a, 4b and 4c to estimate the parameters for the following function:

$$Surplus\ impact = f(\text{cost impost to industry})$$

Specifically, surplus impact is the output from the detailed methodology for Options 4a, 4b and 4c and cost impost is equal to (total scheme costs + deposit/refund costs).

Implicitly, an assumption is being made that profitability and demand response is similar for the industries and product lines affected by other options as it is for Options 4a, 4b and 4c. This is more likely to be the case for option 2d (which is also focused on beverage containers), similarly for options 2b and 2c (which also have a significant focus on beverage containers) and least of all for options 1, 2a and 2e (which are broader in packaging scope). For those options in particular, producer surplus estimates should therefore only be considered order of magnitude.

5. Benefit assumptions

5.1 Value of recovered resources

5.1.1 CRIS Assumptions

The assumptions for the market value of recycled packaging materials in the CRIS are presented in Table 14 of Attachment A of the CRIS and further explained in Appendix F of Attachment C. These are represented in Table 54 and Table 55 below.

Table 54: CRIS market value of materials assumptions

Material	Mark value ($ per tonne)	Premium for material from CDS	Basis for assumption
Paper/cardboard	$181	None	PPI Asia for OCC and Mixed Grade (Visy) and Paper Fibre Network
Glass	$30	$100[35] per tonne	Owens Illinois and BDA/MMA (2007)
Aluminium cans	$1,560	None	LME and Metals Price Archive (Letsrecycle.com)
Streamed plastics[36]	$560	$100 premium for PET and HDPE	Streamed plastics (assuming 40% PET, 20% high density polyethylene (HDPE), 20% low density polyethylene (LDPE), 20% mixed) – Recycling industry sources
Plastics – mostly sorted	$530	$100 premium for PET and HDPE	Assuming majority of capital city MRFs undertake some degree of sorting
Plastics – fully mixed	$372	$100 premium for PET and HDPE	Fully mixed plastics (assuming 30% HDPE, 30% PET, 40% mixed) – Recycling industry sources
Steel cans	$280	None	Recycling industry sources
Liquid paperboard	$150	None	Recycling industry sources

Source: Table 14, Attachment A and Appendix F, Attachment C, CRIS.

35 It was not clear from the discussion in the DRIS whether this is to be interpreted as $100 per tonne for glass from a CDS or $100 premium (i.e. $130 per tonne for glass from a CDS)

36 The market value of plastics varies by polymer type and these values are provided in the next table

Table 55: CRIS plastic market value by polymer type assumptions (based on recycling industry sources)

Material	Mark value ($ per tonne)	Premium for material from CDS
PET	$750 - $780	$100
PET Coloured	$535 - $545	$100
HDPE	$660 - $670	$100
HDPE Coloured	$640 - $650	$100
LDPE 90% clean film, 10% stickers of labels	$500 - $510	None
LDPE 95% clean film, 5% stickers of labels	$550 - $570	None
LDPE Colour	$290 - $310	None
Mixed Plastics 442	$370 - $400	None
Mixed Plastics 226	$340 - $380	None

Source: Table F.3, Appendix F, Attachment C, CRIS.

5.1.2 Discussion

Paper/cardboard

Feedback was provided to the project team that cardboard prices are expected to be lower than white-paper prices. However, the CRIS assumption price for paper/cardboard already accounts for this by combining two sources (one for cardboard and the other for waste paper). No new information was provided to the project team and no objections specifically relating to the aggregate market value assumptions for paper/cardboard (or for paper and cardboard separately) were raised through stakeholder submissions. The physical modelling of paper/cardboard is also as a single stream (as opposed to two individual streams). This assumption has therefore been retained.

Glass

Stakeholders requested clarification in what the market value of glass in the CRIS was referring to. Specifically, there is a market for glass in a form prepared for glass re-processing (*'pre-processed'*) and a market for glass that has not yet been pre-processed. These two markets are effectively operating at two different points in the supply chain. As pre-processing involves a cost, the market value for pre-processed glass would be higher than the market for glass not yet pre-processed.

The description of glass market value in the CRIS implied that the value was based on information relating to the market for pre-processed glass. This would be an incorrect value to ascribe to glass sorted by an MRF or CDS facility and pre-processing costs would need to be incorporated (subtracted).

It was also clear from stakeholder discussion that a wide range of values are being observed. This variation stems from the highly concentrated industry structure.

It is recommended that market values are revised based on:

1. Pre-processed material (i.e. pre-processing costs are incorporated);
2. Current values observed by suppliers of the material; and
3. High volume transactions, rather than transactions relating to a small proportion of the market (which can reflect the extremes of the market).

In particular, values have been provided to the project team relating to transactions that represent a small proportion of the market and that would have some degree of pre-processing already undertaken, either manually or through a pre-processing plant. These were not adopted for the DRIS. Rather, values based on recycling industry sources, specifically relating to material not yet pre-processed, representing a large proportion of the market and verified against prices received by suppliers of that material have been adopted. These are:

- nil value ($0 per tonne) for glass from non-CDS sources; and
- $40 per tonne for glass from CDS sources.

Aluminium cans

The CRIS assumption of $1,560 per tonne is broadly consistent with information provided to the project team relating to current values. However, information from the recycling industry was provided to suggest that this would apply to higher quality material (e.g., from a CDS facility) rather than derived from the kerbside (which would trade at approximately a 10% lower market value owing to the lower quality). This implies a value for non-CDS aluminium of $1,418 per tonne.

Plastics

The CRIS provided significant detail relating to values for individual polymer types but the CRIS was less transparent on how these were combined to derive average values.

Information was provided to the project team that suggested a higher average value for plastics from CDS sources compared with conventional sources. This higher value is based on two factors:

- the polymer mix from CDS sources has greater proportions of higher value polymers; and
- the material from a CDS is higher quality.

The first factor requires careful consideration in the CBA and distributional analysis.

A portion of this material (under a container deposit policy) is expected, in the counterfactual (base case), to have been littered or sent to landfill. In this case, there is incremental economic value being created.

However, a portion of this material is expected to have been diverted from the kerbside. In this case, the value is being transferred from beneficiaries in the base case (e.g. local councils) to the CDS operators.

Polymer mix assumptions provided by industry sources and cross-checked against proportions experienced in their Northern Territory facility (75% PET, 5% coloured PET and 20% HDPE) and polymer value assumptions from the CRIS result in an average value of plastic of approximately $676 per tonne. Note that this still does not incorporate the alleged quality premium for plastics originated from CDS facilities.

It is therefore recommended that $676 per tonne is ascribed to the market value of plastic beverage containers. Using this figure and the average 'streamed plastics' figure of $530 per tonne, an average value for non-beverage plastic recyclate of $349 may be back-calculated (applying the assumption that approximately 47% of plastics packaging recycling is beverage containers as per the material flows analysis).

As per the CRIS, which proposes a $100 per tonne premium for PET and HDPE owing to quality, an average value of $776 per tonne for CDS sourced plastic is adopted.

Steel

No new information was provided to the project team and no objections specifically relating to the market value assumptions for steel were raised through stakeholder submissions. This assumption has therefore been retained.

Liquid paper board

No new information was provided to the project team and no objections specifically relating to the market value assumptions for paper/cardboard were raised through stakeholder submissions. This assumption has therefore been retained.

Macroeconomic benefits resulting from increasing material quality

Stakeholder submissions were received relating to potential effects of increasing the quantity of high quality recyclate supplied to the recycling industry in Australia. Specifically, a proportion of the current supply of lower grade aluminium, glass and plastics is either landfilled or exported. Increasing the quantity of high quality material would allow more recyclate to be processed within Australia and, on face value, this would lead to economic benefits of investment, employment and value added.

In response, we note that answering the question of whether introducing a beverage container deposit or refund scheme would increase the level of reprocessing within Australia would depend on establishing whether a regulatory or market failure exists within the reprocessing industry in Australia. Further, even if a market or regulatory failure could be established, assessing the economic benefits that would result from correction of that failure is a macroeconomic question that would require input-input output or general equilibrium modelling.

5.1.3 DRIS Assumptions

Based on the discussion outlined above, the following market value assumptions are recommended for the DRIS.

Table 56: Proposed DRIS market value assumptions

Material	CRIS		DRIS	
	Market value ($ per tonne)	Premium for material from CDS	Market value ($ per tonne)	Premium for material from CDS
Paper/cardboard	$181	None	$181	None
Glass	$30	$100[37] per tonne	$0	+ $40 per tonne
Aluminium cans	$1,560	None	$1,418	+ $142 per tonne
Plastics (Beverage)	$560	$100 premium for PET and HDPE	$676	+ $100 per tonne
Plastics (Non-beverage)	$560	$100 premium for PET and HDPE	$349	Not applicable
Steel cans	$280	None	$280	None
Liquid paperboard	$150	None	$150	+ $70 per tonne

5.2 Avoided landfill costs

5.2.1 Avoided landfill operating costs

CRIS assumption

The CRIS cites BDA (2009) as the source for assumptions on landfill operating costs.[38] Operating cost of landfill by size and controls, as presented in the BDA report, are shown below.

Table 57: CRIS Operating cost of landfill ($/tonne)

	Best practice controls	Poor controls
Small	$100	$74
Medium	$60	$44
Large	$40	$30

Source: Table 70, Attachment C, CRIS.

The CRIS adopted the simplifying assumption that, since *'large landfills constituted more than 70% by weight in the National Landfill Survey conducted by the Waste Management Association of Australia, private costs of landfill are expected to range from $30 - $40 per tonne'*.

37 It was not clear from the discussion in the CRIS whether this is to be interpreted as $100 per tonne for glass from a CDS or $100 premium (i.e. $130 per tonne for glass from a CDS)

38 The BDA report has also been identified as the recommended source for landfill cost assumptions for the DRIS.

Discussion and DRIS assumption

This simplification results in a potentially inaccurate estimate of the average cost of landfill across Australia, particularly in non-metro regions where landfills are typically smaller. For the purposes of the CBA and the distributional analysis, the project team has drawn on additional data available in BDA (2009) and WCS (2010).

Average cost of landfill by state/territory and by metro/non-metro has been determined through information on the size distribution of Australian landfills (WCS, 2010), level of controls in Australian landfills (WCS, 2010) and an assumption that the metro region typically has large landfills while non-metro regions contain a mix of medium and small landfills.

The relevant information drawn from these reports is shown below.

Table 58: Waste disposal to landfill by size-class and jurisdiction

	Disposals by licensed landfill size-class (million tonnes per year)							
	Small		Medium		Large		Total	
	No.	Disposals (tonnes)	No.	Disposals (tonnes)	No.	Tonnes	No.	Disposals (tonnes)
NSW	30	0.14	40	1.4	15	4.91	85	6.45
Vic	8	0.03	30	1.37	19	3.59	58	4.99
WA	87	0.17	23	0.76	11	2.7	122	3.63
Tas	3	0.01	7	0.29	1	0.12	11	0.42
SA	58	0.11	8	0.25	5	0.92	71	1.28
Qld	63	0.14	22	0.9	12	2.97	100	4.01
ACT	Nil	Nil	Nil	Nil	1	0.19	1	0.19
NT	13	0	3	0.3	Nil	0	4	0.3
Australia	262	0.32	133	5.27	64	15.21	459	21.27
%	57%	3%	29%	25%	14%	72%		

Source: Table 4-6, WCS (2010).

Table 59: Landfills - level of compliance with design and construction requirements

	Liner	Leachate collection	Water management	Air emissions	Landfill gas
NSW	Large - moderate to high Medium - low to moderate Small - low	Large - high Medium - moderate to high Small - moderate	Large - high Medium - high Small - moderate to high	Large - high Medium - high Small - moderate to high	Large - low Medium - low Small - nil
VIC	Large - moderate to high Medium - moderate to low Small - low	Large - high Medium - moderate to high Small - moderate	Large - moderate to high Medium - moderate Small - moderate	Large - high Medium - moderate to high Small - low to moderate	Large - low Medium - low Small - nil
QLD	Large - moderate to high Medium - low to moderate Small - low	Large - high Medium - moderate to high Small - low	Large - high Medium - moderate to high Small - low	Large - high Medium - high Small - low to moderate	Large - low Medium - low Small - nil
WA	Large - low Medium - low Small - low	Large - low to moderate Medium - low Small - low	Large - moderate Medium - moderate Small - low	Large - moderate Medium - moderate Small - low	Large - low Medium -low Small - low
SA	Large - moderate to high Medium - low Small - low	Large - high Medium - moderate Small - low	Large - high Medium - moderate to low Small - low	Large - moderate to high Medium - moderate Small - low to moderate	Large - moderate Medium - low Small - low
TAS	Medium - moderate Small - moderate to high	Medium - high Small - high	Medium - moderate Small - moderate to high	Medium - high Small - moderate to high	Medium - low Small - low

Source: Table 6-3, WCS (2010)

Resulting estimates of landfill operating costs by state/territory and by metro/non-metro (inflated to 2011 dollars) are provided below.

Table 60: Recommended operating cost of landfill[39,40] ($/tonne)

	Metro	Non-metro
NSW	42	57
VIC	42	55
WA	32	52
TAS	37	56
SA	42	56
QLD	42	58
ACT	37	-
NT	55	55

5.2.2 Avoided landfill externality costs

Greenhouse gas emissions reductions

The CRIS provides a range of -$5.3 to $13.5 per tonne for greenhouse gas emissions (GHGs) from landfill, with a negative value for the lower bound of the range reflecting the capture of landfill gas, which can be used for fuel. However, the CRIS report was not transparent on the derivation of this range estimate.

The average externality costs of greenhouse gas emissions reductions for a given region depend on five factors:

- the extent of landfill gas capture of landfills;
- average efficiency rate of landfill gas (LFG) capture;
- the extent to which landfills are covered by an emissions trading scheme (ETS) which ‘internalises’ the cost of emissions;[41]
- the ‘emissions factor’[42] (EF) of the material being deposited in landfill; and
- the monetary value of environmental damage caused by GHGs.

Given these factors, the DRIS model will derive a specific externality cost for GHGs based on the region in which a given tonne of material is being deposited and the material type.[43] Assumptions for the above factors (apart for the monetary value of environmental damage

[39] Operating costs do not include transport to landfill, which is included under collection and transport costs.

[40] Operating costs also do not include landfill levies, which are a transfer from one stakeholder group (waste producers/ managers) to another stakeholder group (state governments) and, as such, do not constitute an economic cost.

[41] Emissions reductions from a landfill covered by an ETS does not result in a reduction to Australia’s balance of emissions as emissions increase equally in other covered landfills or in another sectors covered by the ETS.

[42] The emissions factor refers to the amount of carbon dioxide equivalent ($tCO2_e$) that are released by a tonne of that material deposited to landfill

[43] All materials except for paper/cardboard have an EF of zero (DCCEE, 2012) therefore do not result in any GHG externality cost.

caused by GHGs) have been obtained by the project team through discussions with the Australian Landfill Owners Association (ALOA) and DCCEE (2012).

Combined, the extent of LFG coverage, the average efficiency rate of LFG capture and the extent to which landfills are covered by an ETS provide the **proportion** of GHGs to which emissions factors and environmental values should apply. These will be estimated in the DRIS as shown below.

Table 61: Proportion of GHGs to which emissions factors and environmental values should apply, assuming an Emissions Trading Scheme (ETS) is in place

	Metro	Non-metro
NSW	0%	96%
VIC	0%	96%
WA	0%	96%
TAS	0%	96%
SA	0%	96%
QLD	0%	96%
ACT	0%	n/a
NT	40%[44]	96%

Alternatively, if an ETS is not in place (for example, if the existing ETS is withdrawn by a new government) then the following proportions would apply.

Table 62: Proportion of GHGs to which emissions factors and environmental values should apply, assuming no Emissions Trading Scheme (ETS)

	Metro	Non-metro
NSW	40%	96%
VIC	40%	96%
WA	40%	96%
TAS	40%	96%
SA	40%	96%
QLD	40%	96%
ACT	40%	n/a
NT	40%	96%

Finally, the EF applicable to paper/cardboard based on DCCEE (2012) is 2.5. Other material types (i.e., plastics, metals and glass) are considered to release no or negligible amounts of $CO2_e$ and therefore have an EF of zero.

[44] NT is the only jurisdiction with a metro proportion of 40%. This is because all landfills in NT are estimated to be of a size where the amount of GHG emissions falls below the facility threshold for liability under the ETS (25,000 tonnes of CO2 equivalent per annum). Therefore any GHG reduced from NT landfills is expected to lead to reductions in Australia's GHG balance. If 60% is captured on average, avoidance of 1 tCO2-e from NT landfills is expected to lead to 0.4 tCO2-e reductions in Australia's GHG balance.

Valuing the environmental benefit of reductions in GHGs is a highly contested issue and there are several possible approaches. On one end of the spectrum, it is argued that Australia's GHG emissions represent a miniscule contribution to global emissions and the latter are more important when considering global warming and associated welfare losses. At the other end of the spectrum, preliminary estimates of the marginal social cost of carbon in Stern (2006) were US \$85/t$CO2_e$. However, the review's methodology drew some criticism, notably the use of a very low discount rate. The forecast cost of abatement and the traded market price of carbon permits in Australia may also serve as proxies for the value of changes to GHG emissions. The former is expected to increase in line with increasingly stringent pollution caps, ranging from approximately \$30/t$CO2_e$ to approximately \$150 t$CO2_e$ (Australian Treasury, 2011). The latter will be heavily influenced by the expected price of carbon in European Union Emissions Trading Scheme (EU ETS), which is uncertain, although current EU ETS permits are trading at approximately \$10/ t$CO2_e$ or less.

The estimate recommended for the DRIS, consistent with Australian Treasury (2011) is a value of \$30/t$CO2_e$.

Other air emissions

The CRIS provided a range estimate of air emissions of \$0.2 - \$1.0 per tonne. The project team agrees with this range and combining this estimate with the level of air emissions controls in Australian landfills derived from WCS (2010) and inflating to 2011 dollars results in the following estimates of externality cost of air emissions by state/territory and metro/non-metro.

Table 63: Externality costs of air emissions (\$/tonne)

	Metro	Non-metro
NSW	0.21	0.25
VIC	0.21	0.64
WA	0.63	0.71
TAS	0.21	0.22
SA	0.63	0.63
QLD	0.21	0.27
ACT	0.63	0.00
NT	0.63	0.63

Note: Note that the metro externality costs are lower because the greater proportion of large landfills in metro areas generate lower air emissions per tonne of waste.

Leachate

The project team agrees with the CRIS assumption that leachate costs are negligible. In part this stems from the generally low level of hazardous materials susceptible to causing leachate in packaging materials. In any case, leachate control is now generally well established in Australian landfills, especially in metropolitan areas. Therefore, the DRIS model assumes no externality cost for leachate.

Disamenity

The CRIS provided a range estimate of air emissions of \$1 - \$10. The project team agrees with this range and combining this estimate with the level of litter and odour management practices in Australian landfills derived from WCS (2010) and inflating to 2011 dollars results in the following estimates of externality cost of disamenity by state/territory and metro/non-metro.

Table 64: Externality costs of disamenity ($/tonne)

	Metro	Non-metro
NSW	1.05	1.48
VIC	1.05	1.15
WA	1.05	6.64
TAS	5.78	5.62
SA	1.05	2.50
QLD	1.05	2.32
ACT	1.05	na
NT	5.78	5.78

5.3 Avoided costs of litter

5.3.1 CRIS assumptions

Costs associated with littering range from clean up costs through to amenity, health and ecological impacts. The CRIS estimates the benefits of litter clean up by focussing on avoided costs of litter clean up. It does this by estimating total annual litter clean up costs by local councils and then estimating reduced litter clean up costs in proportion to the percentage reduction in litter tonnes relative to 2011 and packaging litter as a proportion of all litter.

5.3.2 Discussion

The approach taken in the CRIS to estimating avoided costs of litter is questioned on two counts:

- first, the approach overlooks a number of litter clean up activities, both local council and litter clean up undertaken by the broader community; and
- second by focussing simply on marginal clean-up costs other impacts of litter are overlooked.

We propose therefore to use the costs of a broader range of litter clean up activities to provide a shadow price for the economic cost of packaging litter. A similar approach is used by BDA in a report to Zero Waste South Australia (BDA 2007). This is likely to be a conservative shadow price for the economic costs of litter because:

- the fact that the waste is being cleaned up implies that the cost is less than the community's willingness to pay for its clean up; and
- the litter not cleaned up (principally in the marine environment) will have environmental and amenity impacts.

The clean up activities used to derive a shadow price of the economic cost of packaging litter are litter traps, clean up of roadside litter by local councils and community based litter clean up through Clean Up Australia[45]. The shadow price is derived from the estimated average cost of these activities[46]. These are set out in Table 65. Cost estimates for local council activities are based on Victorian council estimates provided in Victorian Local Government Annual Survey (Sustainability Victoria 2011). Costs estimates for the Clean Up Australia activities are derived from estimates of the numbers volunteers involved in Clean Up Australia, their average duration of involvement (Clean Up Australia 2010) and an assumed labour value of $7.67/ hour.

Table 65: Estimated average cost of litter clean up ($/tonne)

Activity	Tonnes collected		Cost		$/tonne	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Litter traps	11,175	10,877	7,650,621	10,134,155	685	932
Roadside litter	41,228	40,378	7,516,463	9,268,563	182	230
Clean Up Australia	15,560	16,150	16,346,400	15,299,174	1,086	980
Weighted average all activities	**67,963**	**67,405**	**31,513,484**	**34,701,892**	**462.16**	**504.20**

Sources: Clean Up Australia 2010, Sustainability Victoria 2011

These costs averaged over two years, and adjusted to 2011 prices gives a shadow price of the economic cost of litter of $501/ tonne.

5.3.3 DRIS assumption

Table 66 provides an overview of litter cost assumptions in the CRIS and proposed for the DRIS. Unlike the approach adopted in the CRIS, the shadow price proposed for the DRIS would apply to all public place packaging litter reductions achieved by each option relative to the base case.

Table 66: CRIS and DRIS litter cost assumptions

Data variable	Application	CRIS assumption	DRIS assumption	Unit
Cost of litter clean up	All options	305	na	$ m/ year
Proportional reduction in litter clean up costs	All options	37%	na	%
Shadow price, economic cost of litter	All options	na	501	$/ tonne

[45] Two litter clean up activities not included in these estimates are litter clean up undertaken in commercial shopping malls and litter clean up in reserves not under the control of local councils (e.g. national parks). On the basis of the limited data available neither of these activities is likely to substantially change the estimate of total litter clean up or the shadow price derived from that clean up. We emphasise again however, that the shadow price used in this analysis is, if anything, likely to be a conservative estimate of community's willingness to pay to avoid litter.

[46] Note, clean up costs associated with litter clean up in Crown land reserves, national parks and state forests are not included in these estimates due to unavailability of relevant data. It is not anticipated that cost of clean up in those areas would substantially affect the weighted average value estimated in Table 65.

6. Distributional analysis assumptions

The modelling undertaken for this analysis will facilitate the calculation of overall economic impacts (CBA) or financial impacts for a particular stakeholder group (distributional analysis) by tracking incidence of all cost and benefit items against relevant stakeholder groups at each stage in the chain of physical flows associated with each option. In this way, costs and benefits can be 'filtered' by stakeholder group.

In the CBA some of the cost and benefit items offset each other (i.e. one stakeholder group incurs a cost, which is offset by a corresponding benefit to another stakeholder group) and transfers are completely removed. In the distributional analysis however, the scope is restricted to particular stakeholder groups. All financial costs and benefits that affect each stakeholder group (irrespective of whether they are simply transfers to another group) are still included therefore.

Additionally, some cost and benefit items will be 'uplifted' in the distributional analysis. The most notable example of this is the cost of operating CDS infrastructure (Option 4a). This is because a CDS operator will have to pay corporate or personal income tax, which is relevant for the financial analysis but not the economic analysis.

Finally, some financial flows are fixed in nominal terms by regulation associated with an option (i.e., the refund value for beverage containers in options 4), which requires that inflation of other financial flows be introduced in order to generate an accurate picture of financial adequacy assessment.

Financial impacts that will accrue to particular stakeholder groups in the distributional analysis are assumed to include:

- completely unredeemed deposits (transfers from consumer to scheme operator) [relates to option 4a];
- completely unredeemed refunds (transfers from consumer to liable entity) (assuming liable entity had increased the price in the expectation that consumers would redeem some refund in the future) [relates to options 4b, 4c];
- third party deposit redemption (transfer from non-redeeming consumer to redeeming consumer or kerbside operator) [relates to option 4a];
- third party refund redemption (transfer from non-redeeming consumer to redeeming consumer or kerbside operator) [relates to options 4b, 4c];
- tax under option 3 (transfers from consumers to government); and
- programs funded under Option 3 (transfer from government to private sector).

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Distributional and Cost Benefit Analysis for the Packaging Impacts Decision Regulation Impact Statement

Co-benefits

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Key Points

- Three potential pathways for the achievement of co-benefits are considered in this assessment:
  1. co-benefits achieved through the use of container deposit scheme (CDS) collection depots or hubs to provide a 'drop-off' service for non-CDS materials; these co-benefits are assessed in relation to Options 4a, 4b and 4c;
  2. co-benefits associated with implementation of programs initiated through non-CDS options (Options 2a-2e and 3); and
  3. co-benefits achieved through establishing a commercial and industrial (C&I) collection service as an additional component of Option 4a.
- The key consideration with respect to the first pathway is whether the implementation of a CDS nationally, using collection depots (Options 4b and 4c) or hubs (Option 4a) for collection of non-CDS materials, will result in additional recycling of non-CDS materials beyond what would have happened in the absence of a CDS. There is insufficient evidence to answer this question conclusively. Nevertheless, indicative estimates have been made of the net benefits of this collection service using assumptions about levels of additionality. Annual net benefits of approximately $1.2 million, $5.3 million and $8.0 million have been estimated for Options 4a, 4b and 4c respectively.
- For completeness and consistency potential co-benefits associated with non-CDS options have been assessed on a comparable basis to co-benefits estimated for Options 4a, 4b and 4c. These have been assessed through the application of a 'Marginal Recycling Cost Curves' (MRCC) model (see Data Assumptions report) and the results will be detailed in the Regulation Impacts report.
- While the third pathway has the potential to lead to co-benefits, the proposed pathway can be regarded as a new option, requiring comprehensive modelling to develop robust estimates of its costs and benefits. This modelling is beyond the scope of the study. Nevertheless, indicative estimates of the net benefits of a C&I collection service can be developed drawing on the MRCC process proposed for Options 2a to 2e to gain an estimate of the infrastructure and operating costs of the service.
- Present value estimates of co-benefits for options 2a to 2e and 4a to 4c will be provided with results of the CBA model. Given uncertainties with the estimates however, sensitivity analysis will be undertaken to determine the impact of co-benefits on the overall NPV and ranking of options.
- Because estimation of co-benefits occurs outside of the material flows analysis (MFA) model, it will not be feasible to provide a distributional breakdown of the co-benefits.

1. Introduction

1.1 Report purpose

Australian environment ministers, through the Standing Council on Environment and Water, have agreed to develop a Decision Regulation Impact Statement (DRIS) in 2013 on a range of national options to increase packaging resource recovery rates and decrease packaging litter. The DRIS will continue a process progressed through the 'Packaging Impacts Consultation RIS' (CRIS) and subsequent public consultation. A 'Distributional and Cost Benefit Analysis', entailing financial and economic analysis of the options, will provide an important input to development of the DRIS.

This document discusses the potential co-benefits associated with recycling of non-beverage container materials that could be collected at container deposit scheme (CDS) depots. The analysis will provide an input into subsequent phases of the project, notably the data assumptions report and cost benefit and distributional analysis. The analysis presented in this report discusses:

- non-CDS materials that are likely to be collected at a CDS depot on a voluntary basis by the private party operating the depot;
- the potential increase in recycling (if any) if a national CDS were in place;
- the potential benefits and costs resulting from additional recycling; and
- the treatment of those benefits and costs in the DRIS.

1.2 Scope of analysis

Co-benefits have been defined as "benefits that accrue as a side effect of a targeted policy" (Pearce 2000, p.1). Those benefits could be intended but secondary to the targeted policy, or they could be unintended.

In the case of recycling policies, and specifically a CDS, various possible co-benefits have been identified by stakeholders including increasing recycling of other materials, reducing litter in general (not just packaging litter), increasing employment, and reducing energy and water use (SCEW, 2012). Some of these apparent co-benefits, such as water and energy use associated with the manufacture of packaging from virgin materials, are 'upstream' impacts not directly related to waste policy and are therefore outside of the scope of this assessment. Others, such as downstream environmental impacts, including greenhouse gas emissions, are already captured in the cost benefit analysis. Still others, such as increasing employment, are not economic benefits per se and in any case employment effects of policies would need to be assessed through a macroeconomic analysis, which is outside of the scope of the assessment. Finally, given difficulties in estimating packaging litter benefits associated with options (see Data Assumptions), it is unlikely that non-packaging litter reductions could be estimated with any level of assurance, even order of magnitude.

Analysis of co-benefits for this study is therefore confined to non-CDS materials collected at CDS depots on a voluntary basis by the private party operating the depot and recycled as a consequence of introducing a CDS. Non-CDS materials include:

- packaging materials, other than the beverage containers targeted by the CDS that are collected at the CDS; and
- non-packaging materials that are collected at the CDS (e.g. TVs, computers and batteries).

Although the focus of this analysis is on co-benefits associated with CDS options (4a, 4b and 4c), work on assessment of recycling opportunities and costs associated with Options 2a to 2e indicates that those options also have the potential to generate co-benefits. That potential is discussed further in section 2.3.

2. Potential co-benefits

2.1 Background

2.1.1 Drop-off at collection depots

The collection of non-CDS materials at CDS depots on a voluntary basis has been raised in a number of studies and submissions as a potential co-benefit of container deposit or container refund schemes. This pathway involves the use of CDS collection depots (in the case of Options 4b and 4c) or hubs (in the case of Option 4a) to provide a 'drop-off' service for non-CDS materials. For example, a representative of the South Australian Environment Protection Authority (EPA), in a response to the 2009 report 'Beverage container investigation' (BDA 2009), notes that estimates of the economic costs and benefits of container deposit schemes in the report have not allowed for the:

> *"benefits of the value of a broader range of recyclable materials that are recovered as a result of the establishment of a network of collection centres"* (SA EPA, 2009, p.4).

Specific reference is made to the network of container deposit collection depots across metropolitan and regional South Australia that provide drop-off services for a broad range of materials in addition to deposit containers, including packaging and non-packaging materials:

- paper and cardboard;
- non-deposit plastic bottles;
- non-deposit HDPE milk containers;
- non-deposit steel cans;
- mixed clean plastic;
- car batteries; and
- ferrous and non-ferrous metals.

The CRIS provides a qualitative assessment of the co-benefits associated with the drop-off of these non CDS materials (PWC & WCS 2011). It notes that the depot infrastructure constructed as part of the CDS options could indeed lead to additional benefits of the recycling of other items, but stresses (correctly in our view) that this would be at additional cost. Any assessment of co-benefits needs to take account of all potential costs and benefits on a net basis – a consideration taken up when assessing collection depot co-benefits in section 2.2.

2.1.2 C&I recycling

The Boomerang Alliance (BA 2012) promotes an additional pathway for achieving co-benefits through Option 4a. It presents a scenario whereby C&I waste generated by the retail, property and business services and hospitality sectors (representing approximately 18% of the C&I waste stream) is collected through CDS collection services that will be provided to commercial premises as part of the CDS. The BA estimates that approximately 99,400 tonnes of non-CDS material, with a market value of $37.7 million, could be recovered in this way. This value is assumed to equate to the total benefit of the service.

There are two significant shortcomings with analysis of this pathway as presented by the BA.

First, it is not possible to substantiate key assumptions underpinning co-benefit estimates. The most significant of these are assumed take-up rates of the additional recycling service (ranging from 50% for non-CDS cardboard and paper, plastics and metals to 80% for glass). The pathway assumes that take-up rates will be achieved without provision of an incentive to businesses that is sufficient to overcome costs involved in participating in the scheme (such as distances between business sites and hubs).

Second, and more fundamentally, the co-benefits pathway as presented by the BA is a minor variation of Option 4a, with little or no additional costs involved. In reality, a non-CDS material collection service amounts to a significant variation to Option 4a; one that is likely to entail a substantially different cost structure to Option 4a as originally proposed. There are a number of additional costs that are likely to significantly affect assessment of the net benefits of the proposed service and of the CDS option overall. Those costs include:

- costs associated with establishing new infrastructure;[1]
- business participation costs associated with sorting the non-CDS material from general waste and storing it;
- handling costs associated with the non-CDS material;
- costs associated with reconfiguration/ larger space required at hubs; and
- system administration costs.

As well, the BA analysis assumes no additional transport and collection costs beyond those involved in CDS recovery. While that outcome is feasible in most cases, the use of the collection service as described by BA would, in some cases, involve a dual trip (collection point to hub and hub to material recovery facility (MRF)) compared to the single trip the material would otherwise require (collection point to landfill or MRF).

Given the new cost structure and different category of benefits associated with this sub-option, it should be viewed as a discrete option. As such, a robust estimate of its net benefit will require full modelling with separate assumptions developed for all cost and benefit variables, something that is beyond the scope of this study.

2.2 Assessment of co-benefits associated with drop-off at collection depots

2.2.1 Boomerang Alliance analysis

To date, the only analysis that has sought to quantify co-benefits associated with drop-off at collection depots is contained in the report 'The BA Solution – Co-benefits of Hubs' submitted in response to the Consultation RIS by the Boomerang Alliance (Boomerang Alliance 2012).

Drawing on data provided by Recyclers SA,[2] the BA analysis uses annual collection data from 55 depots in South Australia to extrapolate Australia-wide should a similar drop-off service be

[1] On a tonne for tonne basis it is feasible that these costs would be comparable to costs associated with non-beverage container programs to be implemented under Options 2a, 2b and 2c.

[2] Available at: http://www.recyclesa.com.au/tonnages.htm

provided through 250 CDS hubs. The results of the BA analysis are summarised in Table 1 below.[3]

Table 1: Boomerang Alliance assessment of annual benefits associated with non-CDS materials recovery at CDS hubs

Commodity	Tonnes collected at 55 SA CD Depots	Extrapolate (Pro-Rata 55 Depots to 250 Hubs)	Market Value / Tonne	Revenue	Less: Cost @ MRF Charge of $85/tonne	Benefit
Non Deposit Glass	7,401	33,642	$100.00	$3,364,227	$2,859,593	$504,634
Brass, Copper, Batteries	5,125	23,295	$525.00	$12,230,114	$1,980,114	$10,250,000
Mixed Plastics	212	965	$660.00	$636,600	$81,986	$554,614
LPB	333	1,514	$150.00	$227,045	$128,659	$98,386
Paper and Cardboard	8,061	36,641	$181.00	$6,632,005	$3,114,477	$3,517,527
Steel	3,600	16,364	$280.00	$4,581,818	$1,390,909	$3,190,909
Total	**24,733**	**112,420**		**$27,671,809**	**$9,555,739**	**$18,116,070**

Source: Boomerang Alliance 2012

Some cost items have been overlooked in the analysis, including handling and administration costs. Furthermore, some of the material market values used in the BA analysis appear to be inflated (notably plastics and glass). On the other hand, some benefit items are also overlooked (notably avoided landfill costs, and costs of transporting waste to landfill). After taking all of these factors into account however, the estimates provided in Table 1 could represent reasonable 'ballpark' estimates of the net revenue that would be generated by the collection of non-CDS materials at CDS hubs, **assuming that none of this material would have been collected in the absence of a CDS**.

2.2.2 Additionality

What is missing from the analysis though, is consideration of 'additionality'. Any assessment of co-benefits in the context of a CBA needs to look at the **net** impact of CDS hubs on the collection of non-CDS materials. This requires an answer to the following question:

> *Will some or all of these materials be collected and recycled anyway regardless of whether CDS infrastructure is in place?*

This is a difficult question to answer in the absence of 'ex-ante CDS' and 'ex-post' recycling data. The best that can be done in the absence of this data, therefore, is to examine South Australian and other jurisdictional recycling data to determine whether there are any trends pointing to the positive impact of South Australian CD depots on recycling rates of non-CDS materials.

Table 2 provides a breakdown of recycling rates across jurisdictions for a range of materials currently collected at CD depots in South Australia. The data is for 2008-09, the latest year available at a jurisdictional level.

3 Minor changes have been made to the data, as originally presented in the BA Alliance report, to correct some mistakes.

Table 2: Recycling rates of selected materials (includes packaging and non-packaging) 2008-09, by jurisdiction

	Metals			Paper & cardboard			Plastics			Glass			Total selected materials		
	Waste (tonnes)	Recycled (tonnes)	Recycled (%)	Waste (tonnes)	Recycled (tonnes)	Recycled (%)	Waste (tonnes)	Recycled (tonnes)	Recycled (%)	Waste (tonnes)	Recycled (tonnes)	Recycled (%)	Waste (tonnes)	Recycled (tonnes)	Recycled (%)
NSW	1,785,100	1,608,800	**90.1**	2,595,500	1,691,000	**65.2**	957,900	299,800	**31.3**	627,400	464,200	**74.0**	5,965,900	4,063,800	**68.1**
Vic	1,184,800	1,099,000	**92.8**	1,566,300	1,132,000	**72.3**	505,100	144,000	**28.5**	263,700	185,000	**70.2**	3,519,900	2,560,000	**72.7**
Qld	788,700	687,800	**87.2**	978,500	529,100	**54.1**	389,700	39,200	**10.1**	294,400	195,000	**66.2**	2,451,300	1,451,100	**59.2**
WA	478,700	375,200	**78.4**	673,000	231,000	**34.3**	245,300	19,400	**7.9**	102,200	26,700	**26.1**	1,499,200	652,300	**43.5**
SA	344,700	311,700	**90.4**	319,200	204,100	**63.9**	74,700	13,800	**18.5**	88,500	61,600	**69.6**	827,100	591,200	**71.5**
Tas	13,900	1,200	**8.6**	98,300	40,300	**41.0**	48,200	2,800	**5.8**	18,800	7,100	**37.8**	179,200	51,400	**28.7**
ACT	43,100	37,600	**87.2**	84,400	56,900	**67.4**	22,100	1,100	**5.0**	21,800	16,000	**73.4**	171,400	111,600	**65.1**
NT	10,000	800	**8.0**	47,500	11,100	**23.4**	29,600	800	**2.7**	11,000	4,000	**36.4**	98,100	16,700	**17.0**
Aust.	4,649,000	4,122,100	**88.7**	6,362,700	3,895,500	**61.2**	2,272,600	520,900	**22.9**	1,427,800	959,500	**67.2**	14,712,100	9,498,000	**64.6**

Source: Reworked from Hyder Consulting 2012

No clear conclusions can be drawn from the data, either for individual materials or for the materials as a whole. Recycling rates in South Australia are slightly above the national average for all materials, but are below recycling rates in NSW, Victoria and, for some materials, the ACT. These outcomes are likely to reflect a number of factors relating to the availability of recycling infrastructure and services in the different jurisdictions (including kerbside collection services, other collection services and drop-off centres) and to the nature of related policies (including landfill levies and education and information programs).

The most conclusive inference that can be drawn from the data is that, if a CDS scheme were to be introduced nationally, the impact of the scheme on recycling rates for non-CDS materials is likely to be most evident in jurisdictions that currently have low relative rates of recycling for these materials, such as in Queensland, Western Australia, Tasmania and the Northern Territory. Even in those jurisdictions the extent to which CDS collection depots would induce additional recycling of non-CDS materials would depend on the location of the collection depots and the extent to which alternative recycling infrastructure and services are already available in those areas.

Another important point to note from the data presented in Table 2 is the high recycling rate of metals, both nationally and in most jurisdictions, reflecting the high market value of scrap metal. Previous MJA analysis (MJA 2007) suggests that scrap metal prices historically have been a very significant factor driving recycling rates of steel and other metals (see Figure 1 below). In recent years, recovery rates of metals have approached maximum feasible levels in regional and remote locations, where transport and collection costs can outweigh the market value of the metals. Significant additional recovery of metals through CDS depots, therefore, would probably be contingent on locating collection depots in remote locations – an outcome potentially mitigated by the same barrier of high transport and collection costs.

Figure 1: International scrap steel price v recovery level of scrap steel in Victoria

2.2.3 DRIS analysis

Building on the approach taken by the Boomerang Alliance, annual estimates of 'collection depot drop-off' co-benefits have been made. These are provided in Tables 3 to 5. There are a number of important points to note about these estimates.

- First, different estimates are provided for Options 4a, 4b and 4c, reflecting the fact that Option 4a will rely to a far greater degree on RVMs and smaller 'shop front' collection centres than Option 4c and, to a lesser extent, Option 4b. It is assumed that these types of collection points will not be suited to accepting other non-CDS products. Option 4a will therefore generate lower quantities of co-benefit materials than Options 4b and 4c.
- Second, rates of additionality have been applied to each of the material types creating co-benefits. These additionality rates reflect assumptions about the percentages of the relevant materials that potentially would be recycled in the absence of collections depots or hubs. A three step process was used to establish additionality rates:
  a) Drawing on data presented in Table 2, a comparison of recycling rates between South Australia and other jurisdictions was made for the different material types. Kerbside and other recycling services and strategies and policies were also compared between South Australia and other jurisdictions drawing on available information (e.g. Hyder Consulting 2011).
  b) Based on this comparison, an assumption is made that the level of additionality in NSW, Victoria and the ACT would effectively be zero with the introduction of a CDS scheme, due to the high recycling rates and broad range of services offered in those jurisdictions.[4] Similarly, the level of additionality in remote and very remote locations in other jurisdictions is also assumed to be zero, reflecting the difficulty of establishing collection points in those locations. For remaining communities in Queensland, Western Australia and Tasmania, the level of additionality is assumed to be the difference between recycling rates in South Australia and the respective jurisdictions, for each of the main material types, expressed as a percentage, population weighted adjusted.
  c) Additionality rates for glass and plastics were further adjusted (down). In the case of glass the adjustment factor is approximately -40% for Options 4a and 4b, reflecting the assessed ratio of wine bottles to non-container glass in the packaging consumption stream - noting that wine bottles represent a significant proportion of the glass co-benefits collected at SA depots, but will be included in Option 4a and 4b CDS schemes. In the case of plastics, the adjustment factor is -70% for Options 4a and 4b, reflecting the proportion of HDPE and PET containers in the plastics co-benefits collected at SA depots that will be included in Option 4a and 4b schemes. The plastics adjustment factor for Option 4c is -61%, reflecting the proportion of HDPE containers in the co-benefits collected at SA depots that will be included in the Option 4c scheme.
- Third, estimates of additional tonnes collected have been reduced to reflect an assumed reject rate due to contamination of 20%, consistent with CRIS and DRIS assumptions.
- Fourth, the market values of materials have been adjusted in this analysis (relative to the analysis used by the BA) reflecting market value assumptions proposed for use in the CBA (see Data Assumptions report).

4 South Australia and Northern Territory are also assumed to have no additionality due to collection depots already being in place in those jurisdictions.

- Finally, a number of additional cost and benefit items are included in the analysis (compared to the BA analysis) adding avoided transport costs and avoided landfill costs to the assessment of benefits, but netting out additional handling and transport costs and MRF charges.

Annual estimates of the net value of co-benefits presented in Tables 3 to 5 range from approximately $1.2 million for Option 4a to $5.4 million for Option 4b and $8.0 million for Option 4c. These co-benefit estimates should be viewed as indicative because of the large number of assumptions that are made in extrapolating the South Australian data. As noted previously, most of these benefits are anticipated to occur in Queensland, Western Australia and Tasmania. Again however, it is not feasible to be precise on this point.

Table 3: Estimated annual co-benefits, Option 4a

Material	Materials collected at SA CD Depots (tonnes)	Assumed additionality (%)	Additional tonnes collected	Extrapolated nationally[1]	Less residual (@20%)	Market value ($/tonne)	Material revenue	Plus: transport & collection costs avoided (@ $132/ tonne)	Plus: avoided landfill costs (@ $52/ tonne)	Less: additional handling costs & transport costs to central point[2] (@ $37/ tonne)	Less: MRF charge (@$45/ tonne)	Net benefit ($/annum)
Non Deposit Glass	7,401	5.0%	370	1,110	888	$0	$0	$117,402	$46,204	$32,508	$39,969	$91,129
Brass, Copper, Batteries	5,125	2.8%	143	430	430	$500	$215,069	$56,856	$22,376	$15,743	$19,356	$259,201
Mixed Plastics	212	9.9%	21	63	50	$349	$17,561	$6,651	$2,618	$1,842	$2,264	$22,724
LPB	333	12.5%	42	125	100	$150	$15,037	$13,250	$5,215	$3,669	$4,511	$25,322
Paper and Cardboard	8,061	12.5%	1,011	3,033	2,427	$181	$439,225	$320,756	$126,235	$88,816	$109,200	$688,201
Steel	3,600	2.8%	101	302	302	$280	$84,601	$39,938	$15,718	$11,059	$13,597	$115,601
Total	**24,733**		**1,688**	**5,064**	**4,198**		**$771,493**	**$554,853**	**$218,365**	**$153,636**	**$188,897**	**$1,202,178**

1. Extrapolation is based on ratio of assumed relevant national collection points to collection depots in SA. For Options 4a, 4b and 4c these are respectively: 165:55; 850:55; 1200:55.
2. Includes additional handling costs @ $36/ tonne and transport costs of $37/ tonne. The latter applies only to the proportion of additional recyclate moved from depot to consolidation point, which is assumed to be 0% for Option 4a (since all additional recyclate is to be collected at hubs), 71% for 4b and 100% for 4c.

Table 4: Estimated annual co-benefits, Option 4b

Material	Materials collected at SA CD Depots (tonnes)	Assumed additionality (%)	Additional tonnes collected	Extrapolated nationally[1]	Less reject (@20%)	Market value ($/tonne)	Material revenue	Plus: transport & collection costs avoided (@ $132/ tonne)	Plus: avoided landfill costs (@ $52/ tonne)	Less: additional handling costs & transport costs to central point[2] (@ $62/ tonne)	Less: MRF charge (@$45/ tonne)	Net benefit ($/annum)
Non Deposit Glass	7,401	5.0%	370	5,148	4,118	$0	$0	$544,318	$214,219	$181,008	$185,310	$392,218
Brass, Copper, Batteries	5,125	2.8%	143	1,994	1,994	$500	$997,137	$263,603	$103,742	$87,659	$89,742	$1,187,081
Mixed Plastics	212	9.9%	21	292	233	$349	$81,421	$30,838	$12,136	$10,255	$10,498	$103,642
LPB	333	12.5%	42	581	465	$150	$69,716	$61,434	$24,178	$20,429	$20,915	$113,983
Paper and Cardboard	8,061	12.5%	1,011	14,064	11,251	$181	$2,036,409	$1,487,141	$585,271	$494,536	$506,289	$3,107,995
Steel	3,600	2.8%	101	1,401	1,401	$280	$392,240	$185,165	$72,873	$61,575	$63,039	$525,664
Total	**24,733**		**1,688**	**23,479**	**19,462**		**$3,576,923**	**$2,572,498**	**$1,012,418**	**$855,462**	**$875,794**	**$5,430,584**

1. Extrapolation is based on ratio of assumed relevant national collection points to collection depots in SA. For Options 4a, 4b and 4c these are respectively: 165:55; 850:55; 1200:55.
2. Includes additional handling costs @ $36/ tonne and transport costs of $37/ tonne. The latter applies only to the proportion of additional recyclate moved from depot to consolidation point, which is assumed to be 0% for Option 4a (since all additional recyclate is to be collected at hubs), 71% for 4b and 100% for 4c.

Table 5: Estimated annual co-benefits, Option 4c

Material	Materials collected at SA CD Depots (tonnes)	Assumed additionality (%)	Additional tonnes collected	Extrapolated nationally[1]	Less reject (@20%)	Market value ($/tonne)	Material revenue	Plus: transport & collection costs avoided (@ $132/ tonne)	Plus: avoided landfill costs (@ $52)	Less: additional handling costs & transport costs to central point[2] (@ $73/ tonne)	Less: MRF charge (@$45/ tonne)	Net benefit ($/annum)
Non Deposit Glass	7,401	8.3%	615	13,426	10,741	$0	$0	$1,419,703	$558,730	$780,847	$483,331	$714,255
Brass, Copper, Batteries	5,125	2.8%	143	3,128	3,128	$500	$1,564,137	$413,495	$162,733	$227,425	$140,772	$1,772,167
Mixed Plastics	212	12.9%	27	597	477	$349	$166,644	$63,115	$24,839	$34,714	$21,487	$198,397
LPB	333	12.5%	42	911	729	$150	$109,359	$96,367	$37,926	$53,002	$32,808	$157,841
Paper and Cardboard	8,061	12.5%	1,011	22,061	17,648	$181	$3,194,366	$2,332,770	$918,071	$1,283,041	$794,179	$4,367,987
Steel	3,600	2.8%	101	2,197	2,197	$280	$615,278	$290,455	$114,310	$159,753	$98,884	$761,406
Total	**24,733**		**1,940**	**42,320**	**34,921**		**$5,649,784**	**$4,615,905**	**$1,816,609**	**$2,538,782**	**$1,571,461**	**$7,972,054**

1. Extrapolation is based on ratio of assumed relevant national collection points to collection depots in SA. For Options 4a, 4b and 4c these are respectively: 165:55; 850:55; 1200:55.
2. Includes additional handling costs @ $36/ tonne and transport costs of $37/ tonne. The latter applies only to the proportion of additional recyclate moved from depot to consolidation point, which is assumed to be 0% for Option 4a (since all additional recyclate is to be collected at hubs), 71% for 4b and 100% for 4c.

2.2.4 Perverse effects?

In feedback provided on the Consultation RIS and at a recent workshop, some stakeholders suggested that, far from leading to co-benefits, the introduction of a CDS nationally could have the perverse effect of reducing non-CDS material recycling. The argument advanced for this outcome is that, with a CDS in place, there will be reduced incentive for Australian Packaging Covenant (APC) partners to actively pursue recycling through other channels. No information was provided to support this claim. As with claims advancing the co-benefits of a CDS, it will not be possible to verify this claim in the absence of ex-ante and ex-post data. It is important to note, however, that the APC is intended to remain in place in parallel with a CDS.

2.3 Co-benefits associated with options 2a-2e and 3

Assessment of the packaging recycling potential and costs of Options 2a to 2e and 3 being undertaken for the DRIS suggests that these options are also likely to generate co-benefits. This preliminary finding confirms the view, expressed in the CRIS, that Options 2b and 2c in particular could generate co-benefits including:

- increased public place recycling opportunities (such as the National Bin Network), which is likely to increase recycling rates of non-packaging products;
- improved kerbside recycling through investment in appropriate bin configurations, which will benefit non-packaging products (such as newspapers) that are also accepted as part of this service; and
- recycling campaigns and education programs, which are likely to increase the awareness of the benefits of recycling more generally.

For reasons of consistency and completeness, it is important that these co-benefits are assessed on a comparable basis to co-benefits associated with Options 4a, 4b and 4c. The project team has estimated packaging recycling rates and costs through the application of a ‘Marginal Recycling Cost Curves’ (MRCCs) model to Options 2a to 2e and 3 (see Data Assumptions report). When applying the recycling outcomes of programs and initiatives to each of the options, packaging and non-packaging recycling rates have been inferred. This has enabled non-packaging recyclate associated with each of the options to be estimated. Indicatively, the level of non-packaging recyclate generated through programs initiated under options 2a to 2e is approximately 20,000 to 30,000 tonnes/ annum, depending on the option (see for example, Data Assumptions report, Figures 3 to 5).

The critical question surrounding non-packaging recyclate, as it is for Options 4a, 4b and 4c, is what level of additionality is associated with this material? Because program investments under Options 2a to 2e add to existing recycling programs without restructuring the waste management and recycling supply chain (unlike Options 4a, 4b and 4c), the rates of additionality are likely to be substantially higher than are assumed for non-packaging recycling under Options 4a, 4b and 4c; potentially even 100%. Nevertheless, there is still considerable uncertainty about rates of additionality associated with non-packaging recyclate generated through these options.

Because non-packaging waste is not included in the material flows analysis (MFA) being applied to the DRIS, it is not feasible to provide fully developed jurisdictional and regional breakdowns of potential co-benefits. Modelled costs and benefits for each of the options will therefore be presented in the Regulation Impacts report in a similar format to results for Options 4a, 4b and 4c as presented in Tables 3 to 5.

3. Conclusions and recommendations

In conclusion, the following points are made regarding potential co-benefits resulting from implementation of options.

- In relation to the use of CDS collection depots or hubs to provide a 'drop-off' service for non-CDS materials, the key issue is one of additionality. That is, the key question is will the implementation of a CDS nationally, using hubs for collection of non-CDS materials in addition to beverage containers, result in additional recycling of non-CDS materials beyond what would have happened in the absence of a CDS? There is insufficient evidence to answer this question conclusively.

  Notwithstanding this uncertainty, a revised extrapolation of the South Australian performance data nationally has been undertaken. It applies a similar approach to that used by the Boomerang Alliance (2012), but incorporates a more complete range of costs and benefits and includes assumptions regarding the level of additionality for non-CDS materials. The extrapolation yields annual net benefits of approximately $1.2 million, $5.3 million and $8.0 million for Options 4a, 4b and 4c respectively. Due to uncertainty about rates of additionality, these estimates should be regarded as indicative only.

- Other (non-CDS) options being examined through the DRIS also produce co-benefits. For reasons of consistency and completeness these co-benefits have been assessed on a comparable basis to co-benefits estimated for Options 4a, 4b and 4c and will be presented in the Regulation Impacts report alongside those for Options 4a to 4c.

- With regards to the potential for Option 4a to generate co-benefits through a C&I collection service, the modelling required to develop a robust estimates of the costs and benefits of this discrete option is beyond the scope of the study. Nevertheless, indicative estimates of the net benefits of a C&I collection service could be developed. This will involve utilising infrastructure and operating cost estimates developed through the MRCC process applied to Options 2a to 2e (see section 2.3).

Given these points, the proposed approach to addressing potential co-benefits of options in the Distributional and Cost Benefit Analysis is as follows:

1) Present value estimates of co-benefits for options 2a to 2e and 4a to 4c will be provided with results of the CBA model. Given uncertainties with the estimates however, sensitivity analysis will be undertaken to determine the impact of co-benefits on the overall NPV and ranking of options.

2) Because estimation of co-benefits occurs outside of the MFA model, it will not be feasible to provide a distributional breakdown of the co-benefits.

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FINAL REPORT 1 OCTOBER 2013

Distributional and Cost Benefit Analysis for the Packaging Impacts Decision Regulation Impact Statement

Regulation Impacts Report

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Abbreviations

ABS	Australian Bureau of Statistics
ADF	Advance Disposal Fee
APC	Australian Packaging Covenant (formerly NPC)
BCR	Benefit Cost Ratio
C&I	Commercial and Industrial
CAGR	Compound Annual Growth Rate
CBA	Cost Benefit Analysis
CDL	Container Deposit Legislation
CDS	Container Deposit Scheme
CRS	Container Refund Scheme
CPI	Consumer Price Index
CRIS	Consultation Regulatory Impact Statement
DRIS	Decision Regulatory Impact Statement
HDPE	High Density Polyethylene
LGA	Local Government Area
LPB	Liquid paperboard
MFA	Material Flows Analysis
MRCCs	Marginal recycling cost curves
MRF	Materials Recovery Facility
NEPC	National Environment Protection Council
NPC	National Packaging Covenant (now Australian Packaging Covenant)
NPV	Net Present Value
PET	Polyethylene terephthalate
PSO	Product Stewardship Organisation
PV	Present Value

NPC	National Packaging Covenant
RVM	Reverse Vending Machine
WTP	Willingness to pay

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Executive summary

Introduction

This report presents the results of a Distributional and Cost Benefit Analysis comparing the costs and benefits of ten national options to increase packaging resource recovery rates and decrease packaging litter. The costs and benefits of the options are compared against a base case defined as business-as-usual waste, recycling and litter legislation, policies and strategies. Table 1 in the main report contains a summary of the options.

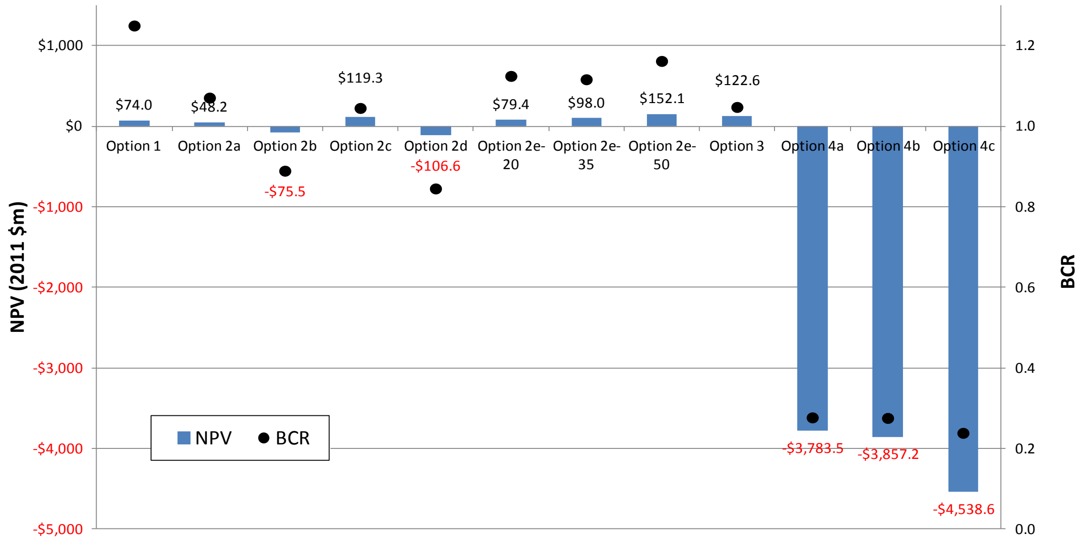
Cost benefit analysis results

Figure ES 1 below shows results of the CBA and compares the performance of options using two key metrics:

- Net Present Value (NPV), which is the Present Value (PV) of benefits delivered by the policy less the PV of costs incurred; and
- Benefit Cost Ratio (BCR), which is the ratio of the PV of benefits to PV of costs.

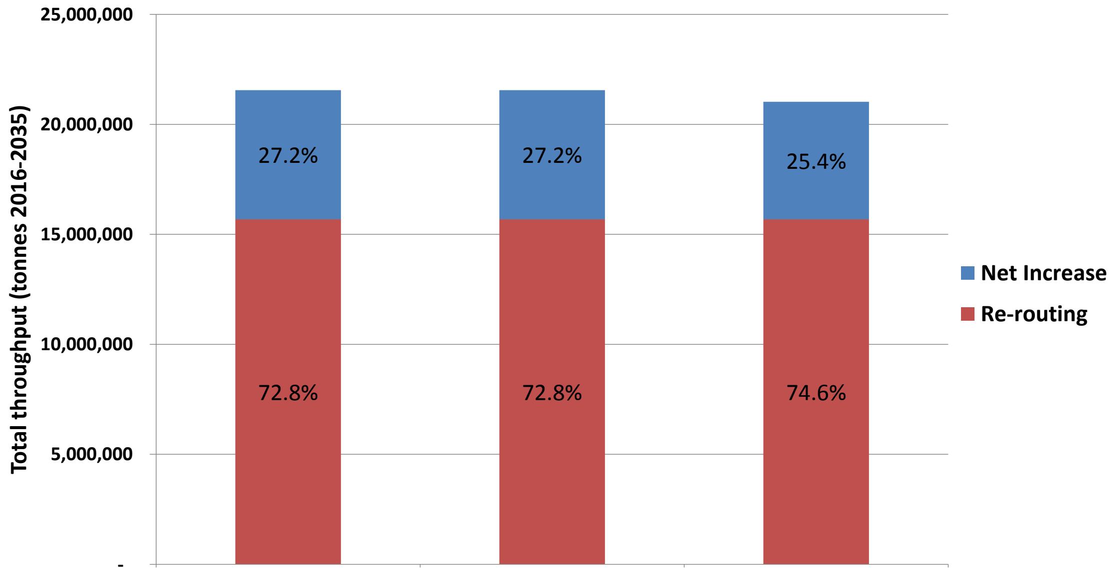
Option 2e ($50m) has the highest estimated NPV and therefore delivers the greatest expected benefit to society based on the assumptions about cost and benefit items adopted. The fact that Option 1 has a higher BCR however, means it is more likely to be robust to variations in benefit and cost assumptions.

Figure ES 1: Results of the CBA, overview (NPV 2011 $m)



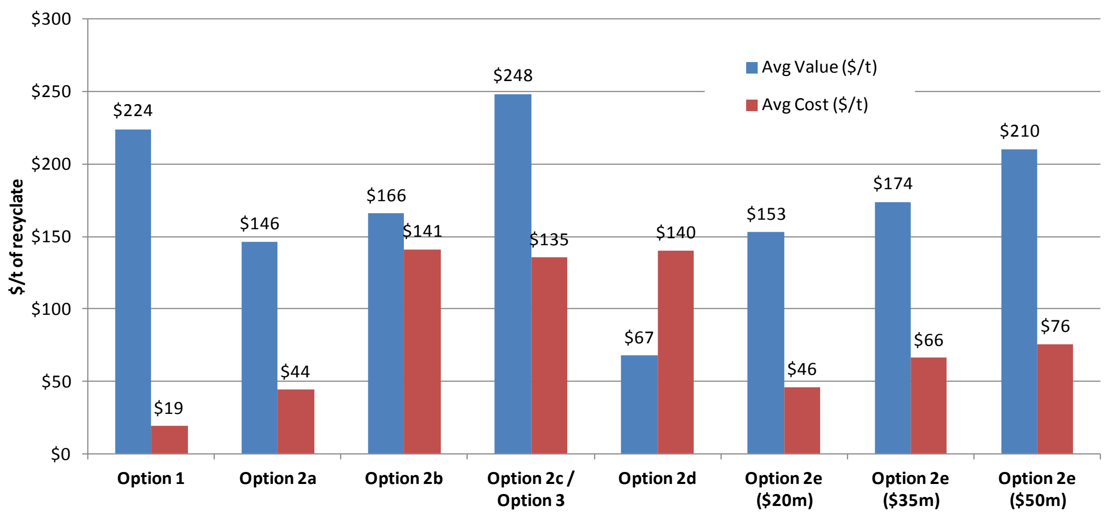
Non-CDS options (Option 1, 2a-2e, 3) perform significantly better than CDS options (4a, 4b, 4c) in the CBA. This reflects the relative cost effectiveness of the two recycling models. Under a CDS option a large amount of new infrastructure is required for the collection, handling and processing of beverage containers. Established, conventional recycling infrastructure (e.g. kerbside bins, MRFs) still needs to be kept in place however. Figure ES 2 shows the proportion of volume flowing through CDS infrastructure under each of the CDS options that is incremental to the base case, shown in blue. The remaining volume, shown in red, is deemed to be 're-routed' as this proportion is expected to have been recycled anyway under business-as-usual. The effect of this re-routing is a marked reduction in the cost effectiveness of CDS options.

Figure ES 2: Re-routing of volumes under the CDS options



The comparative performance of the non-CDS options depends primarily on the net payoff (the difference between value[1] of recycling and cost[2] of recycling) from recycling investments for each of the options, and the scale of positive payoff opportunities that are likely to be created. Figure ES 3 illustrates this.

Figure ES 3: Average cost and average value of non-regulatory and co-regulatory options in 2020 ($/tonne)



1 Average value is measured as the sum of market value of recyclate and avoided externalities in landfill

2 Average cost is measured as annualised recycling infrastructure investment and operating costs

The positive NPV options (Option 1, Option 2a, Option 2c, Option 3 and Options 2e) have a higher net payoff than the negative NPV options (Option 2b and Option 2d).

The best performing option ranked by NPV, Option 2e ($50m), entails investments in extensive, relatively high payoff, and diverse recycling opportunities.

Option 1, the best performing option measured by BCR, has the lowest expected recycling outcome but entails investments in opportunities with a high net payoff. As such, Option 1 could be described as a ‘low pain, low gain’ option.

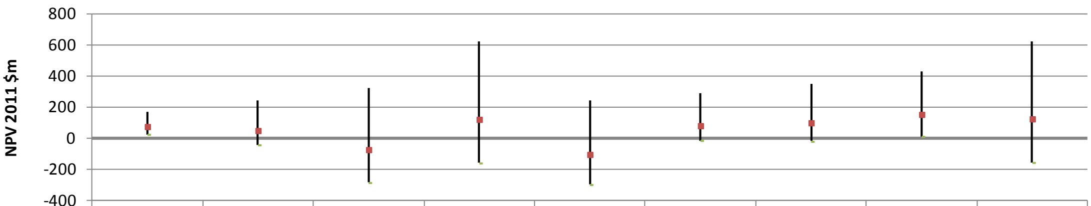
Sensitivity analysis

Two main sensitivity scenarios are tested:

- an ‘optimistic scenario’ assuming reductions in a number of key cost variables and increases in a number of key benefit variables; and
- a ‘pessimistic scenario’ assuming increases in a number of key cost variables and reductions in a number of key benefit variables.

The range of NPVs produced by assuming pessimistic, central and optimistic scenarios for non-CDS options is presented in Figure ES 4. Under optimistic settings, all non-CDS options are estimated to provide a net benefit to society (i.e. have positive NPVs). Only Options 1 and 2e ($50m) maintain positive NPVs under pessimistic settings, with Option 1 having the greatest NPV when adopting pessimistic assumptions.

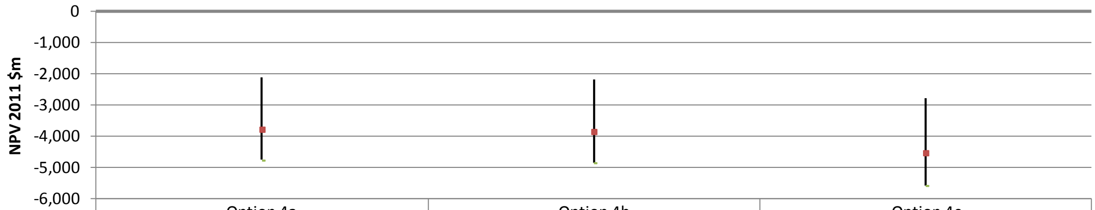
Figure ES 4: NPV outcomes under pessimistic, central and optimistic scenarios for non-CDS options (NPV 2011 $m)



	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e-20	Option 2e-35	Option 2e-50	Option 3
Optimistic	169	245	325	624	243	289	347	431	625
Central	74	48	-75	120	-106	80	98	153	124
Pessimistic	24	-44	-287	-161	-300	-15	-21	11	-157

The range of NPVs produced by assuming pessimistic, central and optimistic scenarios for CDS options is presented in Figure ES 5. The estimated negative NPVs are amplified under the pessimistic case and vice versa under the optimistic case.

Figure ES 5: NPV outcomes under pessimistic, central and optimistic scenarios for CDS options (NPV 2011 $m)



	Option 4a	Option 4b	Option 4c
Optimistic	-2,124	-2,181	-2,784
Central	-3,783	-3,857	-4,539
Pessimistic	-4,776	-4,859	-5,589

The central case has also been modelled with varied discount rates. While different discount rates change absolute NPV values of the options they do not alter whether an option has a positive or negative NPV and the ranking of options remains exactly the same.

Willingness to pay threshold analysis

Some non-market benefits of recycling have not been fully captured in the CBA. These include community's willingness to pay (WTP) for non-market benefits of increasing recycling and litter reduction. In the absence of robust WTP estimates, a threshold analysis has been undertaken to test the WTP at which the community would need to place on non-market benefits of recycling in order for individual options to be considered economically efficient. The estimates derived through the threshold analysis can be compared with outcomes of a review of Australian and international WTP studies (Appendix B).

Based on the analysis, it is our judgement that consistent and careful application of a WTP value for increasing recycling and a higher WTP value for litter reduction in the CBA is unlikely to improve the ranking of the CDS regulatory options (Options 4a, 4b, 4c) relative to the non-regulatory, co-regulatory and regulatory non-CDS options (Options 1, 2a-2e and 3 respectively), measured in terms of NPV or benefit-cost ratio. It may however, improve the ranking of the co-regulatory and regulatory non-CDS options projected to achieve ambitious recycling and litter reduction outcomes (e.g. Options 2c, 2d, 3) relative to options that are projected to achieve only limited recycling and litter outcomes (e.g. Options 1, 2a) or even options that are projected to achieve moderate outcomes (e.g. Option 2e($50m)).

Sectoral impacts

All options require additional expenditure in order to fund recycling and litter outcomes. In each case the sectoral group benefiting from that outcome may differ from the sectoral group that bears the cost. As with overall economic impacts, there is a distinction between the CDS and non-CDS options in terms of sectoral impacts.

Table ES 1 summarises the distribution of costs and benefits (expressed as PV of costs and benefits over the study period) by sectoral group for the non-CDS options.

Table ES 1: Sectoral impacts of non-CDS Options (NPV $ m)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e (35m)	Option 2e ($50m)	Option 3
Consumer	$0.0	-$88.3	-$401.6	-$534.8	-$388.9	-$114.7	-$174.2	-$222.2	-$534.8
Local Government	$12.3	$23.6	$72.4	$79.6	$67.1	$29.6	$35.4	$37.5	$79.6
Commercial & Industrial	$69.1	$78.9	$207.3	$385.0	$159.2	$88.1	$128.2	$184.0	$385.0
Environment	$34.4	$67.0	$122.9	$149.7	$113.0	$74.3	$84.4	$93.0	$149.7
Packaged Goods Industry	$0.0	-$54.6	-$70.6	-$82.1	-$34.3	-$34.7	-$36.1	-$37.3	-$32.7
Government	-$88.0	-$24.6	-$32.0	-$39.4	-$22.7	-$17.0	-$17.0	-$17.0	-$85.5
Co-benefits (unallocated)[3]	$46.2	$46.2	$26.0	$161.3	$0.0	$53.8	$77.3	$114.0	$161.3

Option 1 is funded by state and federal government expenditure. The expenditure results in recycling outcomes, for which some direct benefits accrue to providers of recyclate (LGAs and C&I waste producers). Landfill diversion and litter reduction benefits accrue to the general public (the environment). By contrast, the co-regulatory options (Options 2a, 2b, 2c, 2d, 2e ($20m), 2e ($35m) and 2e ($50m)) require expenditure from the packaged goods industry to fund initiatives, with additional administrative costs borne by government. The beneficiaries of recycling and litter outcomes are the same as for Option 1. The main cost of Option 3 ultimately falls on consumers, who will pay for the cost of the advanced disposal fee (ADF) in the form of higher prices.

Table ES 2 summarises the incidence of costs and benefits (expressed in PV terms) by sectoral group for the CDS options. The net costs of each of the CDS options (infrastructure and operational costs, plus refund costs, less recyclate sales and any deposit revenue (Option 4a only)) are ultimately borne by the consumer. As with non-CDS options, recyclate providers (LGAs and C&I) benefit due to receipt of refunds for beverage containers redeemed. Diversion of recyclate from landfill and avoided litter results in environmental benefits. Government bears administration costs and packaged goods industries experiences a loss of surplus due to price effects.

3 Co-benefits are the value of non-targeted materials that are recovered as a consequence of the packaging recycling programs. Because assessment of these benefits occurred outside of the MFA it was not feasible to distribute these benefits amongst stakeholders or between regions.

Table ES 2: Sectoral impacts of CDS Options (NPV 2011 $ m)

	Option 4a	Option 4b	Option 4c
Consumer	-$7,196.4	-$6,150.9	-$7,984.1
Local Government	$1,083.1	$568.7	$1,022.4
Commercial & Industrial	$2,549.2	$1,998.2	$2,487.7
Environment	$175.7	$173.9	$166.0
Packaged Goods Industry	-$162.6	-$228.8	-$454.5
Government	-$357.9	-$275.8	-$97.9
Co-benefits (unallocated)	$12.1	$56.3	$98.7

The operator of the container deposit scheme is not shown as a sectoral group in the impacts analysis. Under Options 4b and 4c the container deposit scheme operator is expected to break even (because the industry levy will be set at the level necessary to recover the net costs of the scheme). A detailed financial analysis has been undertaken to assess the financial viability of the container scheme operator under Option 4a. The core analysis shows that profits in the years 2016 to 2019 create a cumulative surplus balance of approximately $800m by 2020. This is adequate to sustain the scheme operator up until 2028 after which time the surplus is depleted and the operator enters into a deficit position. For all CDS options, the effective per container deposit rate has been calculated.

Regional impacts

Under the non-CDS options state and territories generally benefit in proportion to waste production and diversion of that waste. An exception to this trend is Queensland. As business-as-usual recycling rates are starting from a lower base in Queensland, a disproportionately higher amount of diversion is assumed to occur in that state, resulting in disproportionately higher benefits compared to the status quo. Similar to the non-CDS options, under the CDS options regional distribution of costs and benefits occurs in proportion to waste production.

PART A

COST BENEFIT AND DISTRIBUTIONAL ANALYSIS

1. Introduction and overview

1.1 Introduction

Australian environment ministers, through the Standing Council on Environment and Water, have agreed to develop a Decision Regulation Impact Statement (DRIS) in 2013 on a range of national options to increase packaging resource recovery rates and decrease packaging litter. The Packaging Impacts Decision RIS continues a process progressed through the 'Packaging Impacts Consultation RIS' (CRIS). This 'Distributional and Cost Benefit Analysis', entailing financial and economic analysis of the options, will provide an important input to development of the Decision RIS. In general terms, the Distributional and Cost Benefit Analysis (CBA) involves:

- a comprehensive review of the methods and assumptions employed for the Consultation Regulatory Impact Statement (CRIS) analysis, especially in light of stakeholder feedback received through the consultation process;
- expanded and more in-depth analysis to meet the requirements for a DRIS, especially of the distributional (financial) impacts; and
- consideration of an expanded number of options.

The ten (10) packaging options to be considered in the Distributional and Cost Benefit Analysis are summarised in Table 1. They include a mix of non-regulatory, co-regulatory and mandatory options. Three of the options (Options 2d, 2e and 4c) were not included in the previous CRIS and represent new options. A detailed description of all options is contained in a separate report (NEPC Service Corporation 2013).

This report presents the results of the Distributional and Cost benefit Analysis comparing costs and benefits of each of the options presented in Table 1 against a base case, which is defined as a business-as-usual scenario where:

1. Most existing waste, recycling and litter legislation, policies, strategies and initiatives, applied by federal, state and local governments or by industries and industry bodies are retained for the period of the analysis[4].
2. Realistic projections of packaging consumption and recycling, landfill and littering of post consumption packaging material litter are set, assuming business as usual policy setting and economic and demographic forecasts.
3. Projections vary according to packaging type, material and region.

Three other reports, produced as part of this study, accompany this report:

- a report on the methodological approach to the analysis;
- a report on the data assumptions underpinning the analysis; and
- a report on the co-benefits associated with the options.

The data assumptions report in particular should be read in conjunction with this report, as impacts discussed in this report stem directly from assumptions about cost and benefit items.

4 An exception is the Australian Packaging Covenant (APC). This remains in place under a majority of options, but is assumed to be replaced under Options 2a, 2b, 2c and 3.

Table 1: Options to increase packaging resource recovery rates and decrease packaging litter

Approach	Option		Summary of option
No new regulation	**1**	National Packaging and Litter Strategy	A nationally coordinated government initiative targeting packaging recycling and litter.
Co-regulatory product stewardship	**2a**	Australian Packaging Covenant replaced by co-regulatory product stewardship under the *Product Stewardship Act 2011* (PS Act)	An industry run co-regulatory product stewardship scheme under the PS Act to replace the existing Covenant.
	2b	Industry Packaging Stewardship	An industry run co-regulatory product stewardship scheme under the PS Act based on the National Bin Network proposal developed by companies in the packaging and packaged goods industries.
	2c	Extended Packaging Stewardship	An industry run co-regulatory product stewardship scheme under the PS Act that goes beyond the commitment from industry groups under option 2b.
	2d	Beverage Container Stewardship (**new option**)	A co-regulatory product stewardship scheme under the PS Act that makes the beverage industry responsible for achieving an 80 per cent national beverage container recycling rate by 2025.
	2e	Extended Australian Packaging Covenant (**new option**)	A co-regulatory scheme modelled broadly on the existing Australian Packaging Covenant with a greater financial commitment from industry. Three variations of this option are considered entailing different levels of investment by industry. Reflects stakeholder support for the current Covenant model.
Mandatory product stewardship	**3**	Advance Disposal Fee	An advance disposal fee on all packaging materials that generates revenue to fund packaging recycling and litter programs.
	4a	Boomerang Alliance container deposit scheme	A national container deposit scheme proposed by Boomerang Alliance with a ten cent upfront deposit (payable by domestic producers and importers of pre-sealed beverages) and a ten cent refund for redeemed containers.
	4b	Centralised container refund scheme	A container refund scheme managed by a single national coordinator which allows consumers to receive a ten cent refund when they return their containers to an approved depot.
	4c	South Australian container refund scheme (**new option**)	A national container refund scheme based on the South Australian scheme which allows consumers to receive a ten cent refund for eligible containers they return to approved depots.

Source: NEPC Service Corporation

1.2 Approach to and scope of analysis

1.2.1 Approach to the analysis

The purpose of the cost-benefit analysis is to assess the economic costs and benefits of each of the options identified in Table 1 incrementally to the base case. This is done through an integrated financial and economic model, which disaggregates impacts by sectoral group, state and region (metro and non-metro).

Economic impacts (costs and benefits) are assessed in the model by aggregating the relevant subset of financial (incidence) impacts. This approach reflects the fact that all costs and all market benefits associated with options will have a financial impact on one or more sectoral group. The aggregated costs and benefits are expressed for each option as a Net Present Value (NPV) and Benefit Cost Ratio (BCR), providing a comparable basis for prioritising between the options. Additionally, financial transfers between sectoral groups have been modelled for the distributional analysis, even though in aggregate they do not result in a net economic cost or benefit.

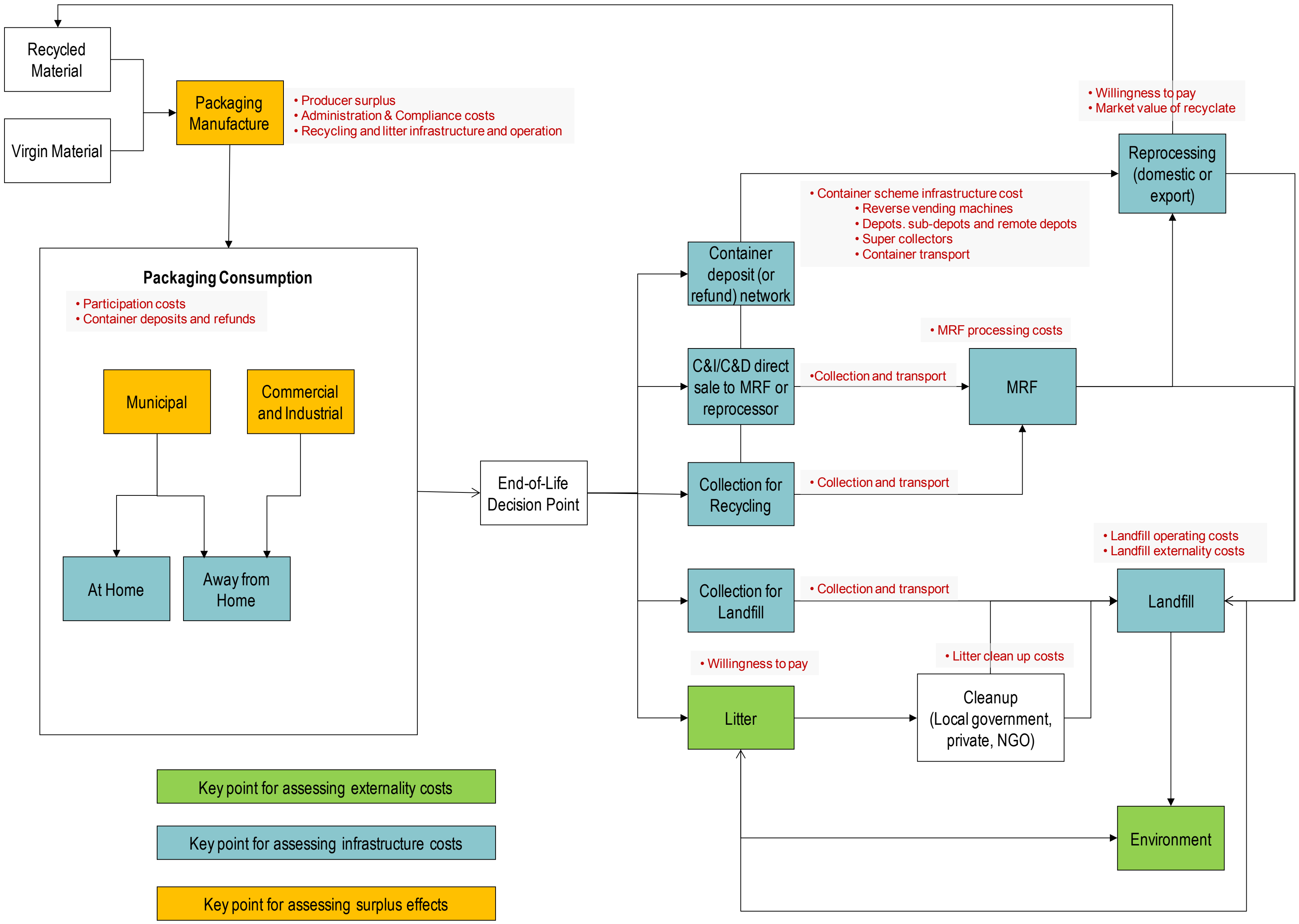
To achieve this disaggregation, required integration of the financial and economic model with a material flows analysis (MFA) model, noting that the physical flow of packaging waste ultimately drives many (although not all) of the costs, benefits and distributional impacts of the options. Thus a conceptual 'physical flow' of waste, as developed for the MFA, is used as the basis for identifying the costs and benefits and distributional impacts. For each option, this process involved:

1. Mapping out the individual steps in the waste 'supply chain' from source to destination. A generic example is provided in (Figure 1).
2. Identifying, at each point in the supply chain, the cost and (for some points in the chain) benefit items that arise (including transfers).
3. Identifying sectoral impacts for each cost and benefit impact (i.e. the sectoral group(s) that will incur the cost or accrue the benefit, including transfers).
4. Assigning values to each cost and benefit item in the model and aggregating them for each sectoral group.

Further details of the MFA model are provided in Appendix C.

Further details of the overall approach applied to the analysis are provided in the methodological report.

Figure 1: Chain of 'physical flows' and associated costs, benefits and transfers



1.2.2 Scope of analysis

Costs and benefits that have been assessed in the cost-benefit and distributional analysis are set out in Table 2. Categorisation of costs and benefits is not rigid and, in practice, a number of the variables listed as costs will present in the analysis as negative costs (i.e. benefits) for at least some options[5].

Table 2: Costs and benefits

Costs	Benefits
Policy & regulatory costs - Regulation (including policy development, policy administration and [less] avoided regulatory costs) **Recycling and litter infrastructure & operating costs** - Recycling and waste collection and transport - MRF processing - Infrastructure investment & operations - Container scheme infrastructure **Packaging and retail industry impacts** - Administration & compliance (including plan development & reporting , labelling, data reconciliation & reporting , retailer compliance and PSO/ project coordinator administration) - Impact on industry surplus **Participation costs** - Consumer participation - Businesses participation	**Avoided landfill costs** - Garbage collection and transport - Landfill operating costs - Landfill externalities **Avoided costs of litter** **Recyclate/ recovered material value** - Paper/ cardboard - Glass - Plastics - Steel cans - Aluminium cans **Co-benefits**[6] - Value of non-target materials

1.2.3 Limitations

Data uncertainties

Assessed costs and benefits of options are dependent on data assumptions that underpin the variables listed in Table 2. Although considerable background analysis has gone into assigning suitable values to the variables (see Data Assumptions report), in practice there are still uncertainties around the estimated values for a number of variables. Even variables that are directly valued in the market (e.g. value of recovered material) are subject to uncertainty due, for example, to fluctuations in market values over time and differences in market values from region to region.

Therefore, where data assumptions have the potential to significantly affect outcomes of the analysis, we have tested uncertainties through sensitivity analysis. This has been done by means of scenarios that involve changes to a number of key assumptions, applying the changes

5 The CDS options have negative net transport costs for example.

6 Co-benefits are defined as 'the potential costs and benefits resulting from additional recycling of non-target materials due to the implementation of the proposed option'. For Options 2a-2e, non-target materials include any non-packaging recyclate. For Options 4a-4c, non-target materials include any recyclate other than beverage containers. Co-benefits are discussed in more detail in a separate Co-benefits report.

across all options to test the impact of changes on the net benefit/cost and ranking of the options. Details of the sensitivity analysis are provided in Section 2.3 following discussion of the main results.

Unquantified benefits

A number of potential benefits of implementing options are not directly reflected in market prices. Because of this, it can be difficult to ascribe dollar values to those benefits or at least values that provide a true reflection of their economic value. Potential non-market benefits include:

- avoided environmental and social externalities associated with the operation of landfills;
- avoided environmental and social externalities of litter;
- reduced resource depletion; and
- avoided environmental externalities due to reduced resource depletion.

Only the first two of these benefits have been estimated in the analysis. The other two benefits have not been valued due to difficulties in quantifying benefits and/ or valuing them.

The absence of full valuation of non-market benefits restricts the analysis, since it is only possible to make definitive statements about the economic efficiency of options when all costs and benefits have been fully valued. To help address this limitation therefore, a threshold analysis was undertaken to demonstrate the level of non-market benefits the community need to place, or their Willingness to Pay (WTP) for non-market benefits, if the outcomes of each of the options were to be considered economically efficient. Estimates can be compared with results of a review of Australian and international literature of households' WTP for recycling, which are discussed in Appendix B. The threshold analysis is presented in Section 2.4.

1.3 Report structure

This Distributional and Cost-Benefit report consists of two key parts, Parts A and B. Part A, the distributional and cost-benefit analysis, presents the main analysis and is divided into three sections as follows:

- Section 1: Introduction (this section);
- Section 2: Cost benefit analysis; and
- Section 3: Distributional impacts.

Part B consists of supporting documentation, with a range of background information and inputs into the Distributional and Cost Benefit Analysis, as follows:

- Appendix A: Detailed results of individual options.
- Appendix B: Community's willingness to pay for recycling and litter reduction.
- Appendix C: Discussion of the material flows model used for the analysis.

2. Cost benefit analysis

2.1 CBA overview

Table 3 and Figure 2 below provide results of the CBA and compare the performance of options using two key metrics:

- Net Present Value (NPV), which is the Present Value (PV) of benefits delivered by the policy less the PV of costs incurred; and
- Benefit Cost Ratio (BCR), which is the ratio of the PV of benefits to PV of costs.

The NPV measures the expected benefit (or cost) to society of implementing the policy expressed in monetary terms. An option with the highest NPV is expected to deliver the highest scale of benefits to society, whereas the option with the highest BCR provides the highest benefit per unit of cost.

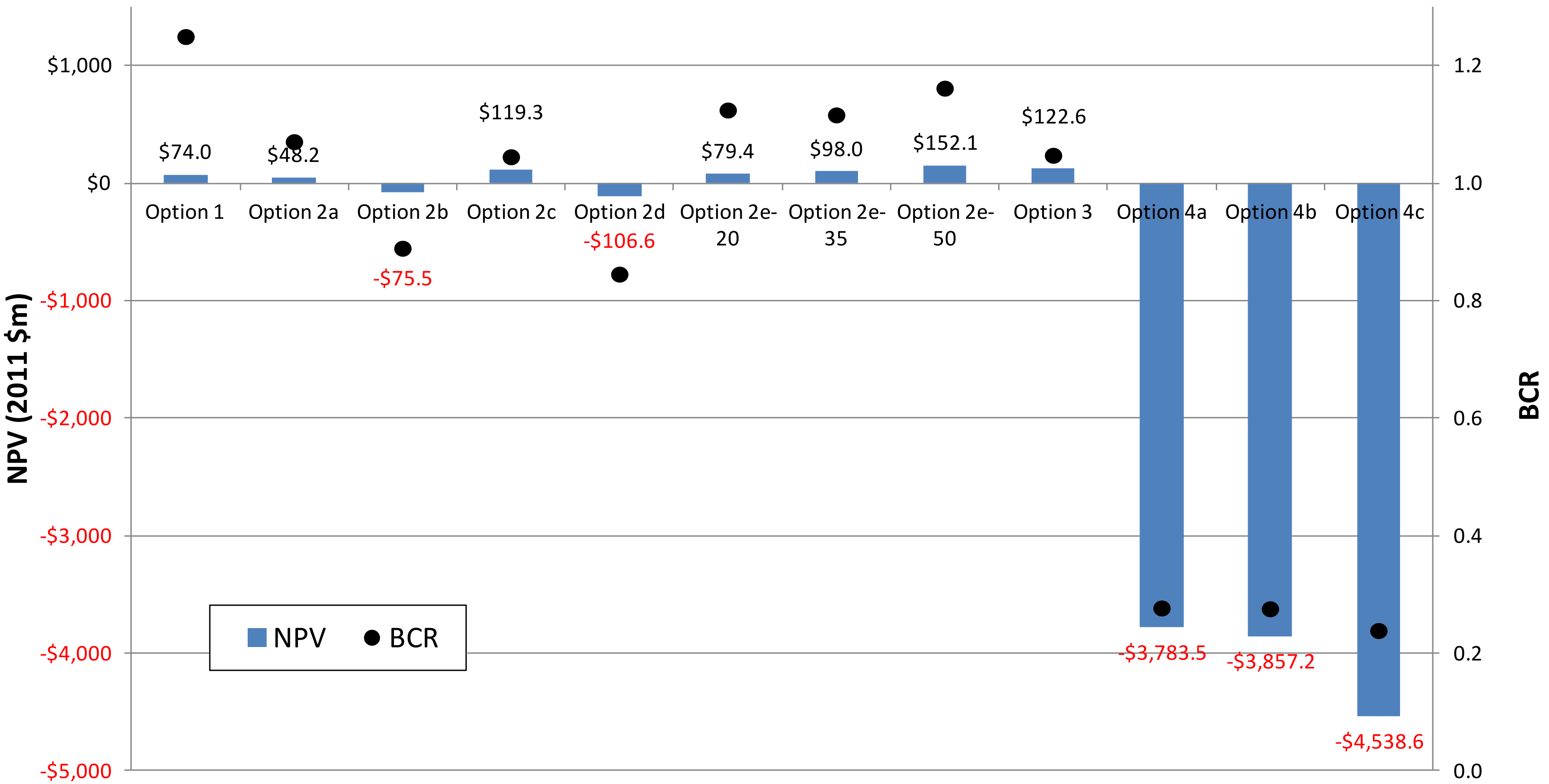
Option 2e ($50m) has the highest estimated NPV and therefore delivers the greatest expected benefit to society based on the assumptions about cost and benefit items adopted. The fact that Option1 has a higher BCR however, means it is more likely to be robust to variations in benefit and cost assumptions. For example, should material values turn out to be lower than anticipated, Option 1 could perform better than Option 2e ($50m). In this way, the BCR provides some measure of the risk of the various alternatives. This risk is further explored in the sensitivity analysis (see Section 2.4).

There is a large diversion between the CDS options (4a, 4b and 4c) and other options, with respect to NPV and BCR, reflecting much higher costs relative to the scale of benefits associated with the CDS options. The drivers behind differences in performance between the options are discussed in the following section.

Table 3: Results of the CBA, overview (PV 2011 $m)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e ($35m)	Option 2e ($50m)	Option 3	Option 4a	Option 4b	Option 4c
Benefits ($m)												
Avoided landfill	$132.9	$218.8	$407.7	$584.0	$359.8	$258.8	$327.0	$382.9	$584.0	$321.6	$309.0	$274.9
Avoided litter	$27.8	$59.6	$113.5	$124.0	$107.2	$63.2	$72.1	$74.2	$124.0	$171.8	$170.1	$162.6
Recyclate value	$114.8	$150.5	$377.2	$632.6	$305.5	$170.4	$232.1	$312.0	$632.6	$1,027.3	$1,016.5	$963.8
Co-benefits	$46.2	$46.2	$26.0	$161.3	$0.0	$53.8	$70.2	$94.9	$161.3	$12.1	$56.3	$98.7
Total Benefits	**$321.7**	**$475.1**	**$924.4**	**$1,502.0**	**$772.4**	**$549.4**	**$709.1**	**$884.7**	**$1,502.0**	**$1,532.8**	**$1,551.9**	**$1,500.0**
Costs ($m)												
Policy & regulatory	$10.0	$24.6	$32.0	$39.4	$22.7	$17.0	$17.0	$17.0	$85.5	$357.9	$275.8	$97.9
Infrastructure & operating	$198.6	$294.0	$789.3	$1,069.6	$735.3	$357.3	$476.1	$570.2	$1,069.6	$4,310.1	$4,442.4	$5,039.2
Industry impacts	$0.0	$54.6	$70.6	$82.1	$34.3	$34.7	$36.1	$37.3	$32.7	$162.6	$228.8	$454.5
Participation	$39.1	$53.8	$108.0	$191.6	$86.6	$57.1	$76.6	$94.2	$191.6	$485.7	$462.2	$446.9
Total Costs	**$247.7**	**$426.9**	**$999.9**	**$1,382.7**	**$879.0**	**$470.0**	**$611.2**	**$732.7**	**$1,379.4**	**$5,316.3**	**$5,409.1**	**$6,038.6**
NPV ($m)	**$74.0**	**$48.2**	**-$75.5**	**$119.3**	**-$106.6**	**$79.4**	**$98.0**	**$152.1**	**$122.6**	**-$3,783.5**	**-$3,857.2**	**-$4,538.6**
BCR	**1.3**	**1.1**	**0.9**	**1.1**	**0.9**	**1.2**	**1.2**	**1.2**	**1.1**	**0.3**	**0.3**	**0.2**

Figure 2: Results of the CBA, overview (NPV 2011 $m)



2.2 CBA drivers

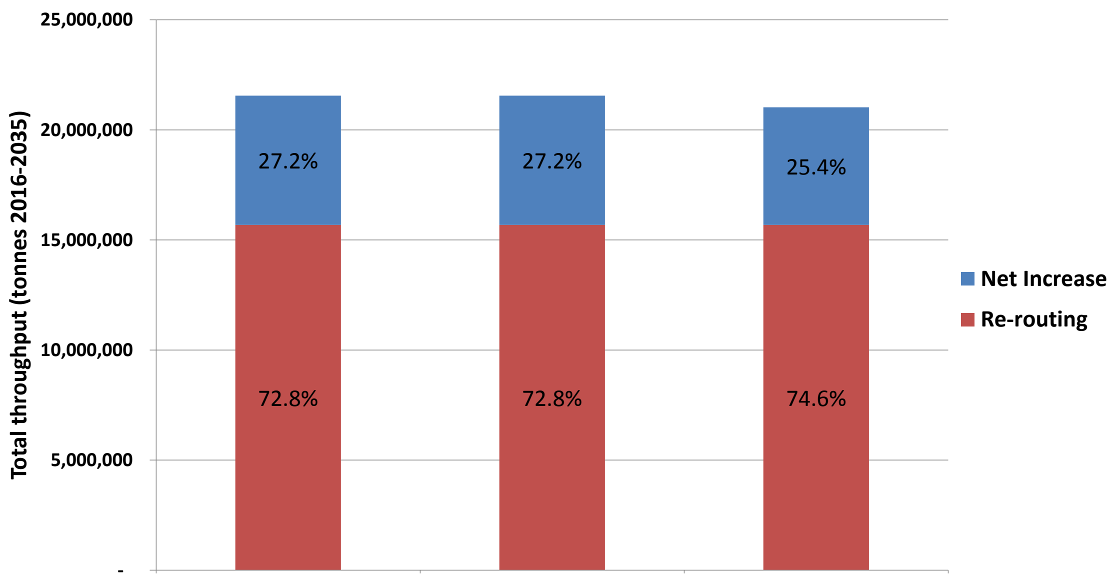
2.2.1 Lower cost effectiveness of CDS options

Non-CDS options (Option 1, 2a-2e, 3) perform significantly better than CDS options in the CBA. This reflects the relative cost effectiveness of the two recycling models. Under a CDS option a large amount of new infrastructure is required for the collection, handling and processing of beverage containers. Established, conventional recycling infrastructure (e.g. kerbside bins, MRFs) still needs to be kept in place however. While there are some reductions in costs to conventional infrastructure, due to lower volumes needing to be processed, there are substantial fixed costs involved with this infrastructure.

This augmentation to the recycling supply chain associated with the CDS options comes at a high cost, without a commensurate level of benefit, as a large proportion of the volumes flowing through the CDS infrastructure would have otherwise flowed through the conventional recycling route under business-as-usual.

Figure 3 below shows the proportion of volume flowing through CDS infrastructure under each of the CDS options that is incremental a net increase to the base case, shown in blue. The remaining volume, shown in red, is deemed to be 're-routed' as this proportion is expected to have been recycled anyway under business-as-usual.

Figure 3: Re-routing of volumes under the CDS options (tonnes)

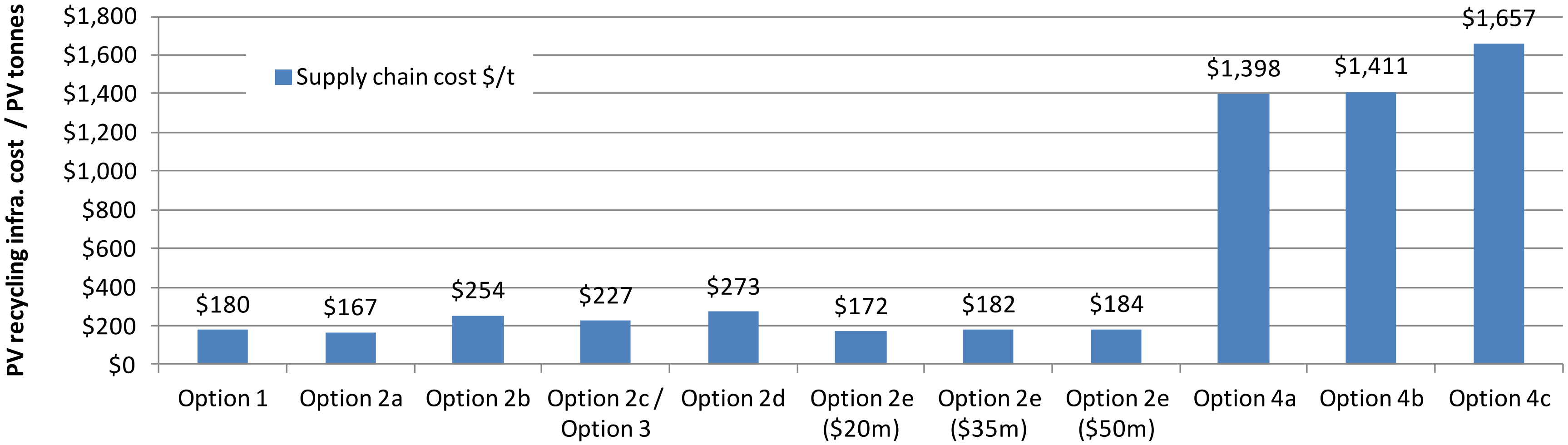


The effect of this re-routing is a marked reduction in the cost effectiveness of CDS options. As an illustration of this effect, measuring cost effectiveness as total net increase in recycling infrastructure costs[7] (expressed as a PV), divided by additional tonnes of recycling (also expressed as a PV), the significant differences in cost effectiveness of CDS options can be seen (see Figure 4).

CDS options are clearly less cost effective due to the need for infrastructure augmentation and subsequent underutilisation of existing conventional recycling infrastructure.

7 This includes infrastructure investment and operation, MRF sorting costs, collection & transport and CDS infrastructure costs

Figure 4: Supply chain cost effectiveness ($/ additional tonne)



2.2.2 Non-CDS options - scale of recycling opportunities and their average payoff

The comparative performance of the non-CDS options depends primarily on the net payoff (the difference between value of recycling and cost of recycling) from recycling investments for each of the options, and the scale of positive payoff opportunities that are likely to be created.

Figure 5 and Figure 6 illustrate the average payoff received by the various options. Costs are derived from application of Marginal Recycling Cost Curves (MRCCs) to the co-regulatory options for the purpose of identifying the infrastructure and operating costs of those options[8]. Value depends on the material composition of recyclate produced by the options, with a material's value calculated as market value plus avoided landfill costs. Average costs and values in the charts are calculated for the year 2020. Note that not all costs and benefit items are included in these charts. Average value is measured as the sum of market value of recyclate and avoided externalities in landfill. Average cost is measured as annualised recycling infrastructure investment and operating costs.

The positive NPV options (Option 1, Option 2a, Option 2c, Option 3 and Options 2e) have a higher net payoff than the negative NPV options (Option 2b and Option 2d).

The best performing option ranked by NPV, Option 2e ($50m), entails investments in extensive relatively high payoff , and diverse opportunities.

Option 1, the best performing option ranked by BCR, has the lowest expected recycling outcome but entails investments in opportunities with a high net payoff.

A number of factors underlie the two main drivers (that is, net payoff and scale of positive investments). These factors are discussed below.

Constraining policies lowers overall cost effectiveness

Choosing options that have a fixed beverage target, as opposed to focusing on total recycling outcomes, could lower the performance of those options. Specifically, targeting beverage containers could have the effect of reducing the overall value of recyclate collected because:

- to meet the beverage container targets will require substantial investments in glass (because, on per weight basis, glass constitutes a substantial proportion of beverage containers) and glass is a relatively low value material; and
- investments targeting beverage containers tend to produce relatively few co-benefits, since a significant proportion of beverage recycling programs will need to focus on public place recycling (because that is where the greatest capacity for increasing beverage container recycling is), whereas as most co-benefits (e.g. non-packaging paper) will come from C&I and household sources.

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8 The MRCCs were constructed using actual experience (primarily relying on National Packaging Covenant (NPC) and Packaging Stewardship Forum (PSF) data), complemented to a lesser extent with other information on recycling opportunities. Measuring industry costs in this manner provided a 'smoothed' profile of costs to industry with costs increasing (decreasing) as recycling target tonnes increase (decrease) over time. A more detailed discussion of the MRCCs is provided in section 4.7 of the Data Assumptions report.

Figure 5: Composite value of an average tonne of recyclate in 2020 ($/ tonne)

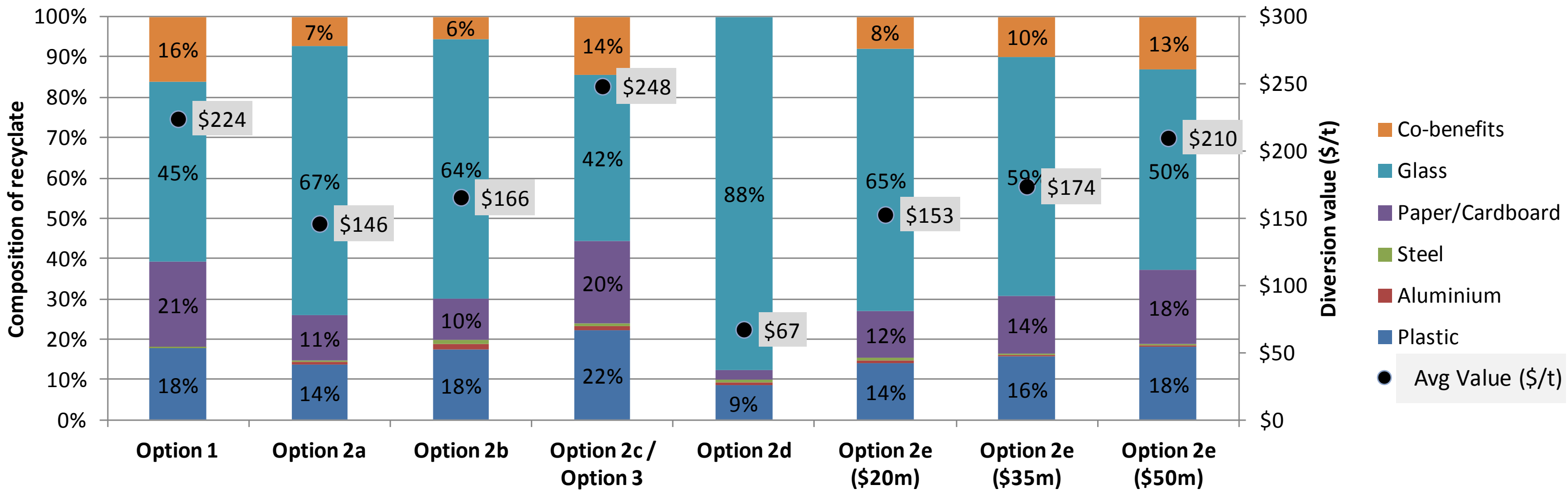
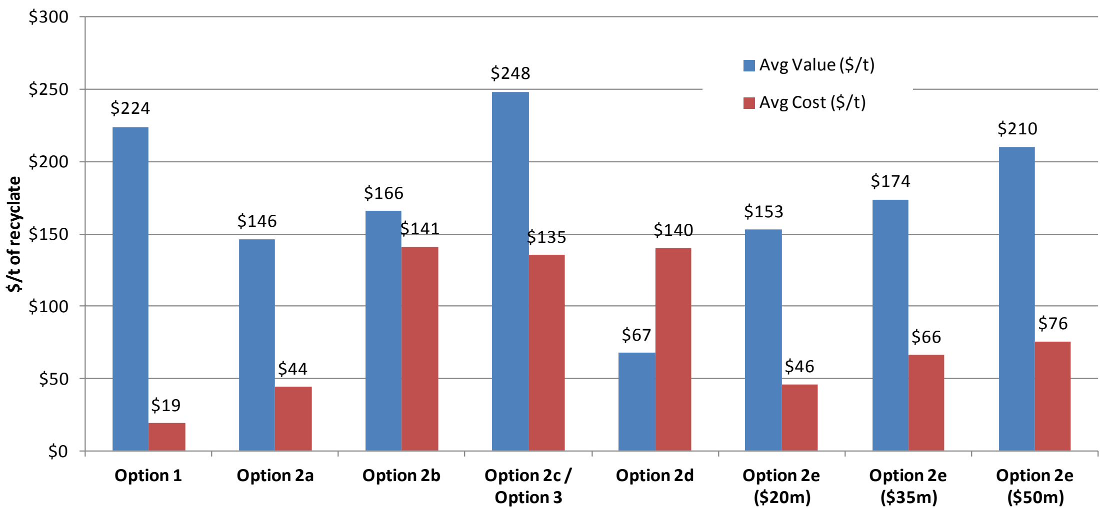


Figure 6: Average cost and average value of non-regulatory and co-regulatory options in 2020 ($/ tonne)



To a lesser extent, constraining options to have a packaging target, as opposed to focussing on total recycling outcomes, could also lower their performance, since opportunities, which may be relatively cheaper when measured as $ per tonne of overall recyclate, but are relatively more expensive when measured as $ per tonne of packaging, will be overlooked. This is reflected in the low costs of Options 2e ($20m), ($35m) and ($50m)[9]. Similarly Options 2c and 3, while more ambitious in scale than 2b and 2d, are more cost effective because they entail proportionally greater recycling of non-beverage material.

Finally, a more flexible approach could result in greater diversification of recycling outcomes across various packaging categories and material types. There will be less risk therefore, that recycling rates approach practical upper limits and that recycling targets will not be met. As a consequence, there is less need for a 'risk premium' to be applied in the form of additional investments in information and education programs to ensure that targets will be achieved. This issue is discussed further in Section 2.5.

There is still scope for additional cost effective recycling

The existence of cost effective recycling opportunities reflect market failures, especially split-incentives[10]. Application of Marginal Recycling Cost Curves (MRCCs) to the co-regulatory options for the purpose of identifying the infrastructure and operating costs of those options provides evidence of this[11]. The MRCCs reveal that there are significant opportunities for recycling that have positive payoffs for society.

The profile of opportunities within the MRCC analysis influences value delivered by an option. Typically, diminishing returns are expected when progressing up a supply curve, as lower cost opportunities are no longer available and higher cost opportunities are required to be invested in. In some instances however, results of the MRCC analysis indicates that options can increase their average payoff through having more ambitious recycling targets. Specifically, Options 2e ($50m), 2c and 3 generate the highest average payoff[12]. This is because while relatively high average infrastructure and operating costs are incurred by these options, a relatively higher average value of recyclate is delivered. This reflects the profile of opportunities within the supply curve. The MRCCs contain a cluster of glass recycling opportunities which entail low to moderate investment costs but also have relatively low recyclate value. Investments include collection from concentrated streams (e.g. bars etc.) and processing plants/alternative markets (to alleviate potential stockpiles). Option 2e ($50m) and Option 2c/Option 3 contain a greater proportion of recycling activities beyond the glass cluster than options with less ambitious recycling targets (e.g. Options 2a, 2e-20, 2e-35), thereby increasing average payoff.

9 Only Option 1 and Option 2a have lower costs, which in these cases reflect much less ambitious recycling targets.

10 A split incentive is the situation where two or more parties to a transaction have differing incentives, either before or after the contracting phase. In the case of packaging recycling, the split incentive arises because the packaging consumer does not get all or even some of the benefit of recycling (e.g. the market value of the recyclate or the reduced environmental impacts).

11 A discussion of development and application of MRCCs for the analysis is contained in the *Data Assumptions* report.

12 Aside from Option 1, which requires low additional recycling captured mainly through 'low hanging fruit'.

There may still be low hanging fruit with high payoff

Option 1 has the lowest expected recycling outcome but at the same time invests in opportunities with high average payoff. Opportunities are selected from the MRCCs and the least cost ($/t of packaging) opportunities are selected for the amount of expenditure available. The average payoff of these opportunities is relatively high as there is a focus on low cost opportunities in the C&I sector with substantial co-benefits. While not designed in this manner, Option 1 emulates a 'strategic' approach where (a relatively small amount of) opportunities with a combination of high value and low cost are preferred. As such, Option 1 could be described as a 'low gain, low pain' option.

2.3 Recycling and litter projections

Recycling and litter tonnages resulting from implementation of options are key factors influencing their respective costs and benefits, since many cost and benefit items are variable in nature, being linked to material throughputs. As discussed in Section 2.2 the correlation between recycling and litter tonnages and costs and benefits is far from a precise one, since differences between options in material and packaging types being recycled, as well as structural differences in the options themselves are major factors influencing the costs and benefits of options. Nevertheless it is useful to compare the recycling and litter outcomes of the options.

2.3.1 Recycling projections

Figure 7 and Table 4 provide packaging recycling projections for the base case and each option over the project period. Tonnages reflect recycling rate assumptions for each of the options provided in the *Data Assumptions* report.

The figure reveals that total packaging recycling under the base case is projected to increase from approximately 2.9 million tonnes in 2013 to 3.8 million tonnes in 2035. Options 2c and 3 are projected to lead to over 4.2 million tonnes of recycling annually by 2035, the greatest of any of the options by a significant margin. Options 1 and 2a, by contrast are projected to achieve annual recycling of just 3.9 million tonnes by 2035. Most other options, including 2b, 2d, 2e-35, 2e ($50m), 4a, 4b and 4c, are projected to achieve annual recycling of between about 4.0 and 4.1 million tonnes by 2035.

Figure 8 and Table 5 show a greater contrast between the options by examining cumulative additional recycling of each of the options relative to the base. Options 2c and 3, for example, are projected to lead to a total of 8.4 million tonnes of additional recycling relative to the base case over 20 years from 2016 to 2035. Option 1, by contrast, is projected to achieve additional recycling of just 1.9 million tonnes over the 20 years. Options 2b, 2d, 4a and 4b will all achieve similar outcomes - approximately 6 million additional tonnes of recycling from 2016 to 2035. Options 2e ($35m), 2 ($50m) and 4c achieve broadly similar outcomes to each other – additional recycling of about 4.8 million tonnes, 5.5 million tonnes and 5.3 million tonnes respectively.

Figure 7: Total packaging recycling, base case and options (tonnes per annum)

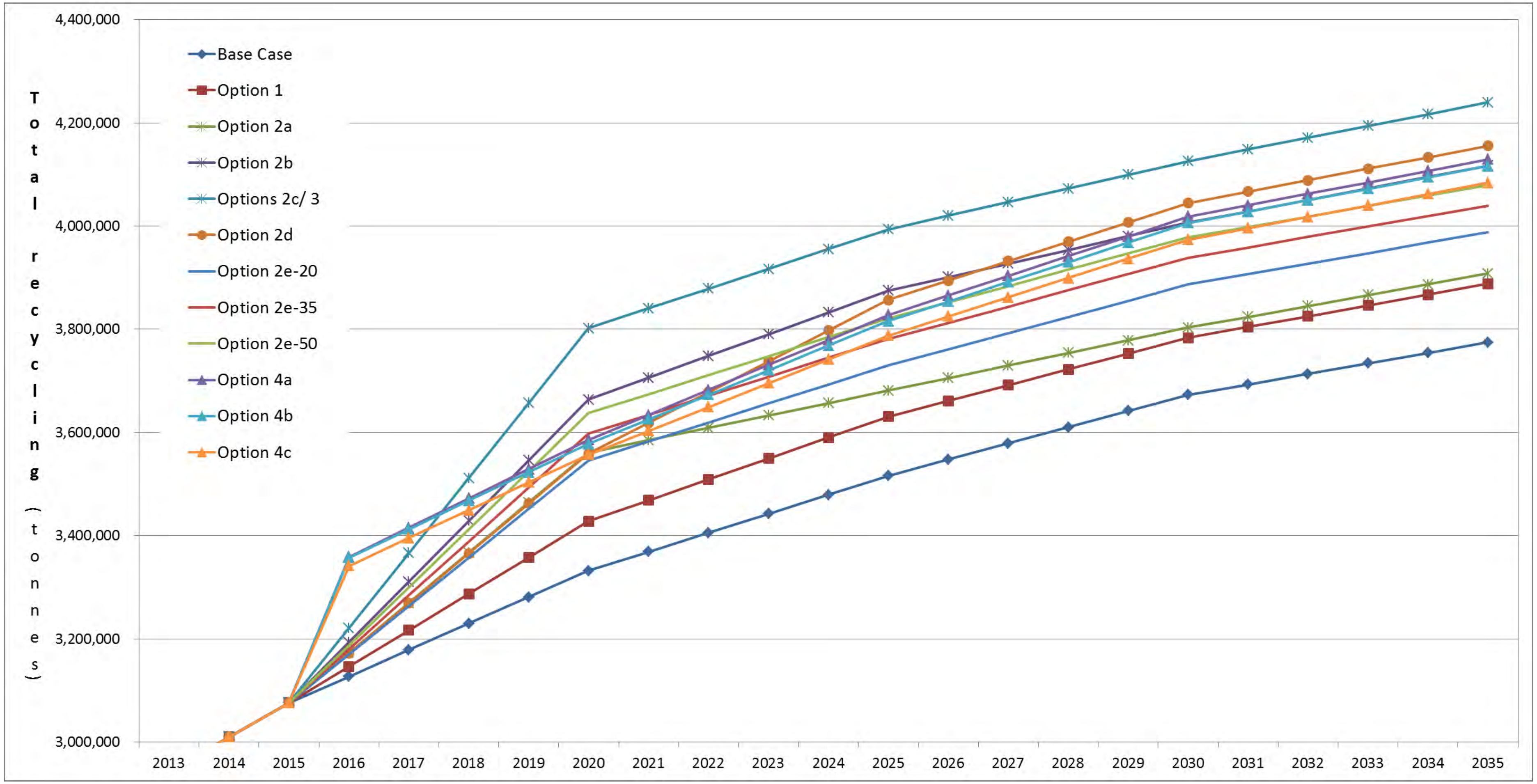


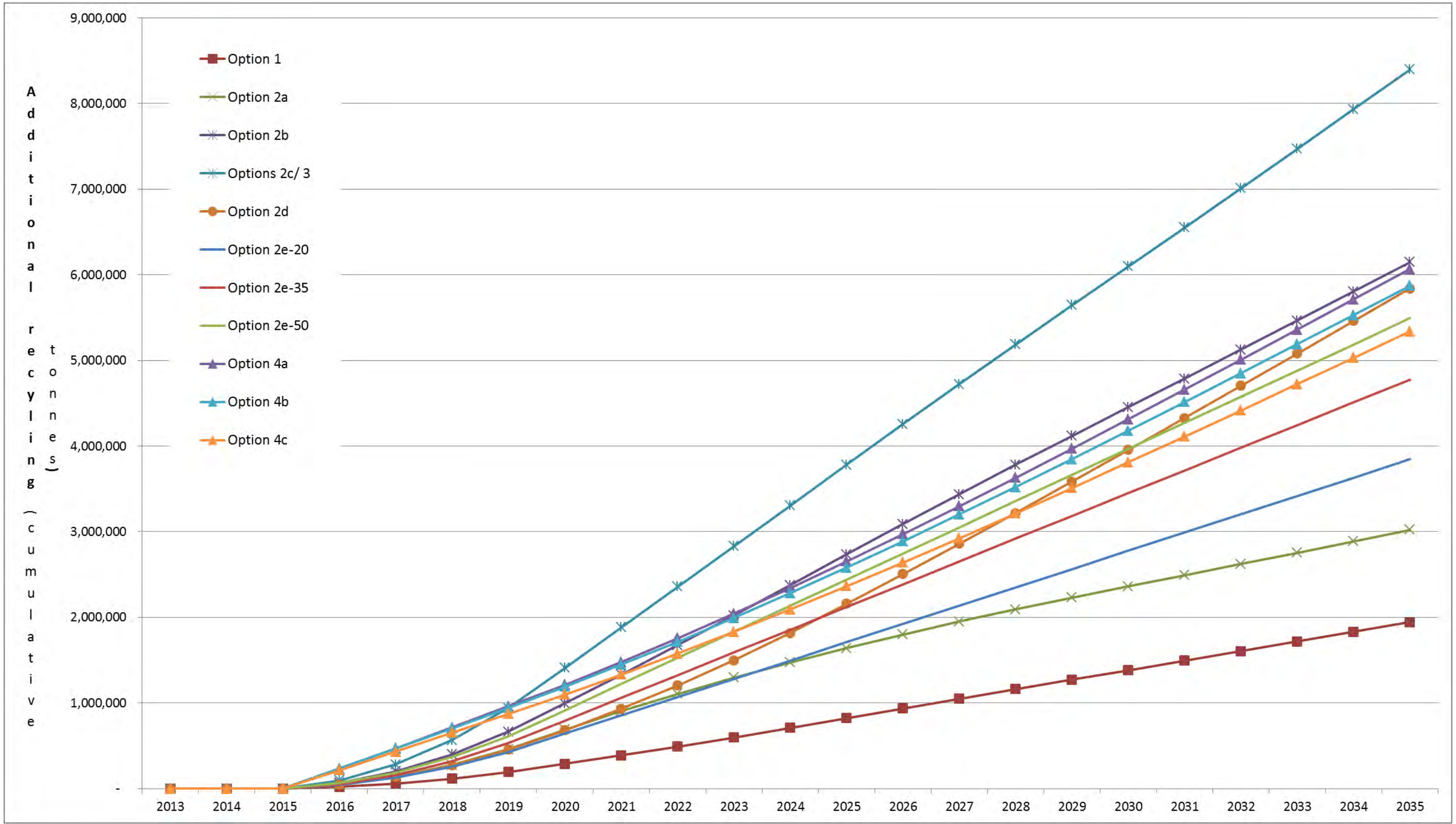
Table 4: Total packaging recycling, base case and options (000's tonnes per annum)

Total	2013	2015	2020	2025	2030	2035
Base Case	2,943.3	3,075.9	3,332.1	3,516.1	3,673.0	3,774.4
Option 1	2,943.3	3,075.9	3,428.0	3,630.4	3,783.5	3,888.0
Option 2a	2,943.3	3,075.9	3,561.0	3,681.1	3,803.0	3,908.0
Option 2b	2,943.3	3,075.9	3,663.7	3,874.9	4,006.4	4,117.2
Options 2c & 3	2,943.3	3,075.9	3,802.4	3,993.5	4,125.6	4,239.5
Option 2d	2,943.3	3,075.9	3,559.1	3,857.1	4,044.6	4,155.5
Option 2e-20	2,943.3	3,075.9	3,545.7	3,729.6	3,886.6	3,988.0
Option 2e-35	2,943.3	3,075.9	3,597.3	3,781.3	3,938.2	4,039.7
Option 2e-50	2,943.3	3,075.9	3,637.2	3,821.2	3,978.1	4,079.5
Option 4a	2,943.3	3,075.9	3,585.5	3,827.7	4,018.1	4,129.1
Option 4b	2,943.3	3,075.9	3,577.8	3,815.8	4,005.9	4,116.5
Option 4c	2,943.3	3,075.9	3,557.2	3,787.6	3,973.8	4,083.8

Table 5: Additional packaging recycling above base case (000's tonnes cumulative)

Increase relative to base case (cumulative)	2013	2015	2020	2025	2030	2035
Option 1	-	-	287.8	822.6	1,382.7	1,944.4
Option 2a	-	-	686.8	1,639.9	2,360.2	3,021.2
Option 2b	-	-	994.8	2,734.5	4,452.5	6,147.6
Options 2c & 3	-	-	1,410.8	3,783.8	6,096.6	8,397.2
Option 2d	-	-	680.9	2,158.0	3,954.8	5,841.3
Option 2e-20	-	-	640.8	1,708.7	2,776.7	3,844.7
Option 2e-35	-	-	795.7	2,122.0	3,448.2	4,774.5
Option 2e-50	-	-	915.3	2,440.8	3,966.4	5,491.9
Option 4a	-	-	1,213.2	2,654.7	4,313.2	6,067.3
Option 4b	-	-	1,190.3	2,581.2	4,179.5	5,871.6
Option 4c	-	-	1,098.9	2,363.7	3,809.1	5,338.9

Figure 8: Additional packaging recycling above base case (tonnes cumulative)



2.3.2 Litter projections

Figure 9 and Table 6 provides packaging litter projections for the base case and each option over the project period. Under the base case, total packaging litter is projected to fall from approximately 76,000 tonnes in 2013 to less than 69,000 tonnes in 2025 before increasing again to about 71,000 tonnes in 2035. This trend reflects two countervailing drivers:

- the impacts of pre-existing recycling and litter programs on the one hand, which contribute to litter reductions early in the study period; and
- increasing packaging consumption on the other, which drives up litter levels in later years.

All options are projected to lead to litter reductions below the base case, although the most substantial litter reductions are expected to be achieved by the CDS options (4a, 4b, 4c), reflecting the positive influence of container refunds on consumer littering behaviour. Annual litter rates under Options 4a, 4b and 4c are expected to fall to about 25,000, 26,000 and 28,000 tonnes respectively in 2030 and then stabilise at those levels. Options 2b, 2c and 2d are also expected to achieve substantial litter reductions relative to the base case, reflecting a combination of significant funding for litter programs and a strong focus on beverage container recycling.

Figure 10 focuses specifically on beverage container litter - a substantial reduction in beverage container litter rates is the principal factor driving reductions in overall litter rates by Options 4a, 4b and 4c and, to a lesser extent, by Options 2b, 2c and 2d

Figure 11 and Table 7 shows cumulative litter associated with each of the options over the period-2016-2035. Under the base case, total litter over the period 2016-2035 is projected to be more than 1.6 million tonnes. Option 4a is projected to achieve the greatest litter reductions over the period 2016-2035, with total litter of 800,000 tonnes representing a reduction in litter of more than 50% below the base case. Options 4b and 4c are projected to achieve similar outcomes. Options 2b, 2c, 3 and 2d are also projected to achieve substantial litter reductions relative to the base case – with total litter for each these options of about 1,000,000 tonnes representing a reduction in litter of about 39% below the base case over the 2016-2035 period. By contrast, Option 1 (cumulative litter of 1.5 million tonnes), is projected to achieve total litter reductions of only 9% below the base over the 2016-2035 period. Options 2e ($20m), 2e ($35m) and 2e ($50 m) are projected to achieve total litter reductions below base case of 20%, 22% and 24% respectively.

Figure 9: Total litter, base case and options (tonnes per annum)

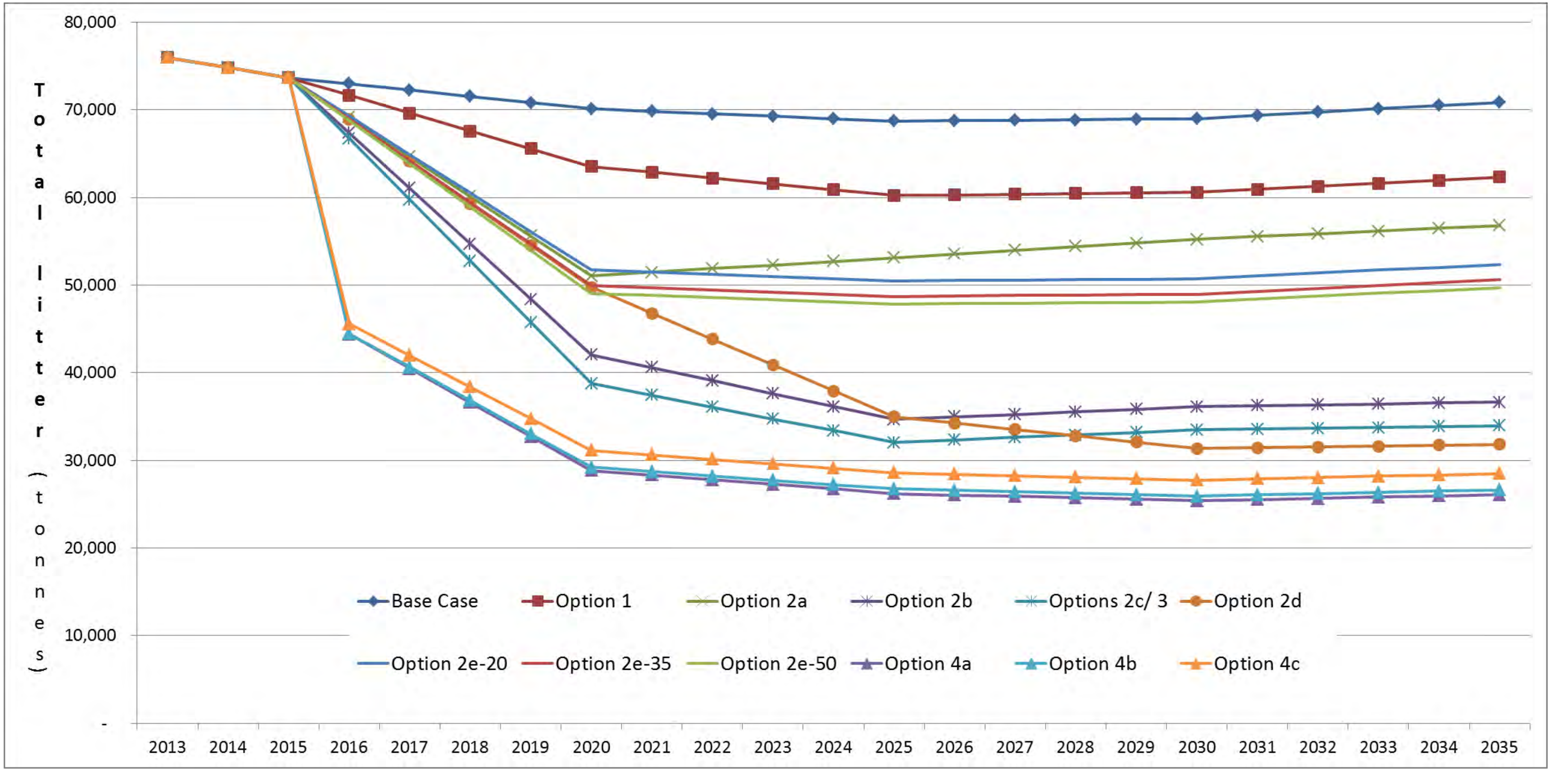


Table 6: Total litter, base case and options (000's tonnes per annum)

Total	2013	2015	2020	2025	2030	2035
Base Case	76.0	73.7	70.1	68.7	69.0	70.9
Option 1	76.0	73.7	63.5	60.2	60.6	62.3
Option 2a	76.0	73.7	51.1	53.1	55.2	56.8
Option 2b	76.0	73.7	42.1	34.7	36.1	36.7
Options 2c & 3	76.0	73.7	38.8	32.0	33.5	33.9
Option 2d	76.0	73.7	49.8	35.0	31.4	31.8
Option 2e-20	76.0	73.7	51.7	50.5	50.7	52.4
Option 2e-35	76.0	73.7	50.0	48.7	49.0	50.6
Option 2e-50	76.0	73.7	49.1	47.8	48.1	49.7
Option 4a	76.0	73.7	28.9	26.2	25.4	26.1
Option 4b	76.0	73.7	29.2	26.7	25.9	26.6
Option 4c	76.0	73.7	31.2	28.6	27.7	28.5

Table 7: Cumulative litter 2016-2035, base case and options (000's tonnes cumulative)

Total	2013	2015	2020	2025	2030	2035
Base Case	76.0	224.5	582.3	928.7	1,273.1	1,623.8
Option 1	76.0	224.5	562.5	870.4	1,172.7	1,480.9
Option 2a	76.0	224.5	525.1	786.7	1,058.7	1,339.6
Option 2b	76.0	224.5	498.1	686.3	864.1	1,046.4
Options 2c & 3	76.0	224.5	488.3	662.0	826.6	995.4
Option 2d	76.0	224.5	521.2	725.7	889.7	1,047.8
Option 2e-20	76.0	224.5	527.1	782.0	1,035.1	1,293.7
Option 2e-35	76.0	224.5	521.8	767.9	1,012.2	1,262.0
Option 2e-50	76.0	224.5	519.1	760.8	1,000.7	1,246.0
Option 4a	76.0	224.5	407.6	544.0	672.6	801.6
Option 4b	76.0	224.5	408.7	547.4	678.6	810.3
Option 4c	76.0	224.5	416.4	564.6	705.0	846.0

Figure 10: Beverage container litter, base case and options (tonnes per annum)

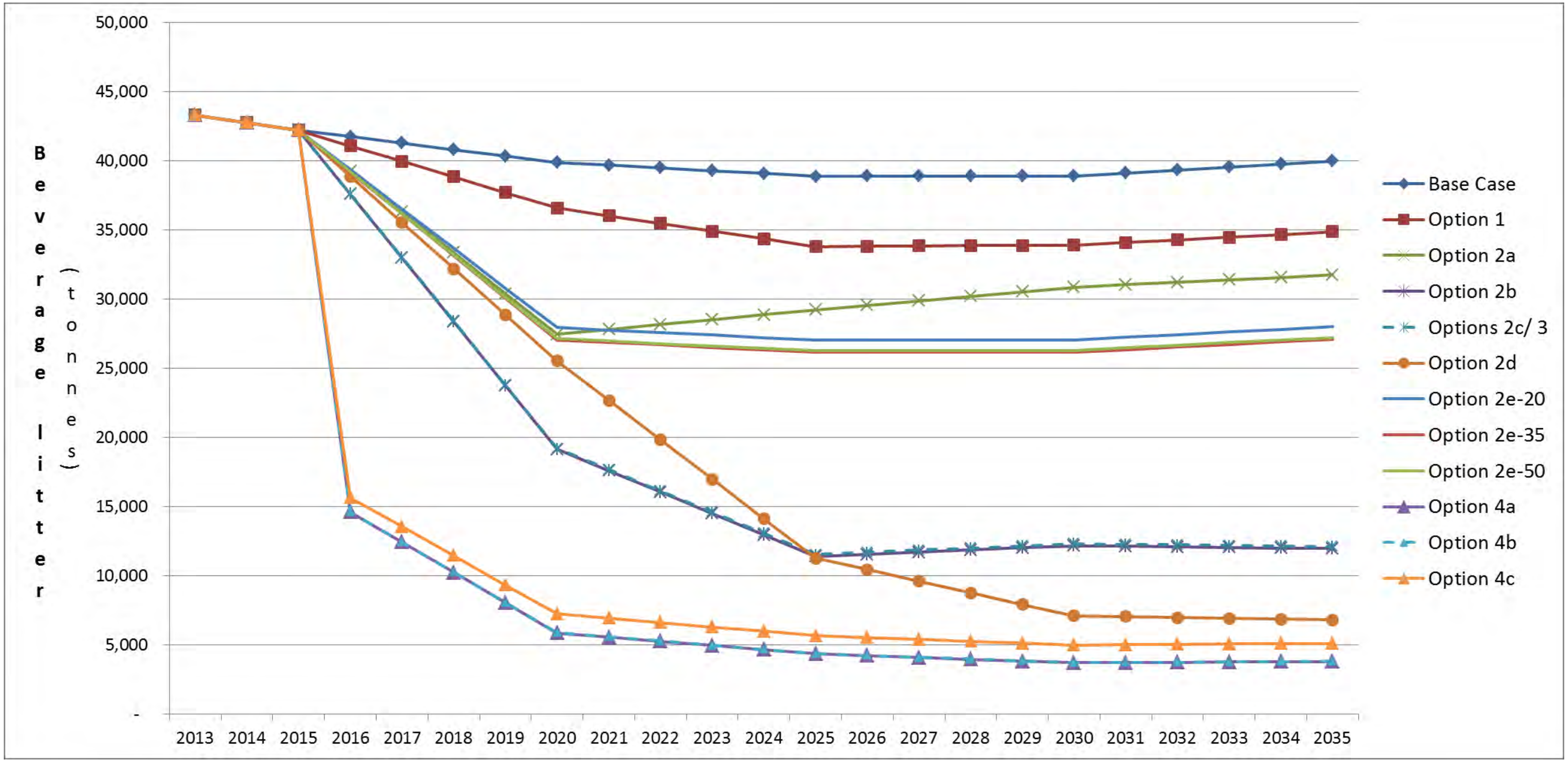
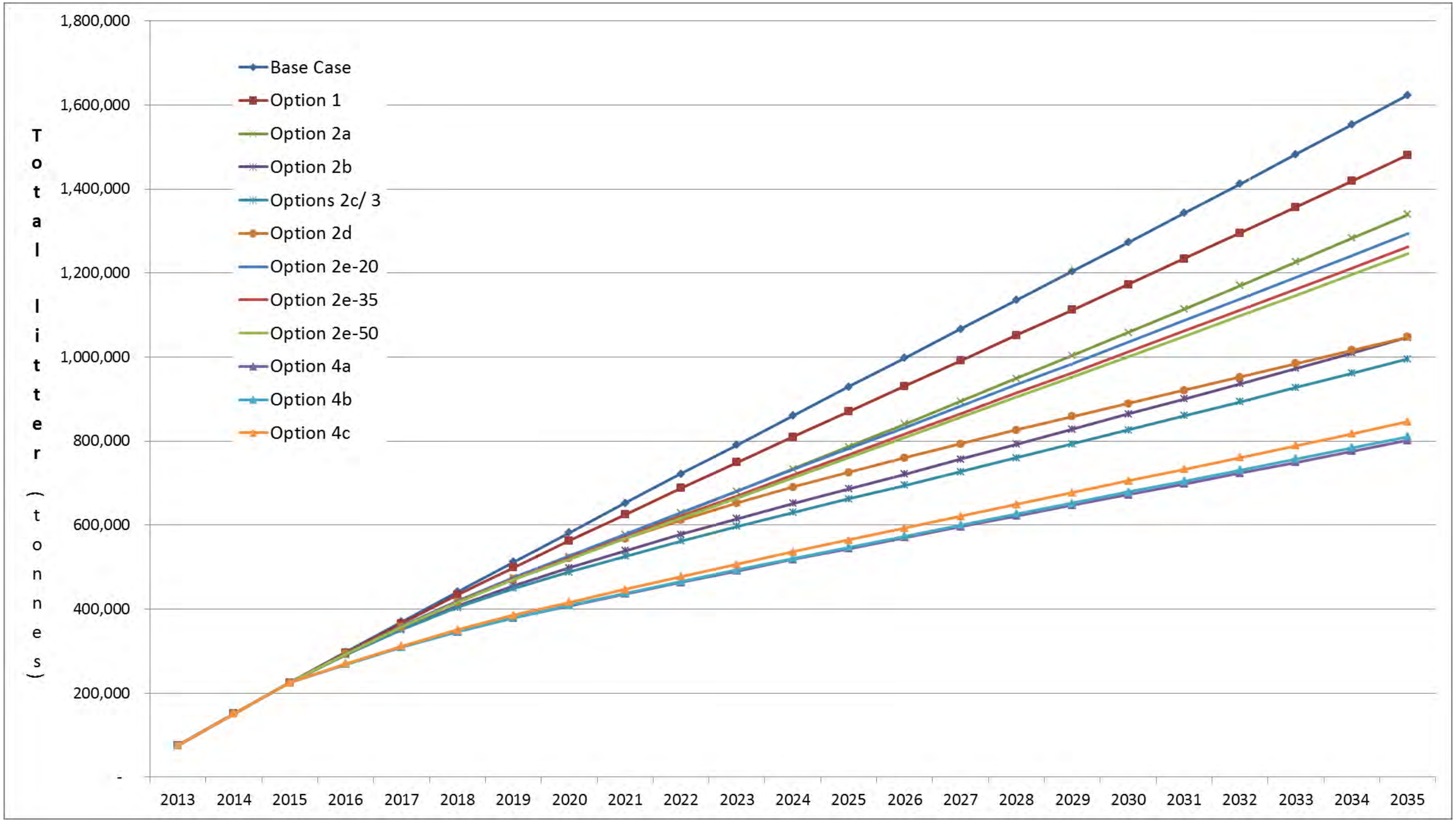


Figure 11: Cumulative litter 2013-2035, base case and options (tonnes)



2.4 Sensitivity and threshold analysis

2.4.1 Sensitivity tests performed

Where data assumptions have the potential to significantly affect outcomes of the analysis we have tested uncertainties through sensitivity analysis. This has been done by means of scenarios that involve changes to a number of key assumptions, applying the changes across all options to test the impact of changes on the net benefit-cost and ranking of the options. As detailed in Table 8, two main scenarios are tested:

- an 'optimistic scenario' assuming reductions in a number of key cost variables and increases in a number of key benefit variables; and
- a 'pessimistic scenario' assuming increases in a number of key cost variables and reductions in a number of key benefit variables.

The central scenario[13] included in the CBA has also been modelled with varied discount rates.

2.4.2 Results of sensitivity analysis

Pessimistic and optimistic scenarios

The range of NPVs produced by assuming pessimistic, central and optimistic scenarios for non-CDS options is presented in Figure 12. The length of the vertical bar depicts the range of NPV values (from lowest under pessimistic assumptions to highest under optimistic options) and the red box depicts the central value. Note that the range provides a larger 'upside' (difference between optimistic and central NPVs) and smaller 'downside' (difference between central and pessimistic NPVs). This reflects the asymmetric nature of uncertainty surrounding assumptions selected as key for the purposes of the sensitivity testing.

Under optimistic settings, all non-CDS options are estimated to provide a net benefit to society (i.e. have positive NPVs). In particular Options 2c and 3 are estimated to provide the greatest net benefit to society. The primary factor behind this result is the effect of a change to recycling infrastructure costs. This is a key driver of NPV under central assumptions, but becomes less important relative to recycling outcomes delivered under the optimistic scenario. Since Options 2c and 3 deliver the greatest recycling outcomes under optimistic settings, they benefit most from any assumed reduction in recycling costs.

Only Options 1 and 2e ($50m) maintain positive NPVs under pessimistic settings, with Option 1 having the greatest NPV when adopting pessimistic assumptions. This follows from the high 'payoff' of recycling investments under Option 1 and, to a lesser extent, Option 2e ($50m). Notably, Options 2e ($35m) and 2e ($20m) have negative NPVs owing to the fact that a degree of administrative cost is incurred (by both government and industry) and less recycling benefits are delivered to offset these when compared with Option 2e ($50m).

The range of NPVs produced by assuming pessimistic, central and optimistic scenarios for CDS options is presented in Figure 13.

The estimated negative NPVs are amplified under the pessimistic case and vice versa under the optimistic case.

13 The central scenario is the main scenario modelled for the analysis and for which results are presented.

Table 8: Scenarios applied in sensitivity analysis[14]

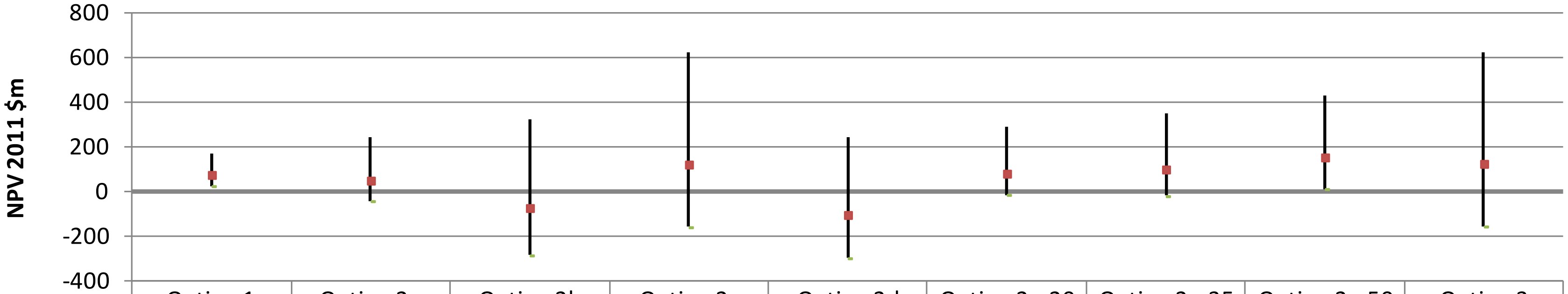
Scenario	Variable	Proposed sensitivity
Optimistic scenario	Infrastructure & operating costs, Options 4a, 4b, 4c	Lower capital and operating costs RVMs and other collection points reflect Boomerang Alliance low estimates and low end of estimated costs of South Australian depots: - RVMs: 3.2c/ container - Collection depots: 4c/ container - Hubs/ consolidation points: 2.8c/ container - Remote collection points: 5c/ container
	Infrastructure & operating costs all other options	Required investments are 15% lower than indicated by MRCCs
	Government and PSO administration costs, all options	Combined (government administration & PSO/ coordinator administration) costs lower reflecting an alternative method of assessing these costs based on a unit (per container) basis
	Household participation costs, Options 4a, 4b, 4c	Household participation costs revised based on: - 1.5 seconds/ container redemption time (RVMs) - 6 minutes/ trip redemption time (non-RVMs)
	Business participation costs, all options	Business participation costs revised based on: - cleaner costs @ $30/hour - trip time @ 90 seconds/ trip
	Transport and collection costs	Remove fixed cost component of transport costs
	Market value glass, beverage plastics, all options	Glass: $40/ tonne, +$60/ tonne premium for CDS materials Beverage plastics: $776/ tonne, +$100/ tonne premium for CDS materials LPB: $150/ tonne, +$100/ tonne premium for CDS materials

14 Table 1 in the Data Assumptions report contains an overview of assumptions applied in the central scenario. The body of the report contains a detailed discussion of those assumptions.

Scenario	Variable	Proposed sensitivity
	Landfill externalities	Proxy adjustment to carbon price assuming no carbon tax/ ETS[15]
	Litter shadow price, all options	Shadow price based on maximum rather than average cost of litter collection: $1073/ tonne
Pessimistic scenario	Infrastructure & operating costs, Options 4a, 4b, 4c	Higher capital and operating costs RVMs and other collection points are at or above BA high estimates and reflect high end of estimates for SA depots: - RVMs: 4.6c/ container - Collection depots: 5.2c/ container - Hubs/ consolidation points: 4.5c/ container
	Infrastructure & operating costs, all other options	Required investments are 15% higher than indicated by MRCCs
	Household participation costs, Options 4a, 4b, 4c	Household participation costs revised based on: - 4.5 seconds/ container redemption time (RVMs) - 14 minutes/ trip redemption time (non-RVMs)
	Business participation costs, all options	Business participation costs revised based on: - cleaner costs @ $42.75/hour - trip time @ 180 seconds/ trip
	Transport and collection costs	15% lower variable costs due to higher fixed costs
	Market value, beverage plastics, LPB, all options	Beverage plastics: $560/ tonne; +$100/ tonne premium for CDS materials LPB: $150/ tonne, +$0/ tonne premium for CDS materials
	Litter shadow price, all options	Shadow price based on minimum rather than average cost of litter collection: $213/ tonne
General	Discount rates	3%, 10%

15 See Section 5.2.2 for further discussion of the assumption applied in the central scenario.

Figure 12: Range of NPV outcomes under pessimistic, central and optimistic scenarios for non-CDS options (NPV 2011 $m)



	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e-20	Option 2e-35	Option 2e-50	Option 3
Optimistic	169	245	325	624	243	289	347	431	625
Central	74	48	-75	120	-106	80	98	153	124
Pessimistic	24	-44	-287	-161	-300	-15	-21	11	-157

Figure 13: Range of NPV outcomes under pessimistic, central and optimistic scenarios for CDS Options (NPV 2011 $m)

	Option 4a	Option 4b	Option 4c
Optimistic	-2,124	-2,181	-2,784
Central	-3,783	-3,857	-4,539
Pessimistic	-4,776	-4,859	-5,589

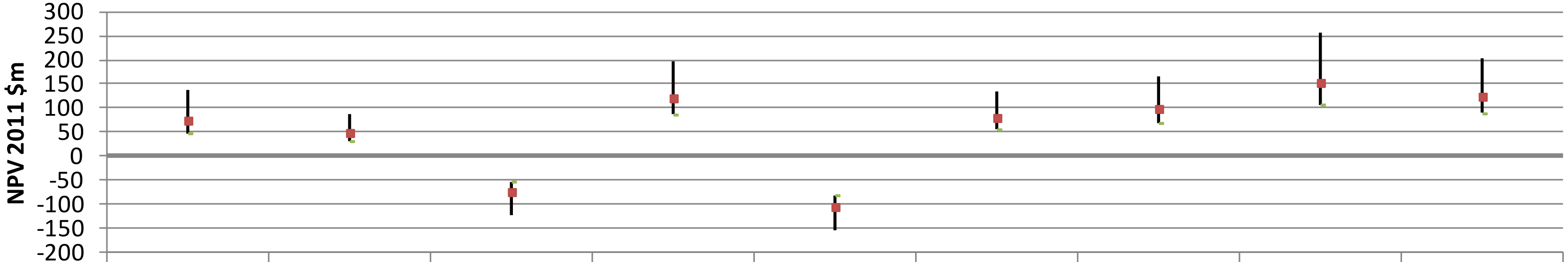
Variation of discount rate

The discount rate used in a CBA affects NPV results as it varies the relative contribution of costs or benefits further in the future compared with those nearer to today. The greater the discount rate, the lower the relative contribution of costs and benefits further in the future to the NPV.

Thus, varying the NPV can change the relativities between NPVs of options if the options differ in their temporal distribution of costs and benefits. The range of NPVs produced by assuming 3%, 7% (central) and 10% discount rates is provided in Figure 14 and Figure 15 below.

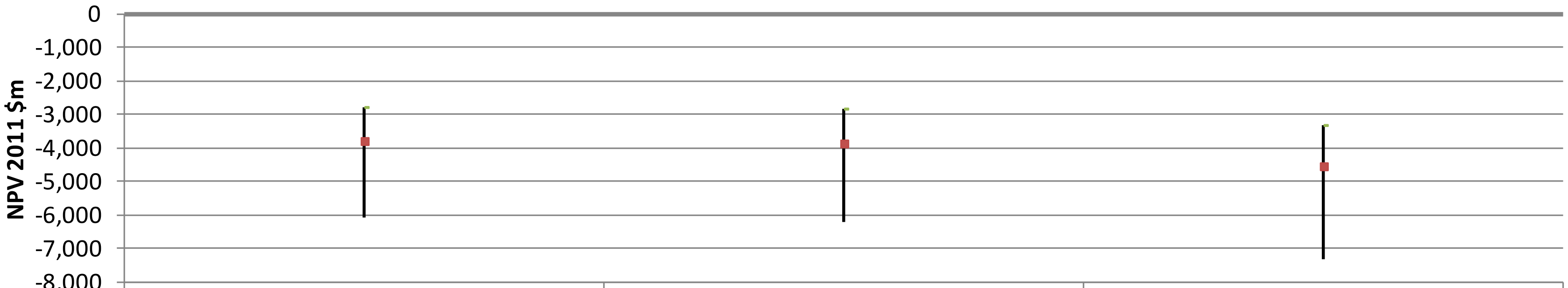
The lack of change in ranking of options reflects the fact that the temporal distribution of cost and benefits of all options is broadly similar.

Figure 14: Range of NPV outcomes for non-CDS options assuming 3%, 7% (central) and 10% discount rate (NPV 2011 $m)



	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e-20	Option 2e-35	Option 2e-50	Option 3
3%	136	88	-124	197	-155	134	165	255	202
7%	74	48	-75	120	-106	80	98	153	124
10%	48	31	-53	87	-81	56	69	107	89

Figure 15: Range of NPV outcomes for CDS options assuming 3%, 7% (central) and 10% discount rate (NPV 2011 $m)



	Option 4a	Option 4b	Option 4c
3%	-6,061	-6,196	-7,305
7%	-3,783	-3,857	-4,539
10%	-2,766	-2,814	-3,305

2.4.3 WTP threshold analysis

As noted in Section 1.2.3, some non-market benefits of recycling have not been fully captured in the CBA. These include community's preference for increasing recycling, measured as their willingness to pay (WTP) for non-market benefits of increasing recycling.

WTP for recycling

A full assessment of recycling WTP has not been undertaken for the DRIS, and (as discussed at length in Appendix B) the WTP values used in the CRIS are subject to considerable qualifications. We have therefore undertaken a threshold analysis to test the WTP at which the community would need to place on the non-market benefits of recycling in order for individual options to be considered economically efficient. The threshold values are presented in Table 9.

The table indicates that Options 1, 2a, 2c and 2e do not require any recycling WTP value in order to achieve positive NPVs, since those options already have a positive NPV based on the costs and benefits that have been valued in the CBA. Options 2b and 2d require WTP values of $30 and $48 respectively for each tonne of projected additional recycling in order to achieve positive NPVs in the CBA. Options 4a, 4b and 4c require WTP values of $1,503, $1,500 and $1,829 respectively for each tonne of projected additional recycling in order to achieve positive NPVs in the CBA.

The estimates in Table 9 can be compared with results of a review of Australian and international literature of households' willingness to pay for recycling, which are discussed in Appendix B. The results of that review indicate WTP values ranging from $154 to $702/ tonne of additional recycling of non-hazardous waste.

Table 9: Recycling WTP required for each option to achieve a positive NPV ($/ tonne)

Willingness to pay for recycling required to achieve a positive NPV ($/ tonne additional recyclate)											
Opt. 1	Opt. 2a	Opt. 2b	Opt. 2c	Opt. 2d	Opt. 2e-20	Opt. 2e-35	Opt. 2e-50	Opt. 3	Opt. 4a	Opt. 4b	Opt. 4c
0	0	30	0	48	0	0	0	0	1,503	1,500	1,829

There are two important points to note about the threshold analysis and potential application of recycling WTP estimates in the CBA:

- First, if a recycling WTP value is to be applied in the CBA then it needs to be consistently applied to all options. Only then is it reasonable to examine the relative merits of the options assessed in terms of their total NPVs and/ or benefit-cost ratios.
- Second, application of a recycling WTP value needs to be done with due care avoiding the potential for double counting in the CBA with respect to valuing avoided environmental impacts and the market value of recyclate. On this point, we note that it is likely that the extrapolated WTP values provided in Appendix B capture avoided landfill externalities but it is unclear whether they include the market value of recyclate.

WTP for litter reduction

It is quite possible the community places a value on reduced litter that is additional to and distinct from the value it places on increased recycling. Recognising this, we have sought to capture the value of reduced litter in the CBA based on the costs of a range of litter clean up activities, outlined in the *Data Assumptions* report. These costs in effect 'reveal' the community's preference for reducing litter. As discussed in the *Data Assumptions* report however, it is quite possible that this value is a conservative estimate of the community's WTP to reduce litter because:

- the fact that the waste is being cleaned up suggests that the cost is less than the community's willingness to pay for its clean up; and
- the litter not cleaned up (principally in the marine environment) has additional environmental and amenity impacts.

It is not possible, based on the review of litter WTP studies discussed in Appendix B, to know the extent to which the shadow price for litter used in the CBA understates the community's willingness to pay to reduce litter, if at all. All that can be definitely stated is that the community clearly places a substantial value on reducing litter.

Recycling and litter WTP sensitivity analysis

To estimate the effect of higher recycling and litter values (that are not adequately captured in the central case assumptions) on the NPV and ranking of options, two additional sensitivity tests were run.

The first test ('WTP adjusted 1') assumed:

- a litter shadow price is at $1073/tonne;
- a recycling WTP of $154/tonne; and
- landfill externalities are excluded (to avoid any double counting of benefits that may have already been included in WTP estimates).

A second test ('WTP adjusted 2') assumed a higher recycling WTP of $702/tonne but otherwise the same assumptions as 'WTP adjusted 1'.

The purpose of these tests was to isolate the importance of litter and recycling WTP on NPV outcomes, thus conveying a sense of what kinds of impacts might be expected if WTP had a significant value.

The NPV result for non-CDS options is shown in Table 10 below.

Table 10: Recycling and litter WTP sensitivity analysis for non-CDS options ($m NPV)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e (35m)	Option 2e ($50m)	Option 3
Central case	$74	$48	-$75	$119	-$107	$79	$98	$152	$130
WTP adjusted 1	$238	$330	$435	$828	$349	$409	$499	$612	$831
WTP adjusted 2	$730	$1,119	$1,825	$2,935	$1,554	$1,339	$1,670	$1,999	$2,939

In both 'WTP adjusted 1' and 'WTP adjusted 2' sets of assumptions, the option with the highest NPV changes from Option 2e ($50m) to Option 3 (followed closely by Option 2c). The highest options under each set of assumptions above are highlighted in yellow. This result is to be expected as Options 2c and 3 produce the best litter and recycling outcomes of the non-CDS options.

The results for the CDS options are shown in Table 11 below.

Table 11: Recycling and litter WTP sensitivity analysis for CDS options ($m NPV)

	Option 4a	Option 4b	Option 4c
Central case	-$3,784	-$3,857	-$4,539
WTP adjusted 1	-$3,204	-$3,271	-$3,974
WTP adjusted 2	-$1,824	-$1,862	-$2,614

The relative ranking of CDS options does not change and the NPV of CDS options remains negative under all sets of assumptions.

The relative BCRs of options are largely unaffected by assuming 'WTP adjusted' assumptions. This is mainly because the effect of 'WTP adjusted' options is to amplify the benefits proportionately. Option 1 remains the highest BCR option with a BCR of 1.3, 2.0 and 3.9 under central case, WTP adjusted 1 and WTP adjusted 2 assumptions respectively. Whereas Option 4c remains the lowest BCR option with a BCR of 0.2, 0.3 and 0.6 under central case, WTP adjusted 1 and WTP adjusted 2 assumptions respectively.

The result of these sensitivity tests reinforces the conclusion that Option 2e ($50m) and Option 1 are the highest ranked options in terms of NPV and BCR respectively, however, Option 2c/3 provide greater upside (and commensurately greater risk) in performance due to their ambitious level of outcomes sought.

Threshold analysis concluding comments

Taking all of the above points into account, it is our judgement that consistent and careful application of a WTP estimate for non-market attributes of recycling and a higher WTP value for litter in the CBA is unlikely to improve the ranking of the CDS regulatory options (Options 4a, 4b, 4c) relative to the non-regulatory, co-regulatory and regulatory non CDS options (Options 1, 2a-2e and 3 respectively), measured in terms of NPV or benefit-cost ratio. It may however, improve the ranking of the co-regulatory and regulatory non-CDS options projected to achieve ambitious recycling and litter reduction outcomes (e.g. Options 2c, 2d, 3) relative to options that are projected to achieve only limited recycling and litter outcomes (e.g. Options 1, 2a) or even options that are projected to achieve moderate outcomes (e.g. Option 2e($50m)).

2.5 Risks

2.5.1 Co-regulatory options

Nature of risks

There are risks inherent in the introduction of any of the co-regulatory options. Risks relate not so much to higher than expected cost of investment in recycling opportunities[16] but to a potential difficulty in achieving intended recycling and litter targets or outcomes. This difficulty stems in part from the split incentives issue, noting that for recycling and litter outcomes to be assured requires that all key players in the recycling chain – the packaged goods

[16] As discussed in section 2.2 there appears to be significant potential for investment in additional recycling at relatively low cost.

industry, consumers and waste managers – have an incentive to act towards the desired outcome. In the case of recycling, the incentive for the packaged goods industry inherent in the co-regulatory options is the mandated target(s). The incentive for waste managers is the market value of the recyclate generated[17] as well as avoided landfill costs (including waste levies where these apply). There is little or no additional incentive from the proposed policy options for consumers to act in a manner consistent with the objective, however. Unlike the container deposit/ refund options, for example, consumer financial incentives (refunds) are not an integral part of any of the co-regulatory options. Thus even well-funded and targeted recycling infrastructure and services will not ensure that recycling targets are met because ultimate success depends on consumers 'doing the right thing'.

Mitigating risks

As discussed in Section 2.2.2 and in the *Data Assumptions* report (section 4.7.2), the risk of not meeting recycling and litter targets or outcomes is particularly evident for options 2b, 2c, 2d and 3 because they entail high beverage container recycling rates – rates that approach practical upper limits for co-mingled recycling systems. To mitigate this risk therefore, a 'risk premium' has been applied to the co-regulatory options in the form of additional funding specifically earmarked for a substantial and ongoing information and education program for both businesses and households. A higher risk premium is applied to Options 2b, 2c, and 2d reflecting their higher risk.

The premium has been included in costing of the co-regulatory options. If any of these options were to be implemented it is important that the proposed education and information programs are:

- designed to overcome behavioural barriers to recycling (i.e. lack of knowledge and understanding, the need for justification, the need for prompts), especially recycling of beverage containers in public places;
- tied closely to the infrastructure and service investments (especially investments targeting beverage container recycling in public places); and
- are ongoing.

If comprehensive and well designed, the information and education programs should reduce the risk of not achieving recycling outcomes to a comparable level to the CDS options.

2.5.2 Option 3

Nature of risks

Option 3 is similar to Option 2c in that it is intended to deliver similar recycling and litter outcomes based on similar levels of investment in recycling and litter programs and services. Where Option 3 differs from Option 2c is that funding for the programs is intended to be tied to an Advance Disposal Fee (ADF). At least in principle, a major purpose of the ADF is to change consumer behaviour at the point of sale, thus influencing demand for packaging materials and types. The ADF will not change behaviour at the point of disposal however, in that it will not directly influence consumers' decision to participate in recycling programs or recycle packaging

[17] This will vary depending on the material type and the circumstances of the waste manager (e.g. local government).

material that is subject to the fee. To that extent it suffers from a similar if not the same risk as co-regulatory options 2b, 2c and 2d is discussed above.

Additionally, the ADF, as currently envisaged, is intended to be a weight based fee, applied per tonne of packaging material, with the potential for differing tax rates for different material types in accordance with the principles of a *Pigovian* tax[18]. If the tax was set at a high enough rate then it would provide an incentive for efficiency-promoting changes in material selection in the packaging market. However, the revenue constraint imposed by hypothecating revenue to recycling projects implies a tax rate so low that such incentives would be weak.

Mitigating risks

The 'risk premium' that has been applied to Options 2b, 2c and 2d has also been assumed in the costing of Option 3 (see section 2.3.1). As with those options, implementation of comprehensive and well-designed information and education programs should reduce the risk of not achieving recycling and litter outcomes.

Given the scale of ADF proposed for Option 3, it is unlikely that the relative price changes to different packaging materials caused by the ADF would have a significant substitution effect. This however, raises the question as to the primary intent of the ADF. As currently designed, the main purpose of the proposed ADF is to raise revenue for expenditure on recycling and litter initiatives. Certainly experience from overseas indicates that ADFs tend to be more effective (measured in terms of encouraging increased recycling) when funds from the ADF are tied directly to recycling and litter programs (Keystone Center 2011, OECD 2008, Palmer & Walls 1999). This experience points to the value of using ADF fees to finance recycling and litter infrastructure and services, targeting materials types and waste streams that have significant downstream impacts and substantial recycling potential. On the other hand, as is the case with any form of government intervention that utilises a market based approach, considerable care will need to be exercised to ensure that financing of these programs by government does not lead to further distortions in the market and avoids perverse incentives or unintended outcomes.

These points all indicate that if a decision is made to proceed with Option 3 considerable attention will need to be paid to the design of the ADF and assessing how ADF funds are best utilised.

2.5.3 Options 4a, 4b and 4c

Nature of risks

The major risk with Options 4a, 4b and 4c is evident from results and discussion of the CBA presented in sections 2.1 and 2.2. In short, there is a major risk that implementation of any of these options will lead to outcomes that are not economically efficient. As discussed in the *Data Assumptions* report and detailed further in Section 3.1, Australian and overseas experience indicates that container deposit or refund schemes can be particularly effective as litter control measures for beverage containers. A trade-off is the high transaction costs involved in recycling of beverage containers via a CDS or CRS due to:

- the need to restructure recycling supply chain (i.e. a large proportion of the recyclate going through the CRS/ CDS will be rerouted away from established kerbside systems), and that

[18] To be a true Pigovian tax, the tax rate must be equal to the marginal environmental and social costs of those impacts at the social optimum.

the new infrastructure needs to have special abilities, such counting containers and making payments;

- the limited scope of container deposit and container refund schemes (i.e. they only cover beverage containers, which represent about 30% of packaging materials).

The proposed design of Option 4a poses a further risk. As detailed in the *Description of Policy Options* report under Option 4a "*major retailers of groceries and/or beverages with a retail floor area greater than 800m² ....must establish a convenience point in their car park or within 400m of the building in which they are housed* (p.29)."

This requirement raises possible competition policy or competition law complications. It also increases uncertainty around compliance costs for retailers, since it is not clear which retailers will be affected by this requirement.

Mitigating risks

Application of an 'optimistic scenario' in the sensitivity analysis (see Section 2.3.1) significantly reduces the present values of some costs and increases the present values of some benefits. Nevertheless the NPV values for the CDS options are still substantially negative under this scenario. Based on the threshold analysis detailed in Section 2.3.2 significant WTP values would be required for these options to achieve positive NPVs. Furthermore, any application of WTP estimates in the CBA needs to be done across all options on a comparable basis meaning that revised NPV values for Options 4a, 4b and 4c will need to be viewed in the context of revised values for all other options as well.

With respect to the design risk associated with Option 4a, advice should be obtained as to whether this requirement is consistent with National Competition Policy and with Australian competition law including competition law provisions contained in Part IV of the *Competition and Consumer Act 2010*. Redesigning the option to remove the requirement that certain stores must install convenience points is likely to mitigate the risk though. Instead, decisions on where convenience points are located could be left to the administrator to decide based on commercial considerations, consistent with the approach adopted for option 4b.

3. Distributional impacts

3.1 Sectoral impacts

All options require additional expenditure in order to fund recycling and litter outcomes. In each case the sectoral group benefiting from that outcome may differ from the sectoral group that initially bears the cost. This section examines the incidence of costs and benefits to different sectors and groups in society, categorised for the purpose of this study as:

- household consumers of packaged goods (consumers);
- commercial & industrial consumers of packaged goods (C&I);
- manufacturers and distributors of packaged goods (packaged goods industry);
- local government;
- state and federal governments (government); and
- the environment and broader community (environment).

As previously discussed, there is also a separate benefit category of co-benefits that has not been allocated across any of the above sectors.

The analysis includes financial transfers between sectors, such as payment of deposits under the CDS options, but certain impacts haven't been included, such as second order economic effects and the impacts of changes to taxes and levies (e.g. landfill levy). Thus the analysis is a bounded rather than a full distributional analysis.

As with overall economic impacts (reflected in results of the CBA), there is a distinction between the CDS and non-CDS options in terms of sectoral impacts.

3.1.1 Sectoral impacts of non-CDS options

Figure 16 and Table 12 provide an overview of the incidence of costs and benefits (expressed as PV of costs and benefits over the study period) by sectoral group for the non-CDS options.

Option 1 is funded by state and federal government expenditure. The expenditure results in recycling outcomes, for which some direct benefits accrue to providers of recyclate (LGAs and C&I waste producers). Landfill diversion and litter reduction outcomes accrue to the general public (environment).

By contrast, the co-regulatory options (Options 2a, 2b, 2c, 2d, 2e ($20m), 2e ($35m) and 2e ($50m)) require expenditure from the packaged goods industry to fund initiatives (which is then passed on to consumers), with additional administrative costs borne by government. The beneficiaries of recycling and litter outcomes are the same as for Option 1, that is, recyclate providers and the environment.

The main cost of Option 3 ultimately falls on consumers, who will pay for the passed on cost of the advanced disposal fee (ADF) in the form of higher prices. The proceeds of the fee revenue are then used to increase recycling and litter outcomes, with the same set of beneficiaries as Option 1 and the co-regulatory options.

It should be noted, that the cost burden of co-regulatory options has been modelled to fall on consumers (passed on by the packaged goods industry) assuming that industry seeks to recover this cost through increases on the price of products. Additionally, to the extent that these price increases lead to reduced sales of packaged goods products, there will be a deadweight loss to society. An estimate of this 'lost surplus' is included in costs to industry.

Furthermore, while no second order effects (e.g. price effect and associated loss of industry surplus) have been modelled where government is wholly responsible for funding initiatives (as in Option 1), increasing government expenditure can also lead to 'deadweight losses' to the economy.

Broadly speaking, in all of these options, packaged goods producers and consumers, or alternatively tax payers fund initiatives which benefit either recyclate providers or the environment. This is expected - and to some extent intended - as the options are designed to address the split-incentives issue (i.e. no direct incentive for consumers to recycle) and environmental externalities. Additionally, the scale of cost to funders and scale of benefit to beneficiaries correlates with the scale of diversion (recycling and litter) outcomes.

Figure 16: Sectoral impacts of non-CDS options (NPV 2011 $m)

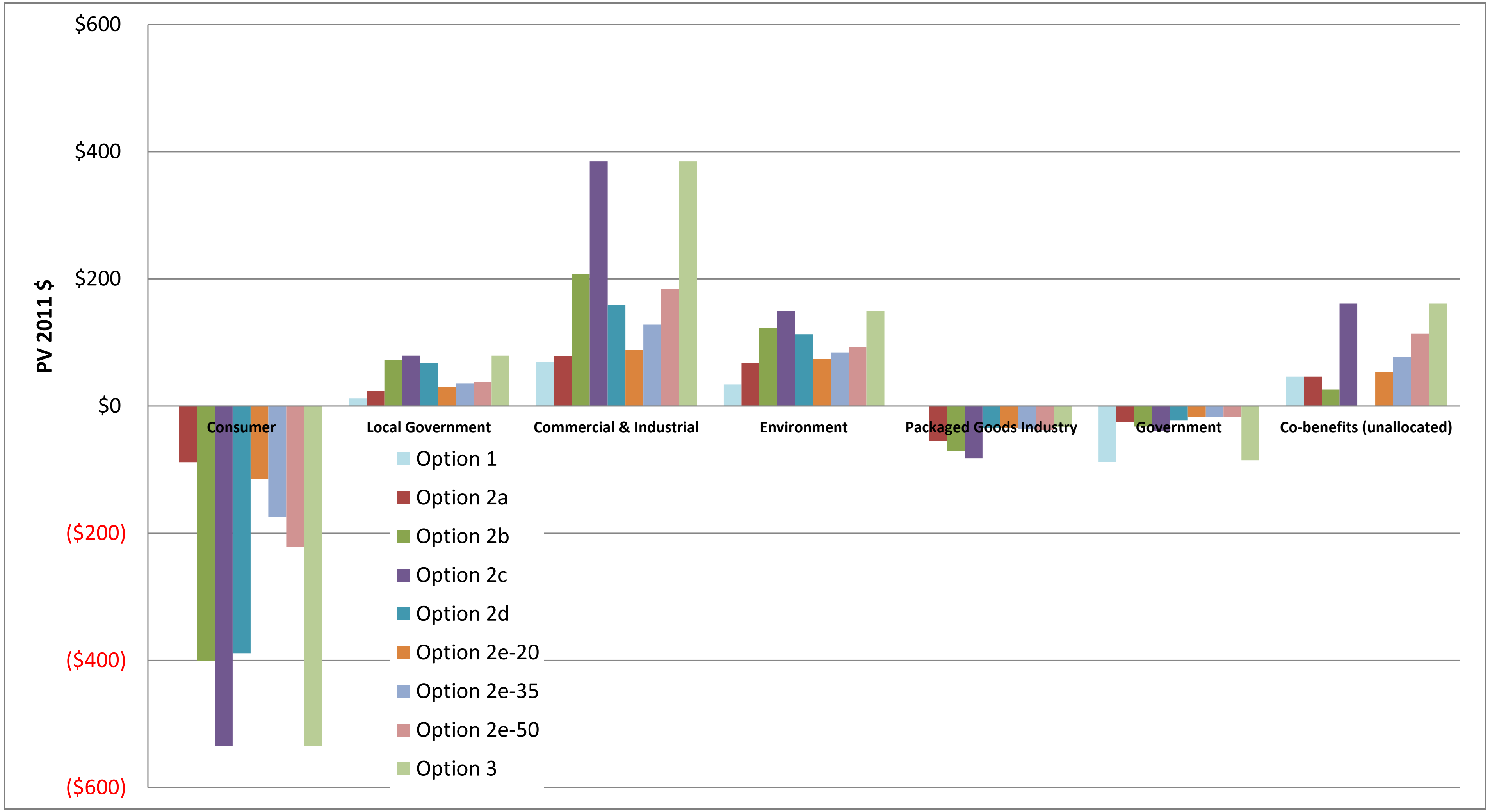


Table 12: Sectoral impacts of non-CDS Options (NPV 2011 $m)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e (35m)	Option 2e ($50m)	Option 3
Consumer	$0.0	-$88.3	-$401.6	-$534.8	-$388.9	-$114.7	-$174.2	-$222.2	-$534.8
Local Government	$12.3	$23.6	$72.4	$79.6	$67.1	$29.6	$35.4	$37.5	$79.6
Commercial & Industrial	$69.1	$78.9	$207.3	$385.0	$159.2	$88.1	$128.2	$184.0	$385.0
Environment	$34.4	$67.0	$122.9	$149.7	$113.0	$74.3	$84.4	$93.0	$149.7
Packaged Goods Industry	$0.0	-$54.6	-$70.6	-$82.1	-$34.3	-$34.7	-$36.1	-$37.3	-$32.7
Government	-$88.0	-$24.6	-$32.0	-$39.4	-$22.7	-$17.0	-$17.0	-$17.0	-$85.5
Co-benefits (unallocated)	$46.2	$46.2	$26.0	$161.3	$0.0	$53.8	$77.3	$114.0	$161.3

3.1.2 Sectoral impacts of CDS options

Table 13 and Figure 17 provide an overview of the distribution of costs and benefits (expressed in PV terms) by sectoral group for the CDS options.

The net costs of each of the CDS schemes (infrastructure and operational costs, plus refund costs, less recyclate sales and any deposit revenue (Option 4a only)) are ultimately borne by the consumer. In Option 4a this is visible to the consumer on beverage packaging at the point of sale, whereas in options 4b and 4c this is indirectly passed on through an industry levy on beverage producers.

The net costs of the scheme are highest under 4c due to the lower reliance on relatively low cost RVMs. Consequently, consumers incur the highest costs under 4c (through industry levies passed on to them through product price increases). As with non-CDS options, recyclate providers (LGAs and C&I) benefit due to receipt of refunds for beverage containers redeemed. Diversion of recyclate from landfill and avoided litter results in environmental benefits. Government bears administration costs and packaged goods industries experience a loss of surplus due to price effects.

Costs borne by the packed goods industry include compliance costs and loss of producer surplus. Government costs include policy development and ongoing costs associated with regulating the scheme. As detailed in the *Data Assumptions* report (see section 4) costs of administering the scheme are split between government and the packed goods industry, with government bearing a high proportion of the costs under Options 4a and 4b but the packaged goods industry bearing most of the costs under Option 4c. In all options, loss of producer surplus (packed goods industry) is estimated to be quite low relative to overall compliance, administration and regulatory costs (packaged goods industry and government), with PV loss of producer surplus estimated to be -$110 million, -$113 million and -$131 million for Options 4a, 4b and 4c respectively.

The operator of the container deposit scheme is not shown as a sectoral group in the impacts analysis. Under Options 4b and 4c the container deposit scheme operator is expected to break even (because the industry levy will be set at the level necessary to recover the net costs of the scheme). Under Option 4a the situation is quite different and for this reason detailed financial modelling of the impacts of the scheme on the container scheme operator has been undertaken. This is discussed in the following section.

Table 13: Sectoral impacts of CDS Options (NPV 2011 $m)

	Option 4a	Option 4b	Option 4c
Consumer	-$7,196.4	-$6,150.9	-$7,984.1
Local Government	$1,083.1	$568.7	$1,022.4
Commercial & Industrial	$2,549.2	$1,998.2	$2,487.7
Environment	$175.7	$173.9	$166.0
Packaged Goods Industry	-$162.6	-$228.8	-$454.5
Government	-$357.9	-$275.8	-$97.9
Co-benefits (unallocated)	$12.1	$56.3	$98.7

Figure 17: Sectoral impacts of CDS options (NPV 2011 $m)

3.2 Financial assessment of CDS Options

3.2.1 Deposits, refunds and effective deposit rate

Under Option 4a a per container deposit amount is specified by the regulation. This starts at a nominal 10c and increases periodically to be broadly constant over time in inflation adjusted (real) terms. Under Options 4b and 4c, there is no explicit deposit amount but industry pays for the scheme through a levy. As with Option 4a, if industry passes the costs of the levy onto consumers through increases in the price of beverages, an effective deposit rate (price increase per container due to the levy) can be calculated for comparison purposes.

The results of this calculation are presented in Table 14 on the next page. For all options, the refund value of a container will be 10 cents from 2016 to 2024, 15 cents from 2025 to 2034 and 20 cents from 2035.

Compared to Options 4b and 4c, the deposit rate under Option 4a starts higher in the earlier years and eventually ends lower in later years.

The higher relative deposit rate in earlier years of Option 4a, provide the scheme with an operating surplus. However, this operating surplus diminishes over time (and becomes a deficit) as throughput increases and unredeemed deposits decrease.

Under Options 4b and 4c the scheme is designed to breakeven. Therefore, the deposit rates must increase as shown to compensate for increasing throughput, and the effects of general price inflation on those costs that are subject to inflation.

Table 14: Comparison of CDS option deposit rates

	Option 4a				Option 4b				Option 4c			
	Deposits received (nominal $m)	Refunds paid (nominal $m)	Net infrastructure costs[19] (nominal $m)	Effective deposit rate (nominal cents per container)	Deposits received (nominal $m)	Refunds paid (nominal $m)	Net infrastructure costs (nominal $m)	Effective rate (nominal cents per container)	Deposits received (nominal $m)	Refunds paid (nominal $m)	Net infrastructure costs (nominal $m)	Effective deposit rate (nominal cents per container)
2016	1,740	1,073	291	10.0	1,380	1,073	307	7.9	1,459	1,053	406	8.5
2017	1,746	1,146	319	10.0	1,482	1,146	336	8.5	1,569	1,125	444	9.1
2018	1,751	1,219	348	10.0	1,585	1,219	366	9.1	1,681	1,196	484	9.6
2019	1,756	1,292	378	10.0	1,690	1,292	398	9.6	1,794	1,267	526	10.2
2020	1,760	1,364	409	10.0	1,795	1,364	431	10.2	1,908	1,339	570	10.8
2021	1,772	1,391	427	10.0	1,842	1,391	450	10.4	1,958	1,364	595	11.0
2022	1,784	1,418	446	10.0	1,889	1,418	471	10.6	2,009	1,389	621	11.2
2023	1,795	1,445	466	10.0	1,936	1,445	492	10.8	2,061	1,413	648	11.4
2024	1,805	1,471	487	10.0	1,985	1,471	513	11.0	2,114	1,438	676	11.7
2025	2,724	2,247	508	15.0	2,783	2,247	536	15.3	2,899	2,195	704	15.9
2026	2,742	2,276	527	15.0	2,832	2,276	556	15.5	2,953	2,222	731	16.1
2027	2,760	2,305	547	15.0	2,882	2,305	577	15.7	3,008	2,249	759	16.3
2028	2,778	2,333	568	15.0	2,932	2,333	599	15.8	3,064	2,277	787	16.5
2029	2,795	2,362	589	15.0	2,983	2,362	621	16.0	3,120	2,304	816	16.7
2030	2,813	2,391	611	15.0	3,035	2,391	645	16.2	3,178	2,331	847	16.9
2031	2,828	2,404	630	15.0	3,068	2,404	664	16.3	3,217	2,344	873	17.0
2032	2,844	2,417	649	15.0	3,102	2,417	685	16.4	3,256	2,357	899	17.1
2033	2,859	2,430	669	15.0	3,136	2,430	706	16.5	3,297	2,370	927	17.2
2034	2,875	2,444	690	15.0	3,171	2,444	727	16.5	3,338	2,383	955	17.4
2035	3,854	3,276	711	20.0	4,025	3,276	749	20.9	4,179	3,195	984	21.6

19 Net infrastructure costs refers to operating costs less recyclate revenue

3.2.2 Cashflow analysis of Option 4a

Additional program spending

A detailed financial analysis has been undertaken to assess the financial position of the container scheme operator under Option 4a, based on the assumptions outlined in *Data Assumptions* report (section 4.7.3, section 5.1.3 and section 6). The financial model calculates on an annual basis:

- scheme operating costs;
- revenue earned from recyclate sales;
- net revenue from unredeemed deposits; and
- interest earned on surplus funds.

This analysis has been undertaken in two different forms. The first form includes a substantial amount of spending on additional programs including:

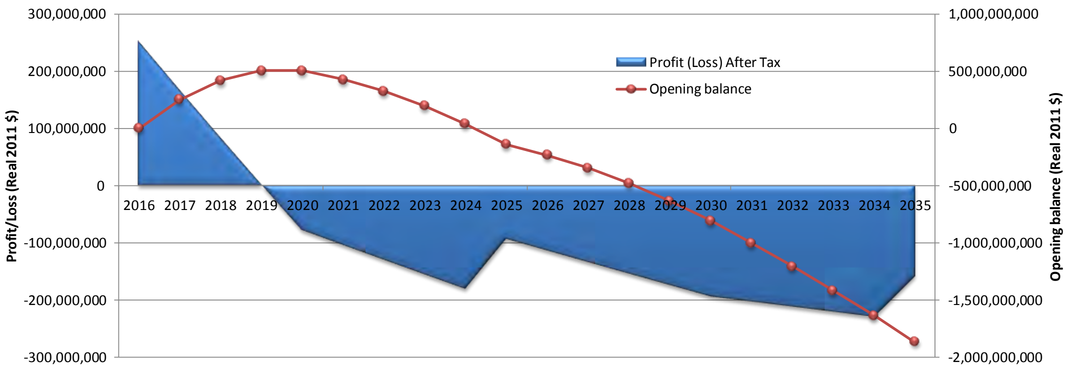
- a $16 million contingency fund to assist local governments that currently operate their kerbside recycling services at a profit with transitional costs (after netting out deposit income and other savings to kerbside) stemming from diversion of beverage containers from kerbside through the CDS;
- a $14 million contingency fund to cover risks relating to the impact of the scheme on South Australian super-collectors and Northern Territory co-ordinators, and others, and the potential need to buy out their operations;
- a $1 billion reprocessing bounty ($50 million per year for at least 20 years) to stimulate the domestic reprocessing industry and reverse the trend of exporting recyclate to other countries; and
- a $646 million rural waste and recycling rebate ($32.3 million per year for 20 years) to support the provision of waste and recycling services by local governments across rural Australia.

These additional programs have been proposed by the proponent of Option 4a (the Boomerang Alliance). However, our analysis shows that the level of funding proposed would result in surplus funds of the container scheme operator being depleted by midway through the modelled study period. Therefore, a second form includes only the revenue and expense items, excluding additional program spend.

Option 4a financial assessment assuming additional program spending

When spread equally in real terms over the period 2016 to 2035 the additional program spend equates to approximately $80m per year. Adding this cost to the scheme changes the estimated financial position of the scheme operator as shown in Figure 18.

Figure 18: Scheme operator financial position and annual profit (loss) in Option 4a (with additional program spend) (2011 $)



With the additional program spend the year of the scheme operator reaches a deficit position in 2029.

Option 4a financial assessment assuming no additional program spending

Figure 19 depicts the gap between deposits and refunds (unredeemed deposits) over time. Note that this chart does not show operating expenses or revenue from recyclate sales. The gap between deposits and refunds is an important source of revenue of the scheme operator. Combined with recyclate revenue, unredeemed deposits provide the scheme operator with a surplus, on which it can earn interest and sustain annual losses in later years. This gap diminishes over time as redemption rates increase. The step increases in 2025 and 2035 reflect increases in the deposit amount per container, as outlined in Table 12 of the Data Assumptions report. Specifically, the deposit amount declines in real terms for a number of years (as they are fixed in nominal terms) but is increased periodically in 5 cent increments to adjust for the effect of inflation and maintain the deposit amount in real terms.

Figure 19: Deposit revenue and refund cost in Option 4a, excluding operating costs (2011 $m)

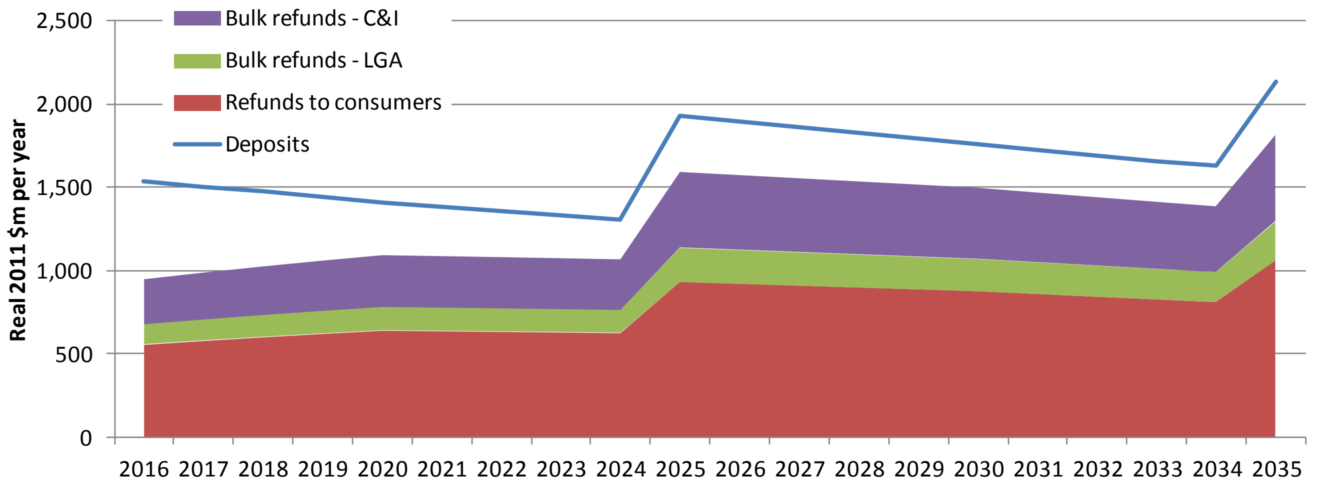
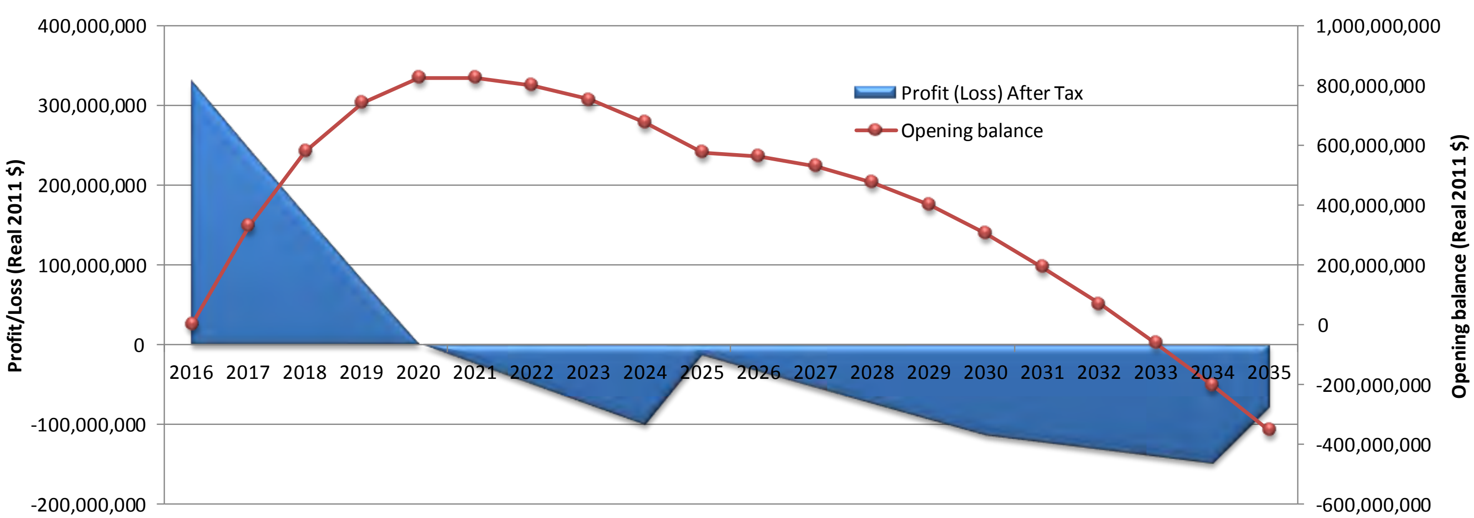


Figure 20: Scheme operator financial position and annual profit (loss) in Option 4a (no additional program spend) (2011 $)



As shown in Figure 20, profits in the years 2016 to 2019 create a cumulative surplus balance of approximately $800m by 2020. This is adequate to sustain the scheme operator up until 2033 after which time the surplus is depleted and the operator enters into a deficit position.

3.2.3 Financial viability of CDS operator beyond 2035

While the modelling period is limited to 2035 it is clear from the above results that should return rates continue to be maintained (or even increase) any revenue earned by the scheme operator is more than offset by the net costs of running the scheme.

Therefore, in order to remain operational over the longer term, the scheme would require additional funding from government or require further increases in the deposit rate to a rate higher than the refund amount.

3.3 Regional impacts

3.3.1 Regional impacts of non-CDS options

Figure 21 and Table 15 provide the PV impact of each of the options by state or territory for non-CDS options. The following costs are either incurred at a national level (e.g. federal government) or only estimated at a national level (i.e. a detailed estimated breakdown by jurisdiction has not been undertaken):

- costs of government regulation;
- costs to industry to comply with regulations;
- costs of recycling initiatives invested in by industry under co-regulatory arrangements;
- costs of recycling initiatives invested in by government under Option 1 or Option 3;
- impact on industry surplus; and
- co-benefits.

In general, state and territories benefit in proportion to waste production. That is, if recycling infrastructure investment is incurred at the national level (by government and/or packaged goods producers) then the benefits flow to waste producers in individual states and territories.

Generally, the higher a state's waste production, the greater benefits it derives through diversion of that waste and resulting recyclate revenue to LGAs and C&I waste producers and environmental benefits of avoided litter and landfill.

The exception to this trend is Queensland. As business-as-usual recycling rates are starting from a lower base in Queensland, a disproportionately higher amount of diversion is assumed to occur in that state, resulting in disproportionately higher benefits compared to the status quo.

Figure 22 and Table 16 provide the PV impact of each of the options by metro or non-metro area. The same cost items that were not disaggregated from a national level are not apportioned by metro or non-metro and are included in the 'unallocated' category.

Consistent with the jurisdictional trend, benefits are concentrated in regions with greater waste production, that is, in metropolitan areas. However, these results are strongly qualified by noting that that there are significant costs and benefits that have not been apportioned beyond a national level. In particular, costs borne by federal and state governments (regulation), packaging industry (administration & compliance, recycling and litter infrastructure and lost surplus) and co-benefits. These costs may not necessarily be apportioned to states by proportion of waste production and some are incurred at a national level (e.g. federal government, national packaging companies etc.). Therefore, the results should be read with this caveat in mind.

Figure 21: Impact of non-CDS options by state or territory (NPV 2011 $m)

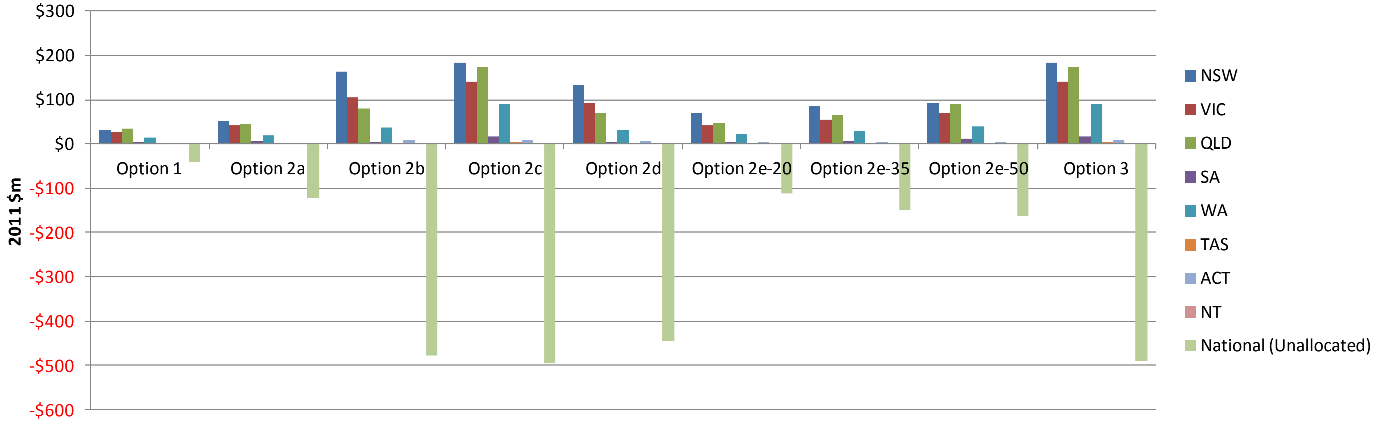


Table 15: Impact of non-CDS options by state or territory (NPV 2011 $m)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e (35m)	Option 2e ($50m)	Option 3
NSW	$32.3	$53.2	$163.7	$182.4	$133.3	$69.8	$85.6	$92.6	$182.4
VIC	$27.6	$41.2	$106.2	$139.5	$91.9	$43.2	$55.3	$70.7	$139.5
QLD	$33.5	$44.0	$79.1	$172.8	$69.0	$46.1	$63.5	$90.5	$172.8
SA	$4.8	$5.7	$5.2	$17.8	$3.1	$4.9	$7.5	$12.8	$17.8
WA	$14.9	$20.2	$36.8	$88.9	$32.8	$21.1	$28.6	$40.2	$88.9
TAS	$0.8	$1.7	$2.2	$3.1	$2.2	$1.8	$2.1	$2.2	$3.1
ACT	$1.6	$2.8	$8.8	$8.8	$6.7	$4.5	$4.8	$4.8	$8.8
NT	$0.3	$0.5	$0.5	$0.9	$0.4	$0.5	$0.6	$0.7	$0.9
Unallocated[20]	-$41.8	-$121.3	-$478.1	-$495.0	-$446.0	-$112.6	-$150.0	-$162.5	-$483.9

20 Includes regulation, administration & compliance, recycling & litter infrastructure investment and operation, impact on industry surplus and co-benefits

Figure 22: Impact of non-CDS options by metro or non-metro area (NPV 2011 $m)

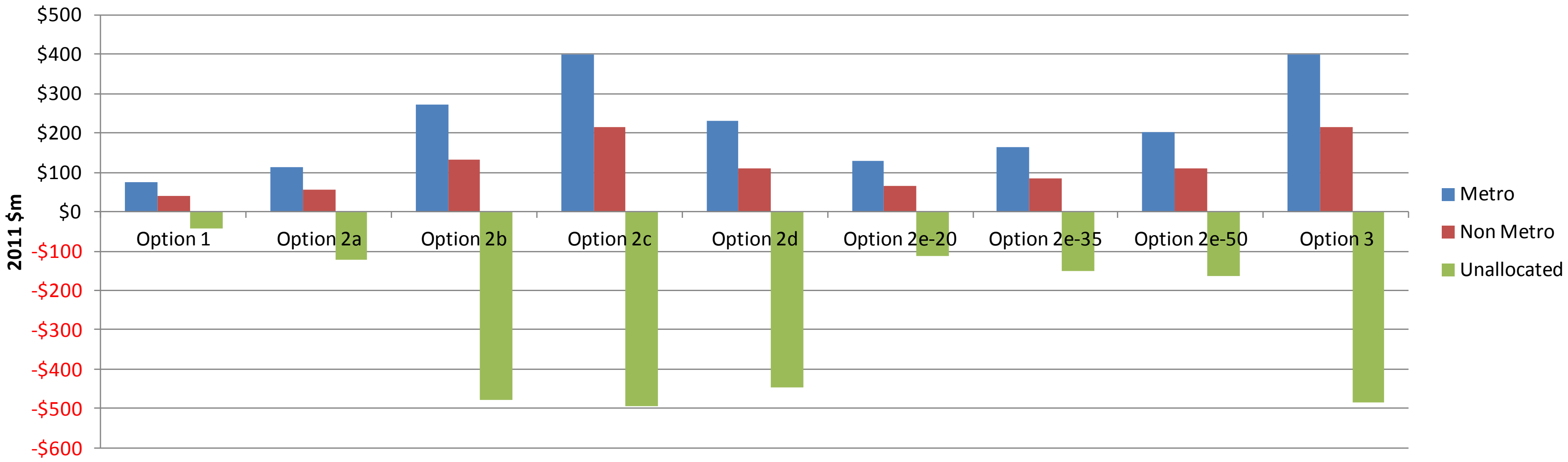


Table 16: Impact of non-CDS options by metro or non-metro area (NPV 2011 $m)

	Option 1	Option 2a	Option 2b	Option 2c	Option 2d	Option 2e ($20m)	Option 2e (35m)	Option 2e ($50m)	Option 3
Metro	**$74.7**	**$112.4**	**$271.8**	**$398.5**	**$230.6**	**$128.0**	**$163.3**	**$203.7**	**$398.5**
Non-metro	**$41.1**	**$57.1**	**$130.9**	**$215.8**	**$108.7**	**$63.9**	**$84.7**	**$110.9**	**$215.8**
Unallocated	**-$41.8**	**-$121.3**	**-$478.1**	**-$495.0**	**-$446.0**	**-$112.6**	**-$150.0**	**-$162.5**	**-$483.9**

3.3.2 Regional impacts of CDS options

In the apportionment of costs and benefits of CDS options to regions (and in contrast to the method used for non-CDS options), CDS infrastructure costs have been assigned to individual jurisdictions and to either metro or non-metro areas. Specifically CDS costs are incurred in proportion to the amount of material processed in each region. This allocation is appropriate given that CDS infrastructure costs are paid for by consumers, and consumption and waste production are strongly correlated.

As consumers ultimately bear the costs of the infrastructure and redemption rates are similar across jurisdictions, net costs are borne by regions in proportion to beverage consumption. However, this simplification may not be the case in reality where redemption rates are likely to differ by region based on consumer behaviour, availability of alternatives to CDS and ease of access of infrastructure. Table 17, Table 18, Figure 23 and Figure 24, show the distribution of CDS net costs or benefits by jurisdiction and by metro or non-metro area. Similar to non-CDS options, distribution occurs in proportion to waste production. National costs and benefits that have not been included in the regional allocation are:

- costs of government regulation;
- costs to industry to comply with regulations;
- impact on industry surplus; and
- co-benefits.

Table 17: Impact of CDS options by state or territory (NPV 2011 $m)

	Option 4a	Option 4b	Option 4c
NSW	-$1,204.2	-$1,250.8	-$1,491.7
VIC	-$938.0	-$974.9	-$1,158.6
QLD	-$675.0	-$701.4	-$848.9
SA	$2.9	$0.5	$4.0
WA	-$349.4	-$364.9	-$442.4
TAS	-$67.0	-$69.9	-$87.0
ACT	-$45.8	-$48.6	-$60.9
NT	$1.3	$1.1	$0.7
Unallocated	-$508.3	-$448.3	-$453.7

Table 18: Impact of CDS options by metro or non-metro area (NPV 2011 $m)

	Option 4a	Option 4b	Option 4c
Metro	-$2,175.9	-$2,277.0	-$2,747.1
Non-metro	-$1,099.3	-$1,131.9	-$1,337.8
Unallocated	-$508.3	-$448.3	-$453.7

Figure 23: Impact of CDS options by state or territory (NPV 2011 $m)

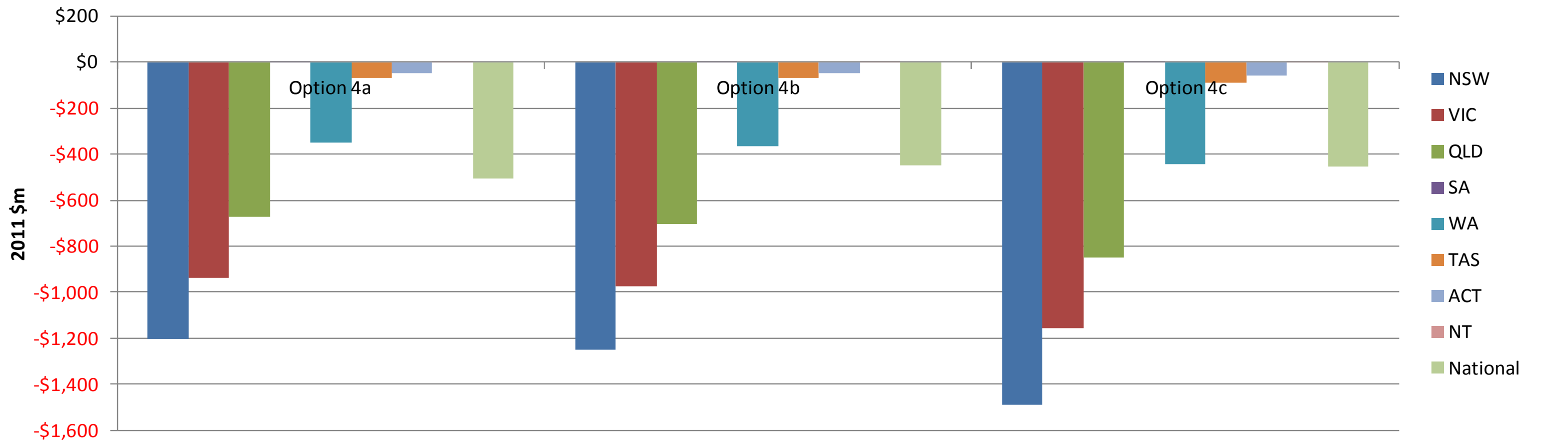
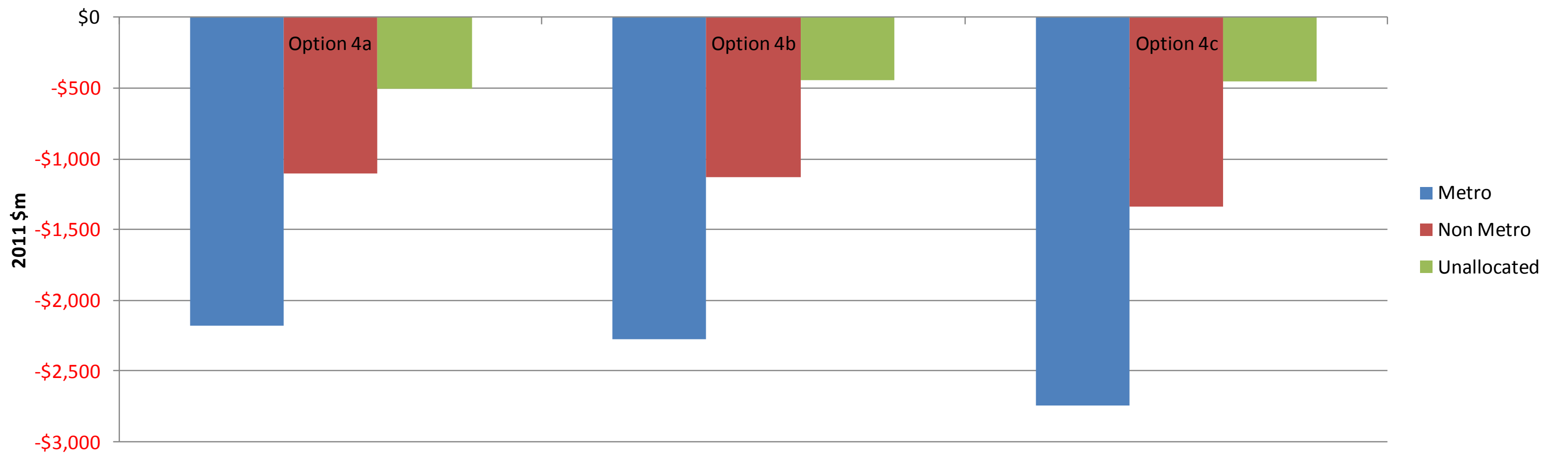


Figure 24: Impact of CDS options by metro and non-metro area (NPV 2011 $m)



PART B

Supporting Documentation

Appendix A: Results of individual options

Option 1 – National Packaging Waste and Litter Strategy

The national packaging strategy coordinates jurisdictional actions to increase recycling and reduce litter. For CBA purposes, there are two sets of costs associated with this option that were included. These are:

- The costs of jurisdictional coordination; and
- Additional costs estimated to be required to achieve a set level of target under the option (these were estimated through the MRCC analysis for consistency of methodology with the co-regulatory options).

Table 19 and Figure 25 provide the costs and benefits for Option 1 by CBA line item.

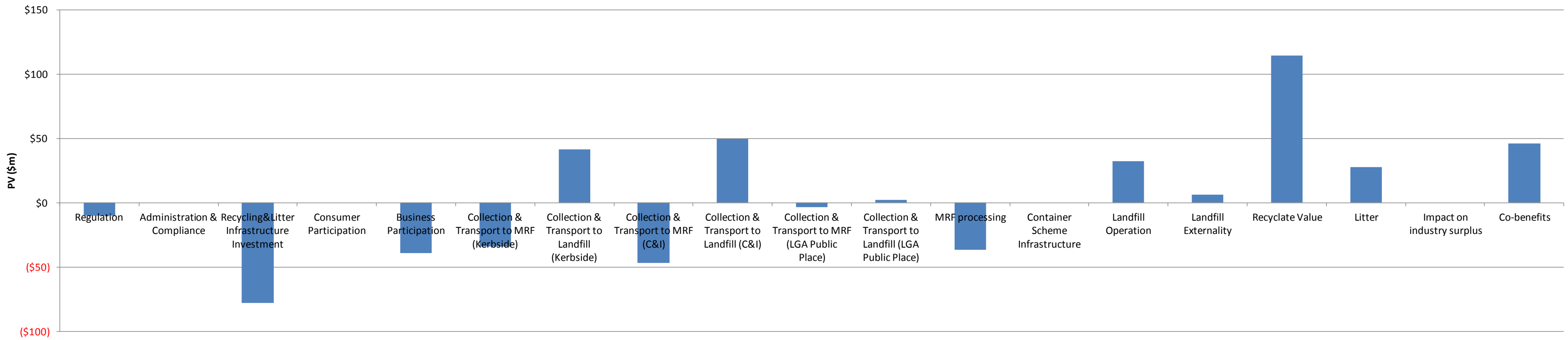
Of the options, Option 1 produces the highest BCR owing mainly to the relatively high payoff from lowest investment. This is illustrated in Figure 25 from the scale of benefits delivered through landfill avoidance, litter avoidance, recyclate value and co-benefits relative to the scale of investment in recycling and litter initiatives.

Table 19: Annual costs and benefits[21] for Option 1 by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$41.8				1.1	2.2	3.4	4.5	5.6	5.7	5.8	5.9	6.0	6.1	6.0	5.9	5.9	5.8	5.7	5.7	5.8	5.8	5.9	5.9
C&T to Landfill (C&I)	$49.8				1.2	2.4	3.7	4.9	6.1	6.4	6.6	6.9	7.2	7.5	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.5
C&T to Landfill (LGA Public Place)	$2.5				0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Landfill Operation	$32.3				0.8	1.6	2.4	3.2	4.1	4.2	4.4	4.5	4.7	4.8	4.8	4.7	4.7	4.7	4.6	4.7	4.7	4.7	4.7	4.8
Landfill Externality	$6.5				0.2	0.3	0.5	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Avoided litter																								
Litter	$27.8				0.7	1.3	2.0	2.6	3.3	3.5	3.7	3.9	4.1	4.3	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.3
Recyclate Value																								
Recyclate Value	$114.8				2.6	5.3	7.9	10.5	13.1	14.1	15.0	15.9	16.9	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8
Co-benefits																								
Co-benefits	$46.2				1.3	2.6	3.8	5.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Policy																								
Regulation	-$10.0	-0.6	-0.6	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$34.2				-0.9	-1.8	-2.7	-3.7	-4.6	-4.7	-4.8	-4.8	-4.9	-5.0	-4.9	-4.9	-4.8	-4.7	-4.6	-4.7	-4.7	-4.8	-4.8	-4.9
C&T to MRF (C&I)	-$46.8				-1.1	-2.3	-3.4	-4.6	-5.7	-6.0	-6.2	-6.5	-6.8	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
C&T to MRF (LGA Public Place)	-$3.2				-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
MRF processing	-$36.5				-0.9	-1.8	-2.8	-3.7	-4.6	-4.8	-4.9	-5.1	-5.3	-5.4	-5.4	-5.4	-5.3	-5.3	-5.2	-5.3	-5.3	-5.3	-5.3	-5.4
Infrastructure investment &operations	-$77.9			-6.0	-7.4	-7.8	-8.3	-8.7	-9.2	-9.3	-9.4	-9.6	-9.7	-9.9	-7.8	-7.8	-7.8	-7.8	-7.7	-7.7	-7.8	-7.8	-7.8	-7.8
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	$0.0																							
Impact on industry surplus	$0.0																							
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$39.1				-1.0	-1.9	-2.9	-3.8	-4.8	-5.0	-5.2	-5.4	-5.7	-5.9	-5.9	-5.9	-5.8	-5.8	-5.8	-5.8	-5.8	-5.9	-5.9	-5.9
Net Present Value (NPV)	$74.0																							
Benefit Cost Ratio (BCR)	**1.3**																							

21 'C&T' refers to Collection & Transport

Figure 25: PV costs and benefits for Option 1 by CBA item (in real 2011 $m)



Option 2a – Australian Packaging Covenant replaced by co-regulatory product stewardship under the Product Stewardship Act 2011

Option 2a is a co-regulatory arrangement requiring the packaged goods industry to undertake initiatives that result in an increase in recycling and reduce litter. Each year over the co-regulatory period (2016 to 2020), the industry must undertake initiatives that result in an additional 2% recycling of packaging that industry members bring to market. Industry must also develop and report against a plan to reduce litter. Option 2a replaces the existing APC.

The quantum of recycling outcome expected under these conditions has been estimated, and the monetary cost of achieving the outcome is estimated using the MRCC analysis.

Table 20 and Figure 26 provide the costs and benefits for Option 2a by CBA line item.

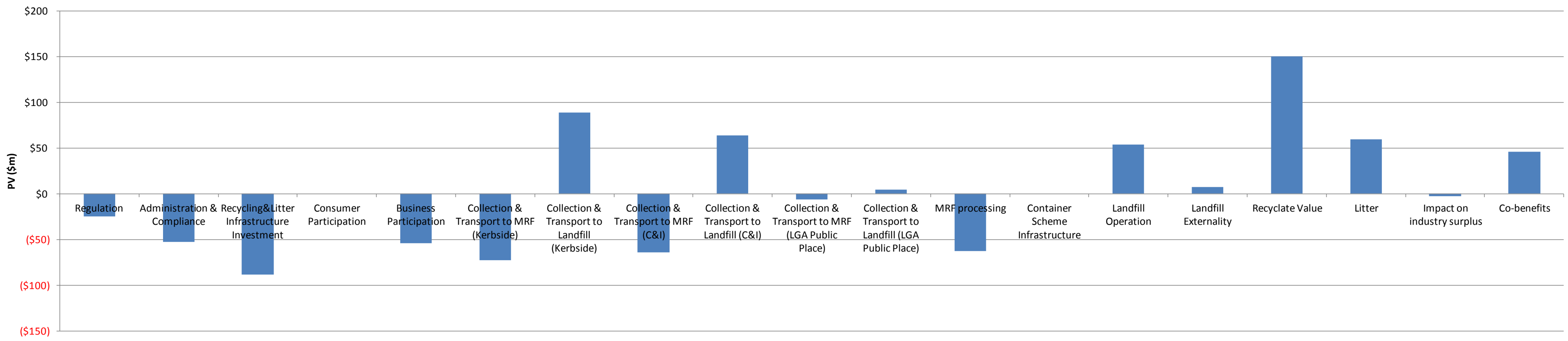
Similar to Option 1, Option 2a results in relatively high payoff investments. However, the scale of investments is higher and average payoff lower, and there are additional administrative costs to industry incurred in complying with the regulation.

Table 20: Annual costs and benefits for Option 2a by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$88.9				3.3	6.6	10.0	13.3	16.6	15.5	14.3	13.2	12.0	10.9	10.3	9.7	9.1	8.4	7.8	7.9	8.0	8.0	8.1	8.2
C&T to Landfill (C&I)	$64.2				2.1	4.2	6.3	8.4	10.5	10.1	9.7	9.2	8.8	8.4	8.2	7.9	7.7	7.4	7.2	7.2	7.2	7.2	7.2	7.2
C&T to Landfill (LGA Public Place)	$4.5				0.2	0.4	0.5	0.7	0.9	0.8	0.7	0.7	0.6	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4
Landfill Operation	$53.9				1.9	3.8	5.7	7.6	9.5	9.0	8.4	7.9	7.3	6.8	6.5	6.2	5.9	5.6	5.3	5.3	5.3	5.4	5.4	5.4
Landfill Externality	$7.4				0.2	0.5	0.7	0.9	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Avoided litter																								
Litter	$59.6				1.9	3.8	5.7	7.6	9.6	9.2	8.9	8.5	8.2	7.8	7.6	7.4	7.3	7.1	6.9	6.9	7.0	7.0	7.0	7.1
Recyclate Value																								
Recyclate Value	$150.5				4.9	9.7	14.6	19.5	24.3	23.3	22.3	21.2	20.2	19.2	18.9	18.6	18.3	18.1	17.8	17.8	17.8	17.8	17.8	17.8
Co-benefits																								
Co-benefits	$46.2				1.3	2.6	3.8	5.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Policy																								
Regulation	-$24.6	-1.3	-1.3	-1.3	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$73.0				-2.7	-5.5	-8.2	-10.9	-13.6	-12.7	-11.7	-10.8	-9.9	-8.9	-8.4	-7.9	-7.4	-6.9	-6.4	-6.5	-6.5	-6.6	-6.6	-6.7
C&T to MRF (C&I)	-$64.1				-2.1	-4.2	-6.3	-8.3	-10.4	-10.0	-9.6	-9.2	-8.8	-8.4	-8.2	-7.9	-7.7	-7.5	-7.2	-7.2	-7.3	-7.3	-7.3	-7.3
C&T to MRF (LGA Public Place)	-$6.2				-0.2	-0.5	-0.7	-0.9	-1.1	-1.1	-1.0	-0.9	-0.9	-0.8	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
MRF processing	-$62.4				-2.2	-4.4	-6.6	-8.8	-11.0	-10.4	-9.7	-9.1	-8.5	-7.9	-7.5	-7.2	-6.9	-6.5	-6.2	-6.2	-6.2	-6.3	-6.3	-6.3
Infrastructure investment &operations	-$88.3				-6.0	-7.1	-8.8	-11.9	-15.9	-14.7	-13.6	-12.5	-11.5	-10.4	-9.8	-9.4	-9.1	-8.8	-8.5	-8.5	-8.6	-8.6	-8.6	-8.6
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$52.4				-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Impact on industry surplus	-$2.2				-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$53.8				-1.8	-3.5	-5.3	-7.0	-8.8	-8.4	-8.1	-7.7	-7.4	-7.0	-6.8	-6.6	-6.5	-6.3	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1

Net Present Value (NPV)	$48.2
Benefit Cost Ratio (BCR)	**1.1**

Figure 26: PV costs and benefits for Option 2a by CBA item (in real 2011 $m)



Note the vertical axis scale used in this figure and in subsequent figures in this appendix differ from option to option.

Option 2b – Industry Packaging Stewardship

Option 2b expands on Option 2a by setting a packaging recycling target, increasing annually over the same period arising from initiatives that deliver an additional 2% in 2016 to an additional 10% in 2020 and also a beverage sub-target of 70% beverage container recycling by 2020 and 80% by 2025 is also required to be achieved. Option 2b replaces the existing APC.

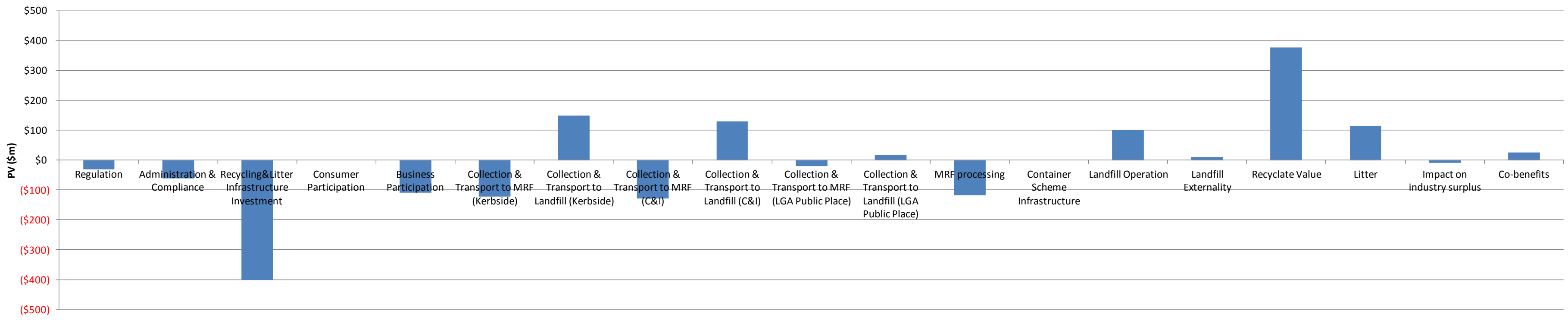
Similar to Option 2a, the quantum of recycling outcome expected under these conditions has been estimated, and the monetary cost of achieving the outcome is estimated using the MRCC analysis. The key difference between the two options is that a minimum level of beverage container recycling requires the selection of relatively less cost effective ($ per tonne of packaging) and lower payoff (e.g. glass beverage container) investments. Similar to Option 2a, industry must also develop and report against a plan to reduce litter.

Table 21 and Figure 27 provide the costs and benefits for Option 2b by CBA line item.

Table 21: Annual costs and benefits for Option 2b by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$149.6				4.2	8.4	12.5	16.7	20.9	20.8	20.8	20.8	20.8	20.7	20.7	20.7	20.6	20.6	20.6	20.5	20.5	20.5	20.4	20.4
C&T to Landfill (C&I)	$130.2				3.5	7.0	10.6	14.1	17.6	18.0	18.5	18.9	19.3	19.7	19.1	18.5	17.9	17.3	16.7	16.9	17.0	17.2	17.4	17.6
C&T to Landfill (LGA Public Place)	$16.9				0.4	0.8	1.2	1.6	1.9	2.1	2.2	2.4	2.5	2.7	2.7	2.6	2.6	2.6	2.5	2.6	2.6	2.6	2.6	2.7
Landfill Operation	$101.5				2.8	5.5	8.3	11.0	13.8	14.0	14.2	14.4	14.6	14.8	14.5	14.3	14.1	13.9	13.6	13.7	13.8	13.9	13.9	14.0
Landfill Externality	$9.4				0.3	0.6	0.9	1.2	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.0	0.9	1.0	1.0	1.0	1.0	1.0
Avoided litter																								
Litter	$113.5				2.8	5.6	8.4	11.2	14.1	14.7	15.3	15.9	16.5	17.1	16.9	16.8	16.7	16.6	16.5	16.6	16.7	16.9	17.0	17.2
Recyclate Value																								
Recyclate Value	$377.2				9.5	18.9	28.4	37.8	47.3	49.6	52.0	54.3	56.6	59.0	57.5	56.0	54.5	52.9	51.4	52.1	52.8	53.4	54.1	54.7
Co-benefits																								
Co-benefits	$26.0				1.4	2.8	4.1	5.5	6.9	6.1	5.2	4.4	3.6	2.8	2.2	1.7	1.1	0.6						
Policy																								
Regulation	-$32.0	-1.3	-1.3	-1.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$123.0				-3.4	-6.9	-10.3	-13.7	-17.2	-17.1	-17.1	-17.1	-17.1	-17.0	-17.0	-17.0	-17.0	-16.9	-16.9	-16.9	-16.9	-16.8	-16.8	-16.8
C&T to MRF (C&I)	-$128.0				-3.4	-6.8	-10.3	-13.7	-17.1	-17.6	-18.0	-18.5	-18.9	-19.4	-18.8	-18.3	-17.8	-17.2	-16.7	-16.9	-17.1	-17.2	-17.4	-17.6
C&T to MRF (LGA Public Place)	-$19.3				-0.4	-0.9	-1.3	-1.8	-2.2	-2.4	-2.5	-2.7	-2.9	-3.0	-3.0	-3.0	-2.9	-2.9	-2.9	-2.9	-2.9	-3.0	-3.0	-3.0
MRF processing	-$117.5				-3.2	-6.4	-9.5	-12.7	-15.9	-16.1	-16.4	-16.6	-16.9	-17.1	-16.9	-16.6	-16.4	-16.1	-15.9	-15.9	-16.0	-16.1	-16.2	-16.2
Infrastructure investment &operations	-$401.6				-6.5	-12.8	-21.2	-32.9	-54.6	-59.5	-60.5	-61.8	-65.0	-68.4	-66.0	-63.6	-61.3	-58.9	-56.6	-56.0	-55.4	-54.8	-54.1	-53.5
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$60.6				-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
Impact on industry surplus	-$10.0				-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$108.0				-2.9	-5.8	-8.7	-11.6	-14.4	-14.8	-15.2	-15.6	-16.0	-16.3	-15.9	-15.4	-15.0	-14.5	-14.1	-14.2	-14.4	-14.5	-14.7	-14.8
Net Present Value (NPV)	-$75.5																							
Benefit Cost Ratio (BCR)	**0.9**																							

Figure 27: PV costs and benefits for Option 2b by CBA item (in real 2011 $m)



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Option 2c – Extended Packaging Stewardship

Option 2c targets go beyond the level of commitment under Option 2b, requiring initiatives that deliver an additional 16% recycling of packaging material brought to market by members by 2020 but the same sub-target of 70% beverage container recycling by 2020 and 80% by 2025. Option 2c replaces the existing APC.

Table 22 and Figure 28 provide the costs and benefits for Option 2c by CBA line item.

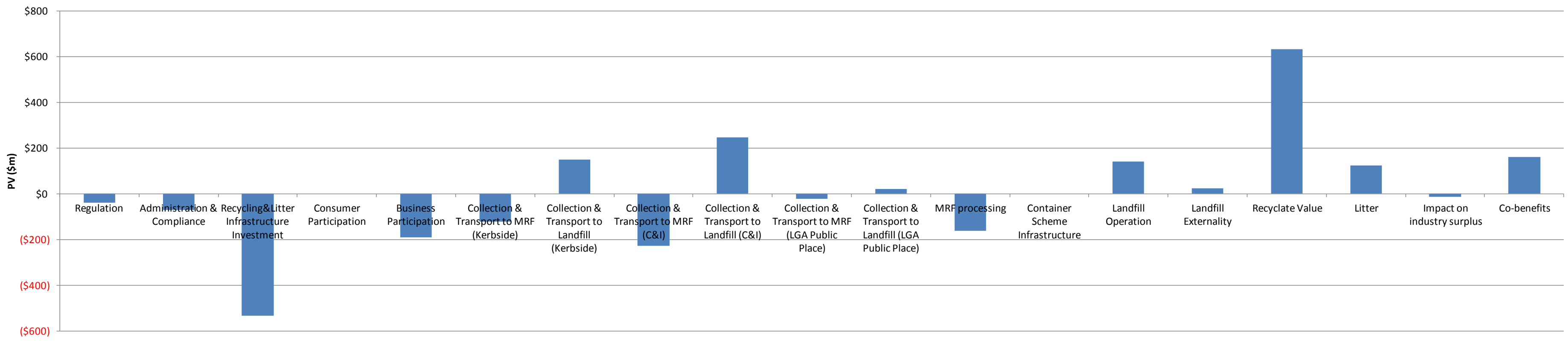
Option 2c delivers the highest level of recycling of all the options. Furthermore, the payoff from recycling investments improves relative to 2b as there is less concentration in low value glass investments. As with options 2a and 2b, industry must also develop and report against a plan to reduce litter.

Table 22: Annual costs and benefits for Option 2c by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$149.6				4.2	8.4	12.5	16.7	20.9	20.8	20.8	20.8	20.8	20.7	20.7	20.7	20.6	20.6	20.6	20.5	20.5	20.5	20.4	20.4
C&T to Landfill (C&I)	$247.0				7.0	14.1	21.1	28.2	35.2	35.1	35.1	35.0	34.9	34.8	34.2	33.6	33.0	32.4	31.8	32.1	32.4	32.6	32.9	33.2
C&T to Landfill (LGA Public Place)	$20.0				0.5	1.0	1.5	1.9	2.4	2.5	2.7	2.8	2.9	3.1	3.0	3.0	3.0	2.9	2.9	2.9	3.0	3.0	3.0	3.1
Landfill Operation	$141.9				4.0	8.0	11.9	15.9	19.9	19.9	19.9	19.9	19.9	20.0	19.7	19.5	19.3	19.1	18.9	19.0	19.1	19.2	19.3	19.4
Landfill Externality	$25.6				0.8	1.6	2.4	3.2	4.0	3.9	3.8	3.6	3.5	3.4	3.3	3.3	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.1
Avoided litter																								
Litter	$124.0				3.1	6.3	9.4	12.6	15.7	16.2	16.8	17.3	17.8	18.4	18.3	18.1	18.0	17.9	17.8	17.9	18.1	18.2	18.4	18.5
Recyclate Value																								
Recyclate Value	$632.6				17.2	34.4	51.6	68.7	85.9	87.1	88.3	89.5	90.7	91.9	90.4	89.0	87.5	86.0	84.5	85.4	86.2	87.0	87.9	88.7
Co-benefits																								
Co-benefits	$161.3				5.4	10.9	16.3	21.7	27.1	25.8	24.4	23.1	21.7	20.4	19.8	19.3	18.7	18.2	17.7	17.8	17.8	17.9	18.0	18.1
Policy																								
Regulation	-$39.4	-1.3	-1.3	-1.3	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$123.0				-3.4	-6.9	-10.3	-13.7	-17.2	-17.1	-17.1	-17.1	-17.1	-17.0	-17.0	-17.0	-17.0	-16.9	-16.9	-16.9	-16.9	-16.8	-16.8	-16.8
C&T to MRF (C&I)	-$228.6				-6.5	-12.9	-19.4	-25.8	-32.3	-32.3	-32.3	-32.3	-32.4	-32.4	-31.8	-31.3	-30.8	-30.3	-29.7	-30.0	-30.2	-30.5	-30.7	-31.0
C&T to MRF (LGA Public Place)	-$22.2				-0.5	-1.1	-1.6	-2.1	-2.7	-2.8	-3.0	-3.1	-3.3	-3.4	-3.4	-3.3	-3.3	-3.3	-3.2	-3.3	-3.3	-3.3	-3.4	-3.4
MRF processing	-$161.0				-4.5	-9.0	-13.5	-18.0	-22.5	-22.5	-22.6	-22.6	-22.7	-22.7	-22.5	-22.2	-22.0	-21.7	-21.5	-21.6	-21.7	-21.8	-21.9	-22.0
Infrastructure investment &operations	-$534.8				-7.2	-16.3	-31.7	-52.4	-79.2	-83.6	-84.1	-84.6	-85.2	-85.7	-82.7	-79.8	-76.9	-74.0	-71.1	-70.6	-70.0	-69.5	-69.0	-68.5
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$68.8				-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
Impact on industry surplus	-$13.3				-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$191.6				-5.4	-10.8	-16.2	-21.6	-27.1	-27.1	-27.1	-27.1	-27.1	-27.1	-26.7	-26.3	-25.8	-25.4	-25.0	-25.2	-25.4	-25.6	-25.8	-26.0

Net Present Value (NPV)	$119.3
Benefit Cost Ratio (BCR)	**1.1**

Figure 28: PV costs and benefits for Option 2c by CBA item (in real 2011 $m)



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Option 2d – Beverage Container Stewardship

Option 2d builds on the existing APC by instituting a co-regulatory beverage container recycling scheme under the Product Stewardship Act 2011. The option contains a higher level of beverage container recycling (but no additional packaging recycling) of 72.5% by 2020, rising to 80% by 2025. As with other co-regulatory options, the MRCC analysis was used to estimate the monetary costs of achieving the quantity of recycling implied by the targets. The APC continues to operate as currently under this option, although beverage producers liable under option 2d would no longer be required to comply with the APC.

Table 23 and Figure 29 provide the costs and benefits for Option 2d by CBA line item.

Due to its concentration on beverage container recycling, Option 2d has the lowest NPV of the co-regulatory options. Industry must also develop and report against a plan to reduce beverage container litter.

Table 23: Annual costs and benefits for Option 2d by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$147.2				4.0	8.0	12.0	16.1	20.1	20.2	20.3	20.5	20.6	20.7	20.7	20.7	20.6	20.6	20.6	20.5	20.5	20.5	20.4	20.4
C&T to Landfill (C&I)	$101.2				1.3	2.6	3.9	5.2	6.5	8.7	10.9	13.1	15.3	17.4	18.1	18.7	19.3	20.0	20.6	20.8	21.0	21.2	21.3	21.5
C&T to Landfill (LGA Public Place)	$15.3				0.2	0.4	0.6	0.8	1.0	1.3	1.6	2.0	2.3	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.2	3.2	3.2	3.3
Landfill Operation	$90.2				1.9	3.7	5.6	7.5	9.4	10.3	11.2	12.1	13.0	14.0	14.2	14.4	14.7	14.9	15.2	15.2	15.3	15.4	15.5	15.5
Landfill Externality	$5.9				0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
Avoided litter																								
Litter	$107.2				2.0	4.1	6.1	8.2	10.2	11.5	12.9	14.2	15.6	16.9	17.3	17.7	18.1	18.5	18.9	19.0	19.2	19.3	19.4	19.6
Recyclate Value																								
Recyclate Value	$305.5				3.2	6.5	9.7	12.9	16.2	23.8	31.3	38.9	46.5	54.1	56.3	58.5	60.7	62.8	65.0	65.7	66.4	67.1	67.9	68.6
Co-benefits																								
Co-benefits	$0.0																							
Policy																								
Regulation	-$22.7	-0.8	-0.8	-0.8	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$121.1				-3.3	-6.6	-9.9	-13.2	-16.5	-16.6	-16.7	-16.8	-16.9	-17.0	-17.0	-17.0	-17.0	-16.9	-16.9	-16.9	-16.9	-16.8	-16.8	-16.8
C&T to MRF (C&I)	-$102.6				-1.4	-2.8	-4.3	-5.7	-7.1	-9.2	-11.2	-13.3	-15.3	-17.4	-18.0	-18.6	-19.2	-19.8	-20.4	-20.6	-20.8	-21.0	-21.2	-21.3
C&T to MRF (LGA Public Place)	-$17.7				-0.3	-0.5	-0.8	-1.0	-1.3	-1.6	-1.9	-2.3	-2.6	-3.0	-3.1	-3.2	-3.3	-3.4	-3.5	-3.5	-3.6	-3.6	-3.6	-3.7
MRF processing	-$105.1				-2.2	-4.4	-6.6	-8.7	-10.9	-12.0	-13.1	-14.1	-15.2	-16.3	-16.6	-16.8	-17.1	-17.4	-17.7	-17.7	-17.8	-17.9	-18.0	-18.0
Infrastructure investment &operations	-$388.9				-6.1	-11.7	-18.6	-26.6	-36.8	-44.9	-49.6	-54.5	-61.2	-67.8	-67.7	-67.5	-67.4	-67.2	-67.1	-66.6	-66.2	-65.8	-65.4	-65.0
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$24.7				-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9
Impact on industry surplus	-$9.7				-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$86.6				-1.2	-2.4	-3.6	-4.8	-6.0	-7.8	-9.5	-11.2	-13.0	-14.7	-15.2	-15.7	-16.2	-16.7	-17.2	-17.3	-17.5	-17.6	-17.8	-17.9
Net Present Value (NPV)	-$106.6																							
Benefit Cost Ratio (BCR)	**0.9**																							

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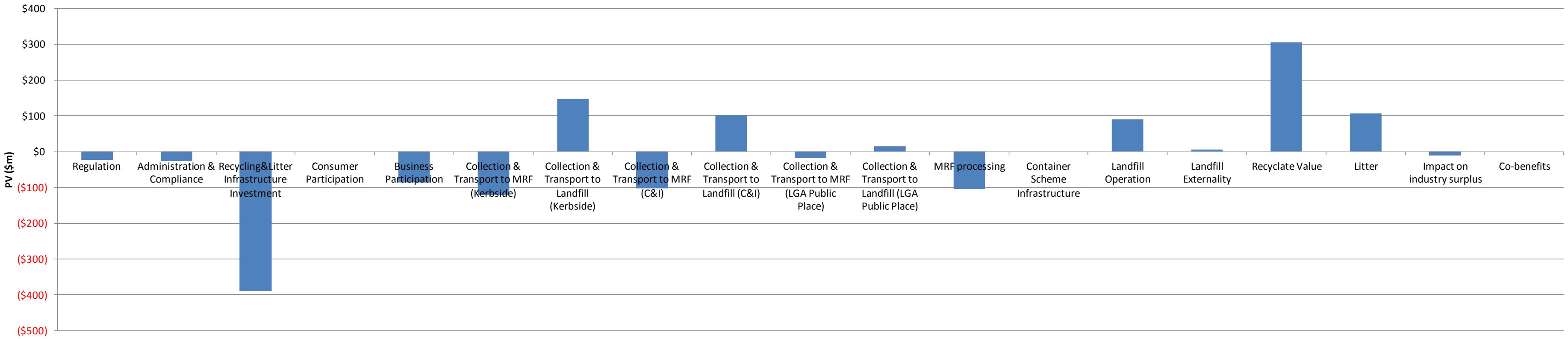
Figure 29: PV costs and benefits for Option 2d by CBA item (in real 2011 $m)



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Option 2e ($20m) – Extended Australian Packaging Covenant

Under all of the Option 2e variants, the packaged goods industry is required to provide a fixed amount of funding upfront. This funding is assumed to be targeted at initiatives which increase recycling but as no fixed packaging target is required to be achieved, this allows co-benefits of potential investments to be another factor that may be pursued.

Under Option 2e ($20m) the industry provides an average annual funding support of $20m per year over the 5 year period (2016 – 2020), which supports initiatives that deliver recycling and litter outcomes throughout the modelled CBA period. The initiatives are modelled to be selected as the least cost ($ per tonne of total recycling, and not $ per tonne of packaging).

Table 24 and Figure 30 provide the costs and benefits for Option 2e ($20m) by CBA line item.

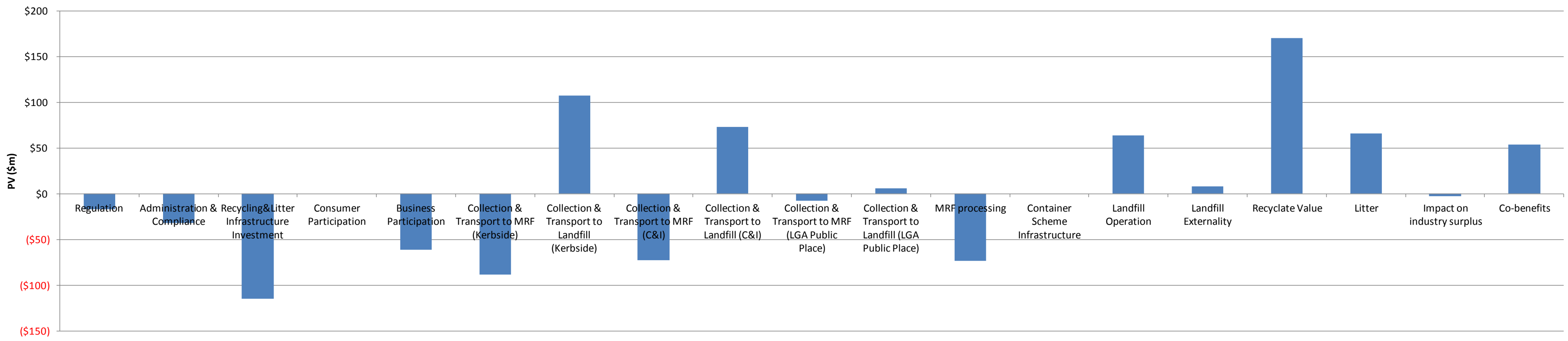
Option 2e variants benefit from the absence of constraints for packaging targets and deliver investments with higher payoffs relative to other co-regulatory options but lower payoffs relative to Option 1. Payoff increases with higher level of investment due to the profile of investments within the MRCC analysis. Specifically, the highest level of funding ($50m per year), delivers the greatest payoff due to less reliance on low cost/low value glass investments mid-way in the recycling opportunities supply curve.

Table 24: Annual costs and benefits for Option 2e ($20m) by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$107.9				3.0	6.0	9.0	12.1	15.1	15.0	15.0	15.0	15.0	15.0	14.9	14.9	14.9	14.9	14.8	14.8	14.8	14.8	14.7	14.7
C&T to Landfill (C&I)	$73.0				2.0	4.0	6.1	8.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
C&T to Landfill (LGA Public Place)	$5.9				0.2	0.3	0.5	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Landfill Operation	$64.0				1.8	3.5	5.3	7.1	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
Landfill Externality	$7.9				0.2	0.4	0.7	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Avoided litter																								
Litter	$66.3				1.8	3.7	5.5	7.4	9.2	9.2	9.2	9.2	9.2	9.1	9.1	9.1	9.1	9.2	9.2	9.2	9.2	9.2	9.3	9.3
Recyclate Value																								
Recyclate Value	$170.4				4.7	9.4	14.2	18.9	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Co-benefits																								
Co-benefits	$53.8				4.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Policy																								
Regulation	-$17.0	-0.3	-0.3	-0.3	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$88.7				-2.5	-4.9	-7.4	-9.9	-12.4	-12.4	-12.3	-12.3	-12.3	-12.3	-12.3	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.1	-12.1	-12.1
C&T to MRF (C&I)	-$72.5				-2.0	-4.0	-6.0	-8.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1
C&T to MRF (LGA Public Place)	-$7.7				-0.2	-0.4	-0.6	-0.9	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
MRF processing	-$73.6				-2.0	-4.1	-6.1	-8.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.1	-10.1	-10.1	-10.1	-10.1
Infrastructure investment &operations	-$114.7				-5.6	-7.2	-9.4	-12.2	-15.6	-15.9	-15.9	-15.9	-15.9	-15.9	-15.8	-15.6	-15.5	-15.3	-15.2	-15.1	-15.0	-15.0	-14.9	-14.8
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$31.8				-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7
Impact on industry surplus	-$2.8				-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$61.0				-1.7	-3.4	-5.1	-6.8	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5
Net Present Value (NPV)	$79.4																							
Benefit Cost Ratio (BCR)	**1.2**																							

.

Figure 30: PV costs and benefits for Option 2e ($20m) by CBA item (in real 2011 $m)



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Option 2e ($35m) – Extended Australian Packaging Covenant

Under Option 2e ($35m) the industry provides an average annual funding support of $35m per year over the 5 year period (2016 – 2020), which supports initiatives that deliver recycling and litter outcomes throughout the modelled CBA period. The initiatives are modelled to be selected as the least cost ($ per tonne of total recycling, and not $ per tonne of packaging).

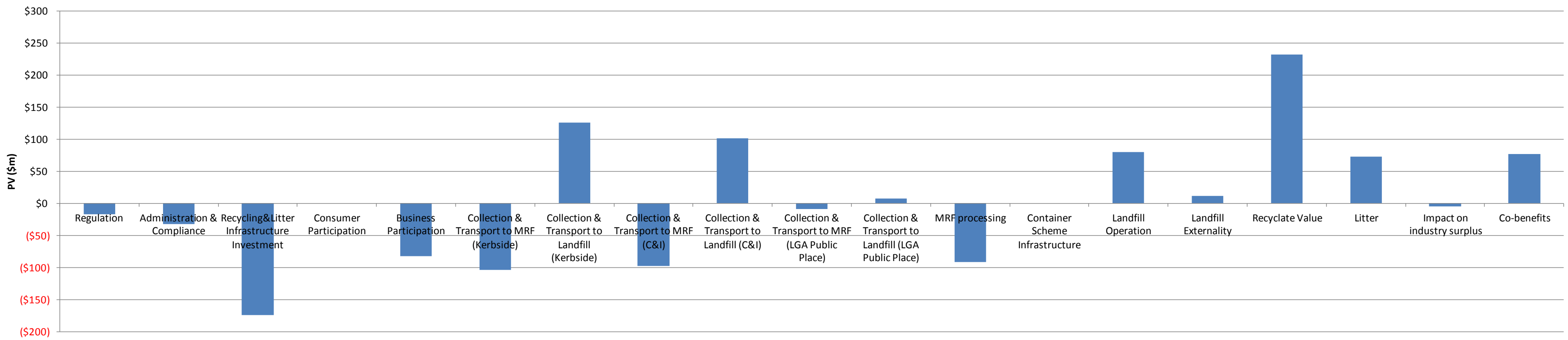
Table 25 and Figure 31 provide the costs and benefits for Option 2e ($35m) by CBA line item.

Option 2e variants benefit from the absence of constraints for packaging targets and deliver investments with higher payoffs relative to other co-regulatory options but lower payoffs relative to Option 1. Payoff increases with higher level of investment due to the profile of investments within the MRCC analysis. Specifically, the highest level of funding ($50m per year), delivers the greatest payoff due to less reliance on low cost/low value glass investments mid-way in the recycling opportunities supply curve.

Table 25: Annual costs and benefits for Option 2e ($35m) by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$126.0				3.5	7.0	10.6	14.1	17.6	17.6	17.5	17.5	17.5	17.5	17.4	17.4	17.4	17.3	17.3	17.3	17.3	17.2	17.2	17.2
C&T to Landfill (C&I)	$101.5				2.8	5.6	8.4	11.2	14.0	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.0	14.0
C&T to Landfill (LGA Public Place)	$7.4				0.2	0.4	0.6	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Landfill Operation	$80.4				2.2	4.5	6.7	8.9	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
Landfill Externality	$11.7				0.3	0.6	1.0	1.3	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Avoided litter																								
Litter	$72.7				2.0	4.0	6.1	8.1	10.1	10.1	10.1	10.1	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.1	10.1	10.1	10.1	10.2
Recyclate Value																								
Recyclate Value	$232.1				6.4	12.9	19.3	25.7	32.2	32.2	32.2	32.2	32.1	32.1	32.1	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2
Co-benefits																								
Co-benefits	$77.3				6.4	6.4	6.4	6.4	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Policy																								
Regulation	-$17.0	-0.3	-0.3	-0.3	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$103.6				-2.9	-5.8	-8.7	-11.6	-14.5	-14.4	-14.4	-14.4	-14.4	-14.3	-14.3	-14.3	-14.3	-14.3	-14.2	-14.2	-14.2	-14.2	-14.1	-14.1
C&T to MRF (C&I)	-$97.7				-2.7	-5.4	-8.1	-10.8	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5
C&T to MRF (LGA Public Place)	-$9.2				-0.3	-0.5	-0.8	-1.0	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
MRF processing	-$91.4				-2.5	-5.1	-7.6	-10.2	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.6	-12.6	-12.6	-12.6	-12.6	-12.6	-12.6	-12.6	-12.6
Infrastructure investment &operations	-$174.2				-6.1	-9.0	-13.1	-18.2	-24.5	-25.2	-25.2	-25.2	-25.2	-25.2	-24.8	-24.5	-24.1	-23.7	-23.4	-23.2	-23.0	-22.8	-22.6	-22.5
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$31.8				-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7
Impact on industry surplus	-$4.3				-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$82.0				-2.3	-4.5	-6.8	-9.1	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4
Net Present Value (NPV)	$98.0																							
Benefit Cost Ratio (BCR)	**1.2**																							

Figure 31: PV costs and benefits for Option 2e ($35m) by CBA item (in real 2011 $m)



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Option 2e ($50m) – Extended Australian Packaging Covenant

Under Option 2e ($50m) the industry provides an average annual funding support of $50m per year over the 5 year period (2016 – 2020), which supports initiatives that deliver recycling and litter outcomes throughout the modelled CBA period. The initiatives are modelled to be selected as the least cost ($ per tonne of total recycling, and not $ per tonne of packaging).

Figure 32 and Table 26 provide the costs and benefits for Option 2e ($50m) by CBA line item.

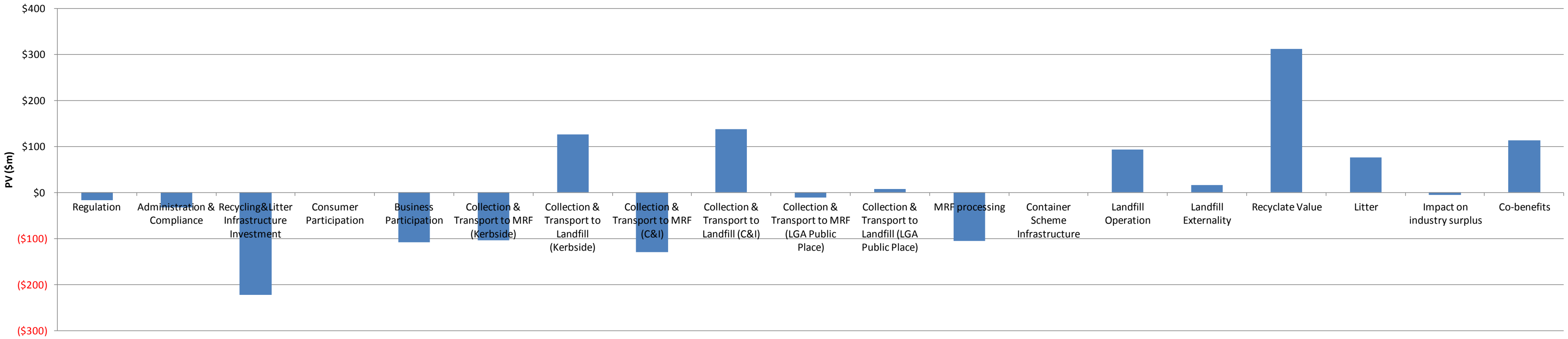
Option 2e variants benefit from the absence of constraints for packaging targets and deliver investments with higher payoffs relative to other co-regulatory options but lower payoffs relative to Option 1. Payoff increases with higher level of investment due to the profile of investments within the MRCC analysis. Specifically, the highest level of funding ($50m per year), delivers the greatest payoff due to less reliance on low cost/low value glass investments mid-way in the recycling opportunities supply curve.

Table 26: Annual costs and benefits for Option 2e ($50m) by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$126.0				3.5	7.0	10.6	14.1	17.6	17.6	17.5	17.5	17.5	17.5	17.4	17.4	17.4	17.3	17.3	17.3	17.3	17.2	17.2	17.2
C&T to Landfill (C&I)	$138.1				3.8	7.7	11.5	15.3	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.2	19.2	19.1	19.1	19.1	19.1	19.1
C&T to Landfill (LGA Public Place)	$8.3				0.2	0.5	0.7	0.9	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Landfill Operation	$93.3				2.6	5.2	7.8	10.3	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
Landfill Externality	$17.1				0.5	0.9	1.4	1.9	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Avoided litter																								
Litter	$75.9				2.1	4.2	6.3	8.4	10.6	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.6	10.6	10.6
Recyclate Value																								
Recyclate Value	$312.0				8.6	17.3	25.9	34.6	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2
Co-benefits																								
Co-benefits	$114.0				6.4	6.4	6.4	9.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Policy																								
Regulation	-$17.0	-0.3	-0.3	-0.3	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$103.6				-2.9	-5.8	-8.7	-11.6	-14.5	-14.4	-14.4	-14.4	-14.4	-14.3	-14.3	-14.3	-14.3	-14.3	-14.2	-14.2	-14.2	-14.2	-14.1	-14.1
C&T to MRF (C&I)	-$129.3				-3.6	-7.2	-10.7	-14.3	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9	-17.9
C&T to MRF (LGA Public Place)	-$10.1				-0.3	-0.6	-0.8	-1.1	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4
MRF processing	-$105.0				-2.9	-5.8	-8.8	-11.7	-14.6	-14.6	-14.6	-14.6	-14.6	-14.6	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.4
Infrastructure investment &operations	-$222.2				-6.6	-10.5	-15.9	-22.9	-31.5	-32.3	-32.3	-32.3	-32.3	-32.3	-31.9	-31.5	-31.2	-30.8	-30.5	-30.3	-30.1	-29.9	-29.7	-29.6
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$31.8				-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7
Impact on industry surplus	-$5.5				-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$108.2				-3.0	-6.0	-9.0	-12.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0

Net Present Value (NPV)	$152.1
Benefit Cost Ratio (BCR)	**1.2**

Figure 32: PV costs and benefits for Option 2e ($50m) by CBA item (in real 2011 $m)



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Option 3 – Advance Disposal Fee

Option 3 entails introducing a disposal fee on packaged goods that is likely to pass through to consumers ultimately. Proceeds from the disposal fee are then used by government to invest in recycling and litter reduction initiatives. The scale and type of investments is assumed to be equivalent to those delivered under Option 2c.

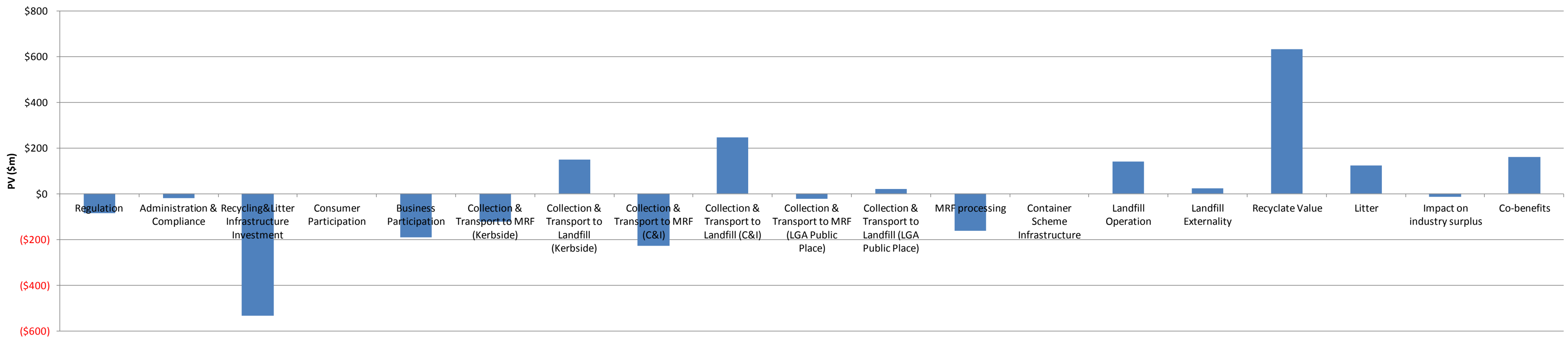
Table 27 and Figure 33 provide the costs and benefits for Option 3 by CBA line item.

Option 3 NPV and BCR outcomes are similar to Option 2c, with the main differentiating factor being the types of risks faced by each option.

Table 27: Annual costs and benefits for Option 3 by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$149.6				4.2	8.4	12.5	16.7	20.9	20.8	20.8	20.8	20.8	20.7	20.7	20.7	20.6	20.6	20.6	20.5	20.5	20.5	20.4	20.4
C&T to Landfill (C&I)	$247.0				7.0	14.1	21.1	28.2	35.2	35.1	35.1	35.0	34.9	34.8	34.2	33.6	33.0	32.4	31.8	32.1	32.4	32.6	32.9	33.2
C&T to Landfill (LGA Public Place)	$20.0				0.5	1.0	1.5	1.9	2.4	2.5	2.7	2.8	2.9	3.1	3.0	3.0	3.0	2.9	2.9	2.9	3.0	3.0	3.0	3.1
Landfill Operation	$141.9				4.0	8.0	11.9	15.9	19.9	19.9	19.9	19.9	19.9	20.0	19.7	19.5	19.3	19.1	18.9	19.0	19.1	19.2	19.3	19.4
Landfill Externality	$25.6				0.8	1.6	2.4	3.2	4.0	3.9	3.8	3.6	3.5	3.4	3.3	3.3	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.1
Avoided litter																								
Litter	$124.0				3.1	6.3	9.4	12.6	15.7	16.2	16.8	17.3	17.8	18.4	18.3	18.1	18.0	17.9	17.8	17.9	18.1	18.2	18.4	18.5
Recyclate Value																								
Recyclate Value	$632.6				17.2	34.4	51.6	68.7	85.9	87.1	88.3	89.5	90.7	91.9	90.4	89.0	87.5	86.0	84.5	85.4	86.2	87.0	87.9	88.7
Co-benefits																								
Co-benefits	$161.3				5.4	10.9	16.3	21.7	27.1	25.8	24.4	23.1	21.7	20.4	19.8	19.3	18.7	18.2	17.7	17.8	17.8	17.9	18.0	18.1
Policy																								
Regulation	-$85.5	-1.3	-1.3	-1.3	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	-$123.0				-3.4	-6.9	-10.3	-13.7	-17.2	-17.1	-17.1	-17.1	-17.1	-17.0	-17.0	-17.0	-17.0	-16.9	-16.9	-16.9	-16.9	-16.8	-16.8	-16.8
C&T to MRF (C&I)	-$228.6				-6.5	-12.9	-19.4	-25.8	-32.3	-32.3	-32.3	-32.3	-32.4	-32.4	-31.8	-31.3	-30.8	-30.3	-29.7	-30.0	-30.2	-30.5	-30.7	-31.0
C&T to MRF (LGA Public Place)	-$22.2				-0.5	-1.1	-1.6	-2.1	-2.7	-2.8	-3.0	-3.1	-3.3	-3.4	-3.4	-3.3	-3.3	-3.3	-3.2	-3.3	-3.3	-3.3	-3.4	-3.4
MRF processing	-$161.0				-4.5	-9.0	-13.5	-18.0	-22.5	-22.5	-22.6	-22.6	-22.7	-22.7	-22.5	-22.2	-22.0	-21.7	-21.5	-21.6	-21.7	-21.8	-21.9	-22.0
Infrastructure investment &operations	-$534.8				-7.2	-16.3	-31.7	-52.4	-79.2	-83.6	-84.1	-84.6	-85.2	-85.7	-82.7	-79.8	-76.9	-74.0	-71.1	-70.6	-70.0	-69.5	-69.0	-68.5
Container Scheme Infrastructure	$0.0																							
Industry Impacts																								
Administration & Compliance	-$19.5				-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Impact on industry surplus	-$13.3				-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
Participation																								
Consumer Participation	$0.0																							
Business Participation	-$191.6				-5.4	-10.8	-16.2	-21.6	-27.1	-27.1	-27.1	-27.1	-27.1	-27.1	-26.7	-26.3	-25.8	-25.4	-25.0	-25.2	-25.4	-25.6	-25.8	-26.0
Net Present Value (NPV)	$122.6																							
Benefit Cost Ratio (BCR)	**1.1**																							

Figure 33: PV costs and benefits for Option 3 by CBA item (in real 2011 $m)



Option 4a – Boomerang Alliance Container Deposit Scheme

The Boomerang alliance model involves a beverage container collection network focusing on the use of RVMs and introducing a deposit (nominally starting at 10c and being periodically increased in increments of 5 cents to be maintained at that level in real terms over the long-term). The refund is always the same amount as the deposit, and is refunded on return of the beverage container.

Figure 34 and Table 28 provide the costs and benefits for Option 4a by CBA line item.

CDS options have the lowest NPV due to their high cost of infrastructure and re-routing of volumes from conventional infrastructure that would have been recycled anyway under base case. Of the CDS options, Option 4a is estimated to have relatively lower cost infrastructure.

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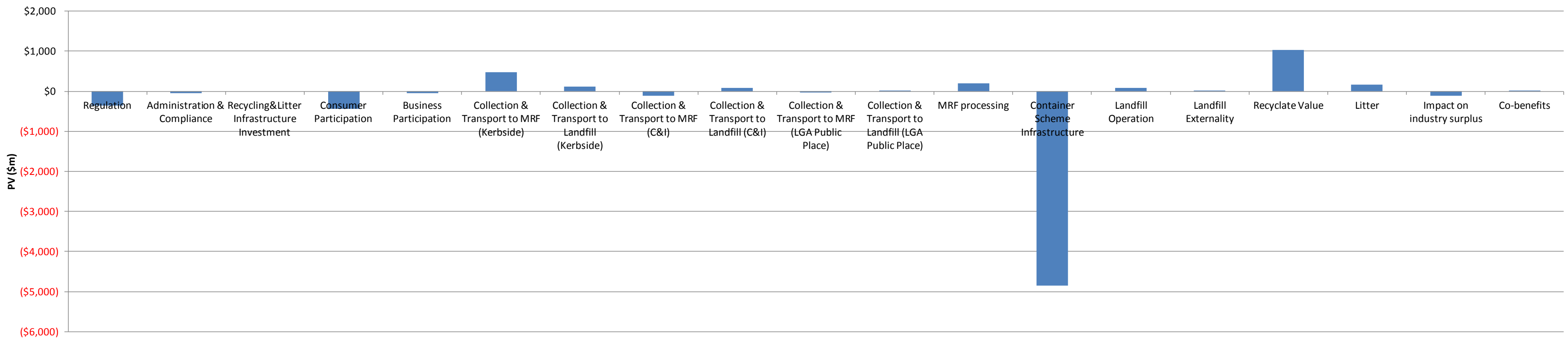
Table 28: Annual costs and benefits for Option 4a by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$118.5				7.9	8.5	9.0	9.5	10.1	11.3	12.5	13.8	15.0	16.2	17.0	17.7	18.4	19.2	19.9	20.1	20.4	20.6	20.8	21.1
C&T to Landfill (C&I)	$91.3				9.7	10.1	10.4	10.7	11.1	10.5	9.9	9.2	8.6	8.0	9.0	10.0	11.0	12.0	13.0	13.0	13.1	13.2	13.3	13.3
C&T to Landfill (LGA Public Place)	$16.9				1.6	1.7	1.7	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3
Landfill Operation	$91.0				7.9	8.3	8.7	9.1	9.5	9.8	10.0	10.2	10.4	10.7	11.2	11.8	12.4	13.0	13.6	13.6	13.7	13.8	13.8	13.9
Landfill Externality	$3.9				0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Avoided litter																								
Litter	$171.8				14.3	15.9	17.5	19.1	20.7	20.8	20.9	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.9	22.0	22.1	22.2	22.3	22.5
Recyclate Value																								
Recyclate Value	$1,027.3				90.7	95.6	100.6	105.5	110.4	114.1	117.8	121.5	125.3	129.0	131.3	133.6	135.9	138.3	140.6	141.4	142.2	142.9	143.7	144.5
Co-benefits																								
Co-benefits	$12.1				1.1	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Policy																								
Regulation	-$357.9	-14.9	-14.9	-14.9	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8	-36.8
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	$484.0				42.3	46.2	50.0	53.8	57.7	58.0	58.4	58.8	59.1	59.5	59.8	60.2	60.6	61.0	61.3	61.6	61.8	62.1	62.3	62.5
C&T to MRF (C&I)	-$113.9				-11.2	-11.6	-12.0	-12.3	-12.7	-12.9	-13.2	-13.4	-13.6	-13.8	-14.0	-14.1	-14.3	-14.4	-14.5	-14.6	-14.7	-14.8	-14.9	-14.9
C&T to MRF (LGA Public Place)	-$22.7				-2.2	-2.3	-2.4	-2.5	-2.5	-2.6	-2.6	-2.7	-2.7	-2.8	-2.8	-2.8	-2.9	-2.9	-2.9	-2.9	-2.9	-3.0	-3.0	-3.0
MRF processing	$200.6				16.9	18.7	20.5	22.3	24.1	24.2	24.4	24.5	24.6	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.8	25.9	26.0	26.1
Infrastructure investment &operations	$0.0																							
Container Scheme Infrastructure	-$4,858.2				-422.0	-453.5	-485.0	-516.5	-548.0	-559.4	-570.8	-582.1	-593.5	-604.9	-612.9	-621.0	-629.1	-637.1	-645.2	-648.8	-652.3	-655.9	-659.5	-663.0
Industry Impacts																								
Administration & Compliance	-$52.1	-8.3	-8.3	-8.3	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
Impact on industry surplus	-$110.4				-16.9	-15.5	-14.2	-12.9	-11.7	-11.2	-10.7	-10.2	-9.8	-14.0	-13.5	-13.0	-12.6	-12.1	-11.7	-11.4	-11.1	-10.9	-10.6	-13.8
Participation																								
Consumer Participation	-$431.4				-36.4	-38.5	-40.5	-42.5	-44.6	-46.6	-48.6	-50.7	-52.7	-54.7	-56.1	-57.5	-58.9	-60.3	-61.7	-62.2	-62.7	-63.2	-63.8	-64.3
Business Participation	-$54.3				-1.4	-2.8	-4.2	-5.6	-7.0	-7.1	-7.3	-7.4	-7.5	-7.6	-7.7	-7.8	-7.9	-8.0	-8.0	-8.1	-8.1	-8.2	-8.2	-8.3

Net Present Value (NPV)	-$3,783.5
Benefit Cost Ratio (BCR)	**0.3**

Figure 34: PV costs and benefits for Option 4a by CBA item (in real 2011 $m)



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Option 4b – Centralised Container Refund Scheme

The Option 4b model involves a beverage container collection network with less of a focus on the use of RVMs than Option 4a. Also unlike Option 4a, the deposits paid by consumers may be more or less than the value of the refund. However, the costs of the scheme (infrastructure, operation and refund costs net of any recyclate revenue) are borne by the beverage industry in the form of a levy on each container sold. The costs of this levy are expected to be passed on to consumers through higher prices.

Table 29 and Figure 35 provide the costs and benefits for Option 4b by CBA line item.

Figure 35: Annual costs and benefits for Option 4b by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$111.6				7.8	8.2	8.6	9.0	9.3	10.5	11.7	12.8	14.0	15.1	15.9	16.6	17.3	18.0	18.8	19.0	19.2	19.5	19.7	19.9
C&T to Landfill (C&I)	$89.5				9.7	10.0	10.3	10.6	10.9	10.2	9.6	9.0	8.4	7.7	8.7	9.7	10.7	11.7	12.7	12.7	12.8	12.9	12.9	13.0
C&T to Landfill (LGA Public Place)	$16.4				1.6	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2
Landfill Operation	$87.8				7.9	8.2	8.5	8.9	9.2	9.4	9.6	9.8	10.0	10.2	10.7	11.3	11.9	12.5	13.0	13.1	13.2	13.2	13.3	13.4
Landfill Externality	$3.7				0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Avoided litter																								
Litter	$170.1				14.3	15.8	17.4	19.0	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.3	21.4	21.5	21.6	21.7	21.8	21.9	22.1	22.2
Recyclate Value																								
Recyclate Value	$1,016.5				90.5	95.2	99.9	104.6	109.3	112.9	116.5	120.1	123.7	127.2	129.6	131.9	134.2	136.5	138.8	139.6	140.4	141.1	141.9	142.7
Co-benefits																								
Co-benefits	$56.3				5.2	5.5	5.9	6.2	6.5	6.6	6.7	6.8	6.9	6.9	7.0	7.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Policy																								
Regulation	-$275.8	-10.0	-10.0	-10.0	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9	-28.9
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	$489.7				42.5	46.4	50.4	54.3	58.3	58.7	59.1	59.5	60.0	60.4	60.8	61.1	61.5	61.9	62.3	62.5	62.8	63.0	63.2	63.5
C&T to MRF (C&I)	-$112.0				-11.1	-11.5	-11.8	-12.2	-12.5	-12.7	-12.9	-13.1	-13.3	-13.5	-13.7	-13.8	-14.0	-14.1	-14.2	-14.3	-14.4	-14.5	-14.6	-14.6
C&T to MRF (LGA Public Place)	-$22.2				-2.2	-2.3	-2.3	-2.4	-2.5	-2.5	-2.6	-2.6	-2.7	-2.7	-2.7	-2.7	-2.8	-2.8	-2.8	-2.9	-2.9	-2.9	-2.9	-2.9
MRF processing	$204.1				17.0	18.8	20.7	22.6	24.4	24.6	24.8	25.0	25.2	25.4	25.5	25.7	25.9	26.0	26.2	26.3	26.4	26.5	26.6	26.7
Infrastructure investment &operations	$0.0																							
Container Scheme Infrastructure	-$5,001.9				-434.5	-466.9	-499.4	-531.8	-564.3	-576.0	-587.7	-599.4	-611.1	-622.8	-631.1	-639.4	-647.7	-656.0	-664.3	-668.0	-671.6	-675.3	-679.0	-682.6
Industry Impacts																								
Administration & Compliance	-$115.7	-8.3	-8.3	-8.3	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9	-10.9
Impact on industry surplus	-$113.0				-10.5	-11.1	-11.6	-12.1	-12.6	-12.6	-12.7	-12.7	-12.7	-15.2	-15.1	-15.0	-14.9	-14.8	-14.8	-14.6	-14.5	-14.3	-14.2	-15.9
Participation																								
Consumer Participation	-$408.8				-34.5	-36.5	-38.4	-40.3	-42.2	-44.2	-46.1	-48.0	-49.9	-51.9	-53.2	-54.5	-55.8	-57.1	-58.4	-58.9	-59.4	-59.9	-60.4	-60.9
Business Participation	-$53.4				-1.4	-2.8	-4.1	-5.5	-6.9	-7.0	-7.1	-7.3	-7.4	-7.5	-7.6	-7.6	-7.7	-7.8	-7.9	-7.9	-8.0	-8.0	-8.1	-8.1

Net Present Value (NPV)	-$3,857.2
Benefit Cost Ratio (BCR)	**0.3**

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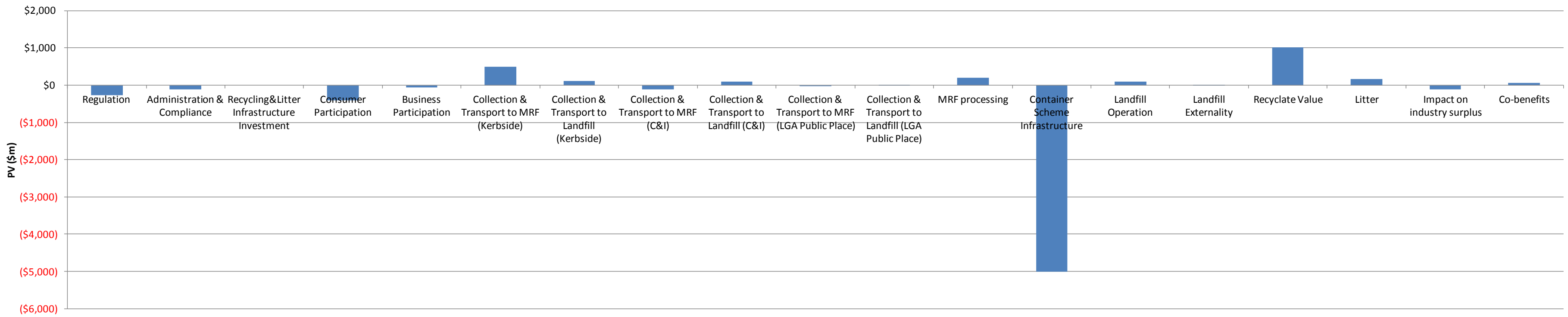
Table 29: PV costs and benefits for Option 4b by CBA item (in real 2011 $m)



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Option 4c – South Australian Container Refund Scheme

The Option 4c model involves a beverage container collection network with depots as the primary redemption point and limited use of RVMs. Also, like Option 4b, the deposits paid by consumers may be more or less than the value of the refund. This is because the costs of the scheme (infrastructure, operation and refund costs net of any recyclate revenue) are borne by the industry, which in turn are likely to pass on these costs to consumers through higher prices.

Table 30 and Figure 36 provide the costs and benefits for Option 4c by CBA line item.

Of the CDS options, Option 4c is estimated to have relatively high cost infrastructure and consequently has the lowest NPV and BCR of all options. This conclusion assumes that option 4c operates at high levels of efficiency – without the need to sort and audit containers according to brand/supercollector. If those efficiencies are not achieved in practice, then the infrastructure costs will be greater still.

Table 30: Annual costs and benefits for Option 4c by CBA item (in real 2011 $m)

	PV ($m)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Avoided landfill																								
C&T to Landfill (Kerbside)	$92.6				6.3	6.6	6.9	7.2	7.5	8.5	9.5	10.6	11.6	12.6	13.3	13.9	14.6	15.2	15.9	16.1	16.3	16.6	16.8	17.0
C&T to Landfill (C&I)	$84.4				9.3	9.6	9.9	10.1	10.4	9.7	9.1	8.4	7.7	7.0	8.0	9.0	9.9	10.9	11.8	11.9	12.0	12.0	12.1	12.2
C&T to Landfill (LGA Public Place)	$15.6				1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.1
Landfill Operation	$79.0				7.2	7.5	7.8	8.1	8.4	8.5	8.6	8.7	8.9	9.0	9.5	10.0	10.6	11.1	11.7	11.7	11.8	11.9	11.9	12.0
Landfill Externality	$3.3				0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Avoided litter																								
Litter	$162.6				13.7	15.2	16.6	18.1	19.5	19.6	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.6	20.7	20.8	20.9	21.0	21.1	21.2
Recyclate Value																								
Recyclate Value	$963.8				86.5	90.9	95.4	99.8	104.2	107.4	110.6	113.8	117.0	120.2	122.3	124.5	126.6	128.7	130.8	131.6	132.3	133.0	133.8	134.5
Co-benefits																								
Co-benefits	$98.7				9.3	9.8	10.4	10.9	11.4	11.6	11.7	11.8	12.0	12.1	12.2	12.3	12.3	12.4	12.5	12.5	12.5	12.5	12.5	12.5
Policy																								
Regulation	-$97.9	-4.5	-4.5	-4.5	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0
Recycling & Litter Infrastructure																								
C&T to MRF (Kerbside)	$491.3				42.6	46.5	50.5	54.5	58.4	58.9	59.3	59.7	60.2	60.6	61.0	61.4	61.7	62.1	62.5	62.8	63.0	63.2	63.5	63.7
C&T to MRF (C&I)	-$106.5				-10.7	-11.0	-11.4	-11.7	-12.0	-12.2	-12.3	-12.5	-12.6	-12.8	-12.9	-13.0	-13.2	-13.3	-13.4	-13.5	-13.6	-13.6	-13.7	-13.8
C&T to MRF (LGA Public Place)	-$21.2				-2.1	-2.2	-2.2	-2.3	-2.4	-2.4	-2.4	-2.5	-2.5	-2.5	-2.6	-2.6	-2.6	-2.6	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7
MRF processing	$206.7				17.2	19.1	20.9	22.8	24.7	24.9	25.1	25.3	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.7	26.8	26.9	27.0	27.1
Infrastructure investment &operations	$0.0																							
Container Scheme Infrastructure	-$5,609.5				-488.8	-525.4	-561.9	-598.4	-634.9	-647.3	-659.8	-672.3	-684.7	-697.2	-706.2	-715.3	-724.3	-733.3	-742.4	-746.5	-750.7	-754.8	-759.0	-763.1
Industry Impacts																								
Administration & Compliance	-$324.0	-4.2	-4.2	-4.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2	-36.2
Impact on industry surplus	-$130.5				-12.3	-12.9	-13.5	-14.1	-14.7	-14.7	-14.8	-14.9	-14.9	-17.2	-17.1	-17.1	-17.0	-16.9	-16.9	-16.7	-16.4	-16.3	-16.1	-17.8
Participation																								
Consumer Participation	-$396.2				-34.2	-35.9	-37.7	-39.4	-41.2	-42.9	-44.7	-46.4	-48.2	-49.9	-51.2	-52.4	-53.6	-54.8	-56.1	-56.5	-57.0	-57.5	-58.0	-58.5
Business Participation	-$50.7				-1.3	-2.7	-4.0	-5.3	-6.6	-6.7	-6.8	-6.9	-7.0	-7.1	-7.2	-7.2	-7.3	-7.4	-7.4	-7.5	-7.5	-7.6	-7.6	-7.6

Net Present Value (NPV)	-$4,538.6
Benefit Cost Ratio (BCR)	**0.2**

Figure 36: PV costs and benefits for Option 4c by CBA item (in real 2011 $m)

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Appendix B: Community willingness to pay for recycling and litter reduction

Introduction

Households and the broader community place a value on recycling that includes a range of market and non-market values. Market values have been fully captured in the main analysis. Non-market values only partly so. Potential non-market values include:

- avoided environmental and social externalities associated with the operation of landfills (e.g. pollution and noise);
- avoided environmental and social externalities of litter (e.g. impacts on landscapes and general enjoyment of open spaces and other public places, ecological impacts - especially in the marine environment);
- reduced resource depletion;
- avoided environmental externalities due to reduced resource depletion; and
- a sense of 'civic duty' that accompanies recycling and waste avoidance.

Only the first two of these benefits have been valued in the analysis. Even then, because the values ascribed to the benefits have been ascertained using particular 'revealed preference' methods[22], it is reasonably likely that they understate the full cost of the impacts associated with the externalities and therefore the community's preference for reducing those impacts, measured as their willingness to pay (WTP). The other three benefits have not been valued at all due to difficulties in quantifying benefits and/ or valuing them.

CRIS WTP estimates

The CRIS identified households' WTP for the non-market benefits of recycling and litter through a WTP study (PwC 2010). The study found that households are willing to pay on average $2.77 per year for every 1% increase above current levels of tonnes of packaging recycled (with a 95% confidence interval of $2.19-$3.77). The study also found that households are WTP on average $4.15 per year for every 1% reduction in litter, (or $41.50 for a 10% reduction in litter overall or $83.00 for a 20% reduction in litter overall) (with 95% confidence interval of $3.39-6.78).

A review of the study by ABARES (2010) however, places qualifications on methodological aspects of the WTP study, with concerns expressed on the litter aspect of the study being especially significant. Paraphrasing from the review, the key qualifications were as follows:

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22 A range of methods are utilised to value costs and benefits that are not directly valued in the market. Some of these methods (e.g. 'preventative expenditure/restoration cost', 'hedonic pricing' and 'travel cost') are referred to as 'revealed preference' or 'revealed willingness to pay' methods because their application involves revealing values (directly or indirectly) through people's market purchases or actions. 'Stated preference' methods (e.g. 'contingent valuation' and 'contingent choice/ contingent ranking') on the other hand, are used when it is not feasible to reveal values through market purchases or actions. Surveys are used instead to get information on people's stated preferences.

- the aggregation factor used in the study, which indicates the proportion of the Australian population to which the sample estimates may be extrapolated, is likely to be overstated. Thus the aggregation factor of 80% used in the study should be regarded as an upper bound;
- the litter effect (i.e. the extent of litter reductions being sought or achieved) was imprecisely defined in the survey as being 'noticeable' or 'significant' reductions and then forced in the model to be 10% and 20% respectively, whereas respondents may value these two levels differently - overall or relative to each other.

ABARES agreed that the report provides indicative values that may inform further policy development. Due to its qualifications however, it did not consider the study to represent good choice modelling practice. ABARES stated that the treatment of the non-use value (WTP) of benefits of increased levels of recycling in the report is appropriate. ABARES also concurred with the decision to leave out WTP estimates for litter reductions due to limitations discussed in the report. However the WTP study did demonstrate that non-use values for litter reduction are potentially significant. Hence, in the CRIS, the litter WTP was reported qualitatively.

The recycling WTP estimates were reported in the CRIS, providing estimates of overall WTP benefits for each of the options. They were not included in the results of the cost benefit analysis due to the potential for double-counting of some benefits, however, were reported in a separate table.

Literature review of WTP for recycling

To further assist with understanding of the community's preference for increasing community recycling rates, a review of recent Australian and overseas WTP studies has been undertaken[23]. Results of the review are presented in Table 31 in the form of a summary of study results, with results then extrapolated to a standard unit ($A/ tonne) to provide a common basis for comparison. Before discussing these results, a number of important qualifiers should be noted about the review and results presented in the table:

- with the exception of the WTP study undertaken for the CRIS (PWC 2010), the review did not include a detailed assessment of the design and approach of the studies. We note however, that a number of the studies, notably those from the USA, discuss survey and model design at length, stressing removal of hypothetical and sample selection bias in study design;
- the social, economic and environmental circumstances of the countries and regions from which the sample populations have been drawn for the international studies could be very different to Australia and therefore particular care needs to be taken with interpreting the results of those studies in the Australian context;
- none of the studies reviewed have a specific focus on recycling of packaging materials. Many of the studies examine municipal kerbside waste recycling and therefore have at least some relevance to recycling of packaging waste. Other studies, examining recycling of organic waste and e-waste for example, have limited relevance to recycling of packaging materials but are included anyway as interesting points of reference;

23 Only results from studies completed within the last 10 years are presented here. The international studies only include results from OECD countries.

- extrapolation of study results to a common unit (A$/ tonne) required assumptions to be made, especially regarding levels of 'additionality'. This is likely to add further to margins of error associated with the results.
- none of the studies are sufficiently disaggregated to the level of being able to indicate the extent (if any) to which the estimated WTP values include market benefits (e.g. value of recyclate) and litter reductions and other non-market benefits estimated in the CBA.

Given the points outlined above, great care needs to be exercised in drawing any inference from results presented in the WTP for recycling range of values indicated in Table 31.

Nevertheless, the results are useful in providing an indication of the range of possible values for WTP for recycling. Removing outlying values associated with WTP for recycling of waste that clearly has no links to packaging material (e-waste at the high end and green waste at the low end, both shaded) provides values for WTP for additional recycling of domestic waste (of which packaging materials are a substantial proportion) of approximately $150 to $700/ tonne. Further, it is not clear to what extent the WTP values capture market values, which would raise concerns about double-counting if results were applied additively to core CBA results. On the other hand, it is notable that all of the lower end values are from studies undertaken in the USA where circumstances are most likely to differ from those in Australia.

Table 31: Estimates of WTP for recycling derived from literature

Study	Focus	Estimated WTP	Extrapolated WTP (A$ 2011/ tonne)
Australia			
PWC 2010	WTP for additional packaging recycling, above 50%	$2.77/ household/ year/ 1% increase	702
Gillespie & Bennett 2011	WTP for fortnightly kerbside recycling scheme	$131.49/ household/ year	639
URS & ERE Consulting 2009	WTP for e-waste recycling scheme (assuming current low levels)	$37-43/ household/ 5 years - 50% $52-60/ household/ 5 years - 70% $68-78/ household/ 5 years - 90%	1,117 1,033 972
Gillespie & Bennett 2011b	WTP for organics (green waste) recycling scheme	$35.23/ household/ year	87
International			
Covec 2007 (New Zealand)	Willingness to spend additional time recycling above current levels (household inorganic waste)	NZ$0.88/household/ week (all inorganics) NZ$1.68/household/ week (plastics, paper & glass)	256 475
Blaine et al. 2005 (USA)	WTP for kerbside recycling program , Central Western USA	US$1.72/household/ month	154
Aadland & Caplan 2006 (USA)	WTP for kerbside recycling program , Western USA	US$2.97/household/ month	258
Koford et al. 2012 (USA)	WTP for kerbside recycling program, SE USA	US$2.27/household/ month	198

Literature review of WTP for litter reduction

A review of recent Australian and overseas WTP studies has also been undertaken with reference to litter. Results of the review are presented in Table 32. Some of the qualifiers that apply to the recycling WTP literature review also apply to the litter studies reviewed, namely:

- with the exception of the WTP study undertaken for the CRIS, the review did not include a detailed assessment of the design and approach of the studies; and
- the social, economic and environmental circumstances of the countries and regions from which the sample populations have been drawn for the international studies could be very different to Australia and therefore particular care needs to be taken with interpreting the results of those studies.

Table 32: Australian and international studies of WTP for litter reductions

Study	Focus	Estimated WTP
Australia		
PWC 2010	WTP for litter reductions	$4.15/ household/ year/ 1% reduction
International		
Cambridge Economics Associates 2010 (UK)	WTP for street cleanliness	£6.45/household/year/grade improvement/regionwide £18.80/household/year/grade improvement/local
Wardman et al. 2011/ Sherrington et al. 2013 (UK)	WTP for ‘best’ status in neighbourhood litter, Scotland	£12.54/person/month/rural £15.81/person/month/urban

Additionally, the following qualifiers should also be noted in reference to the litter studies reviewed:

- aside from the CRIS WTP study, none of the studies have a specific focus on packaging litter, their focus being on litter generally or ‘street cleanliness’ more broadly still;
- as with the CRIS WTP study, the litter effect is very imprecisely defined in the surveys and modelling used in the other studies.

Given these points, and the fact that the range of studies (Australian and international) providing WTP estimates for litter reductions is very limited, unlike recycling WTP estimates, it was not deemed realistic or appropriate to extrapolate results of the litter WTP studies to a standard unit (e.g. $A/ tonne of litter reduced) for the purpose of comparison.

It is noted however, that all of the studies indicate that there is a WTP on the part of communities to reduce litter, that this WTP is likely to be additional to the community’s WTP to increase recycling and that the WTP value could well be substantial. As discussed in the *Data Assumptions* report, the costs of a range of litter clean up activities is used to provide a shadow price, reflecting the community’s ‘revealed preference’ for reducing packaging litter. As noted in that report however, this price is likely to be conservative relative to the community's WTP for reducing litter because:

- the fact that the waste is being cleaned up suggests that the cost is less than the community's willingness to pay for its clean up; and
- the litter not cleaned up (principally in the marine environment) will have environmental and amenity impacts, not easily observable by members of the community and is not the responsibility of any jurisdiction to control.

Appendix C: Material flows analysis model

This appendix outlines the methodology and overall approach to developing the packaging Material Flows Analysis (MFA) model. This includes the steps undertaken in unpacking the CRIS 2010, constructing the Decision Regulation Impact Statement (DRIS) Material Flows Analysis (MFA) model, running options and obtaining results. The methodology comprised a combination of data analyses, research and liaison with project team members undertaking the Cost Benefit Analysis (CBA) to ensure the MFA provides reliable outputs for the CBA model. Additional information is presented in the following sections with regard to the methodology, approach and key assumptions taken into account in the construction of the packaging MFA model.

Materials flows analysis (MFA)

The CBA of the various regulatory and co-regulatory options for the Packaging Impacts Decision Regulation Impact Statement (DRIS) required a detailed quantitative distributional analysis of packaging waste. The packaging waste material information to feed into the CBA was required at a high level of granularity as shown in Table 33 following.

Historic packaging consumption and recycling data used for the MFA came from a number of sources notably:

- national data produced for the Australian Packaging Covenant (APC 2011);
- national and state data produced for the Department of Sustainability, Environment, Water, Population and Communities (Hyder Consulting 2011); and
- data produced for the Packaging Stewardship Forum (Industry Edge 2013).

The Data Assumptions report provides details of the assumptions and, where applicable, other data sources used to produce consumption and recycling projections.

Table 33: Resolution of analysis required by the MFA

Jurisdiction	Region	Material type	Packaging class	Consumption	Recycling	Litter
NSW VIC QLD WA SA ACT TAS NT	Metro Non-metro	Paper/cardboard Glass Plastics Steel cans Aluminum cans	Beverage containers Non-beverage containers Flexible packaging	At Home Away from Home Public Place – LGA – Commercial Non-public place (C&I)	At Home Away from Home Public Place – LGA – Commercial Non-public place (C&I)	At Home Away from Home Public Place – LGA – Commercial Non-public place (C&I)

Materials Flow Analysis (MFA) was adopted as a method to quantify the various flows of packaging waste to the level of detail as described above. MFA is a tool that quantifies material stocks and flows within a given system. It is based on the application of a mass balance approach to a broader domain such as a state or nation. MFA also renders the ability to derive compositional analyses based on consumption, recycling, landfill and litter of waste materials.

MFA is based on a set of inherent principles, which include the following:

- inputs = outputs: the mass balance of consumption and waste generation, recycling, landfill and litter is closed at all times;
- internally consistent logic: the model obeys a set of rules to control the MFA
- compound annual growth rates (CAGRs) are used for consumption and recycling projections
- existing information is incorporated into the model: available data is used as the basis of the model, however this data can be modified to meet the principles of the model
- calculations and operations are explicitly identified: this ensures that the MFA model outputs can be examined in terms of underlying data inputs and assumptions.

Approach and workflow

The development of the packaging MFA model involved a series of iterative steps and continual checking to ensure the model delivered desired results. This was facilitated by a two-way flow of information between the MFA modellers and the CBA modellers.

Figure **37** illustrates this process.

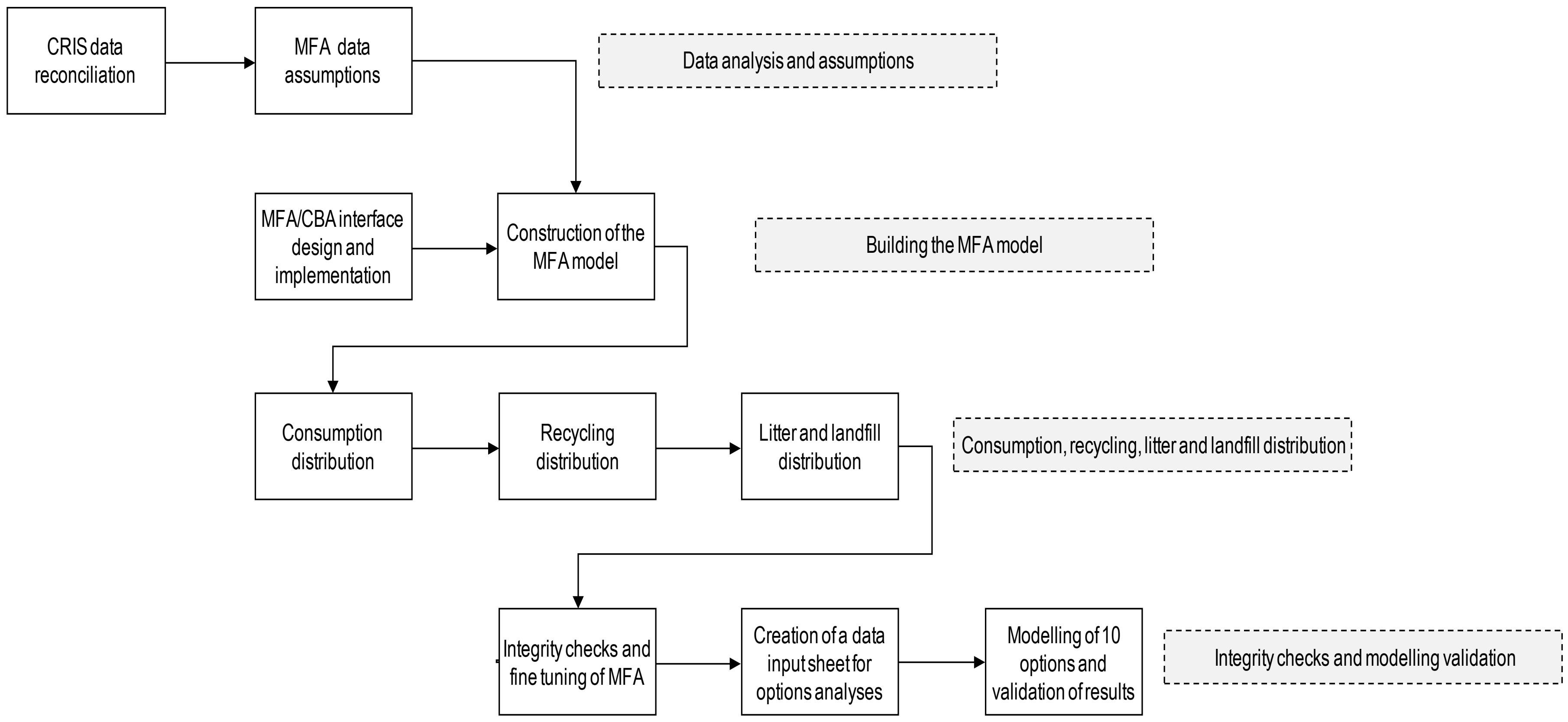
1. Building the MFA model: the MFA model was constructed with an MFA/CBA interface integrated into the MFA model enabling MFA modelling outputs to be linked to the CBA
2. Consumption, recycling, litter and landfill distribution: distribution logic for packaging consumption, recycling, litter and landfill was designed to deliver the required granularity of the packaging MFA model.
3. Integrity checks and modelling validation: four separate tests were designed to ensure the integrity of the model. MFA modelling outputs for the ten options were also validated by cross checking with the CBA model outputs, which effectively acted as an accompanying stress test on the MFA model.

Note that each of the above stages and steps in the development process involved iteration between the MFA model and the CBA model. The following sections provide further information on each of the four stages.

The main stages in developing the packaging MFA model included:

4. Data analysis and assumptions: CRIS data was used as a starting point which was then reconciled and recalibrated into a format suitable for input into the MFA model

Figure 37: Approach and workflow to developing the packaging MFA model



Data analysis and assumptions

Packaging Impacts Consultation Regulation Impact Statement (CRIS) data, assumptions and forecasts were used as a starting point to build the MFA model. The CRIS dataset was analysed and assessed to understand underlying calculations and logic, and to identify assumptions and test their validity.

A reconciliation of the CRIS data with required MFA granularity was undertaken, in addition to the integration of other data sources into base year data of 2013. Other MFA interpolations, calculations, derivations and assumptions were made to overcome data gaps.

CRIS data reconciliation

Base year reconciliation

Packaging consumption for 2010 from the CRIS was used as a starting point for the packaging MFA model, which corresponded to approximately 4,400,000 tonnes of packaging materials. Published data from CRIS was analysed to derive the following consumption proportions:

- packaging materials (paper/cardboard, glass, plastics, steel cans and aluminium cans)
- location (at-home (AH), away-from-home (AFH), public place (PP) and non-public place (NPP))
- packaging class (beverage, non-beverage and flexible packaging).

However, the CRIS base year data did not contain a sufficient level of detail for use within the packaging MFA model. For example, the CRIS material specific recycling tonnages did not reconcile with overall recycling rates for the three packaging classes. Additionally there were data omissions relating to certain material types.

These inconsistencies were reconciled in a manner that had the least relative impact on proportions of packaging recycled for a specific material type and packaging class. This ensured the relative recycling proportions of materials remained consistent from the CRIS to the packaging MFA model. The reconciliation was undertaken by choosing categories of a specific material type and packaging class that accounted for the largest proportions for 'balancing acts' that allows the MFA mass balance to close. The following specific categories were chosen as balancing:

- beverage container: glass
- non-beverage container: glass
- flexible packaging: paper/cardboard.

The packaging MFA model was also recalibrated to a 2013 start year instead of 2010 (CRIS base year). This was done by inflating the 2010 consumption forward by 3 years.

Consumption and Recycling Compound Annual Growth Rates (CAGRs), base case

Consumption CAGRs from CRIS were accepted for the base year and going forward to 2035. These were applied into the MFA model accordingly for the base case. However the CRIS base case recycling rates were not used on the basis that recycling for the base case was likely to be overstated under constantly increasing (or static) CAGRs. The MFA recycling CAGRS were calculated by accepting that CRIS 2015 recycling targets would be met. This allowed the calculation of individual CAGRs across material types and packaging classes, as shown in Table 34 below.

Table 34: Recycling CAGR rules, base case

Overall recycling rate	Adopted CAGR (Beverage)	Adopted CAGR (Non-Beverage)	Adopted CAGR (Flexible packaging)
0% - 50%	4.25%	2.30%	8.70%
50% - 60%	2.13%	1.15%	4.35%
60% - 70%	1.06%	0.58%	2.18%
70% - 80%	0.53%	0.29%	1.09%
80% - 90%	0.27%	0.14%	0.54%
90% - 100%	0.00%	0.00%	0.00%

Each calculated CAGR for recycling was then assumed to decrease over forecast model period as follows:

- CAGRs for non-beverage and flexible packaging recycling halved over each five year period to 2030
- CAGRs for beverage packaging recycling drop by 25 per cent from 2015 to 2020 and are halved over each five year period to 2030
- CAGRs for recycling of all packaging classes drop to zero per cent at 2035.

Industry Edge Beverage Data

Beverage container recycling data for 2012 from an IndustryEdge report was used to recalibrate 2013 base year recycling rates as part of incorporating other reputable data sources in the MFA model.[24] The original total packaging waste consumption used in the packaging MFA model was maintained as was non-beverage consumption. Total packaging consumption was held constant by using the flexible packaging class as the balancing category (note that there was a slight decrease due to rounding). Original CRIS non-beverage and flexible packaging AH/AFH recycling rates were used to calculate the recycling tonnages for each specific material type.

In the process of recalibration for Industry Edge data, the consumption split for beverage and non-beverage steel cans were adjusted by keeping the non-beverage consumption constant and reducing the consumption of beverage steel cans consumption. The consumption split changed from 50:50 to a 25:75 of beverage to non-beverage containers. The defined CAGR rules for recycling were used to map the recycling rates forward to 2013.

Table 35 above summarises the results of the recalibration with Industry Edge data and provides a comparison to the previous base year data. On the basis of the adjustment it can be seen that the original CRIS data projections understated beverage recycling and over stated recycling of flexible packaging.

[24] IndustryEdge, 2013, 'Compilation of Contestable Data for 2011-12 Financial Year on the Consumption and Recycling of Aluminium, Glass, LPB, PET, and HDPE Beverage Containers', Hobart, Packaging Stewardship Forum of the Australian Food and Grocery Council.

Table 35: DRIS recalibrated 2013 data and comparison with original data

	Original CRIS data (reconciled)			New MFA data		
	Packaging consumption	Recycled	Recycling rate	Packaging consumption	Recycled	Recycling rate
Beverage	1,129,697	608,648	53.88%	1,350,972	744,654	55.12%
Non-beverage	367,081	162,356	44.23%	362,603	144,291	39.79%
Flexible packaging	3,031,830	2,296,711	75.75%	2,809,753	2,054,341	73.11%
Overall	4,528,608	3,067,714	67.74%	4,523,328	3,004,024	65.07%

Glass Readjustment

Glass recycling was also adjusted from the 2010 CRIS starting year data due to identified deficiencies in the high AFH non-beverage recycling rate (63.5 per cent) compared to a low AFH beverage recycling rate (16.8 per cent). An adjustment was made by shifting tonnages of glass recycling across AH/AFH and beverage/non-beverage packaging. This is summarised in Table 36 below.

Table 36: Glass readjustment 2010

Glass (packaging type)	At Home recycling rate		Away from Home recycling rate	
	Original (CRIS)	Readjusted (Final MFA)	Original (CRIS)	Readjusted (Final MFA)
Beverage	55.6%	53.2%	16.8%	32.4%
Non-beverage	47.1%	47.1%	63.5%	31.7%

The net effect of the change to glass packaging is a drop in the away from home non-beverage recycling rate by approximately 16,900 tonnes (4.6 per cent) which was compensated by an increase in the away from home glass beverage recycling rate and a slight drop in the glass beverage at home beverage recycling rate.

3.3.3 MFA Data Assumptions

The packaging waste classification nomenclature used in the MFA model was adopted from CRIS as follows:

- beverage container
- non-beverage container
- flexible packaging.

Key data assumptions used in the packaging MFA model are listed as follows:

- AFH collection contamination rates (PP and non-PP) are held constant across jurisdictions and all years to 2035 at five per cent
- CDS contamination rates are held constant across jurisdictions and years to 2035 at two per cent
- beverage recycling rates under CDS are assumed to be constant independent of material type and AH/AFH location
- fixed proportions of beverage container redemption for CDS across material types, jurisdictions and options modelling
  - 82.8 per cent is redeemed through direct CDS
  - remainder is redeemed through kerbside recycling (7.1 per cent) and Commercial and Industrial (C&I) sources (10.1 per cent).
- metro and non-metro distribution of packaging consumption and packaging waste generation was based on the distribution of population across metro/non-metro regions
- metro and non-metro distribution of AH recycling was based on a set of calculated access rates to recycling services derived from National Environment Protection Council (NEPC) data on kerbside recycling from 2010/11
- metro and non-metro distribution of AFH recycling was based on the distribution of population across metro/non-metro regions.

More details on other data assumptions used in the MFA model can be found in the 'Data Assumptions Report'.

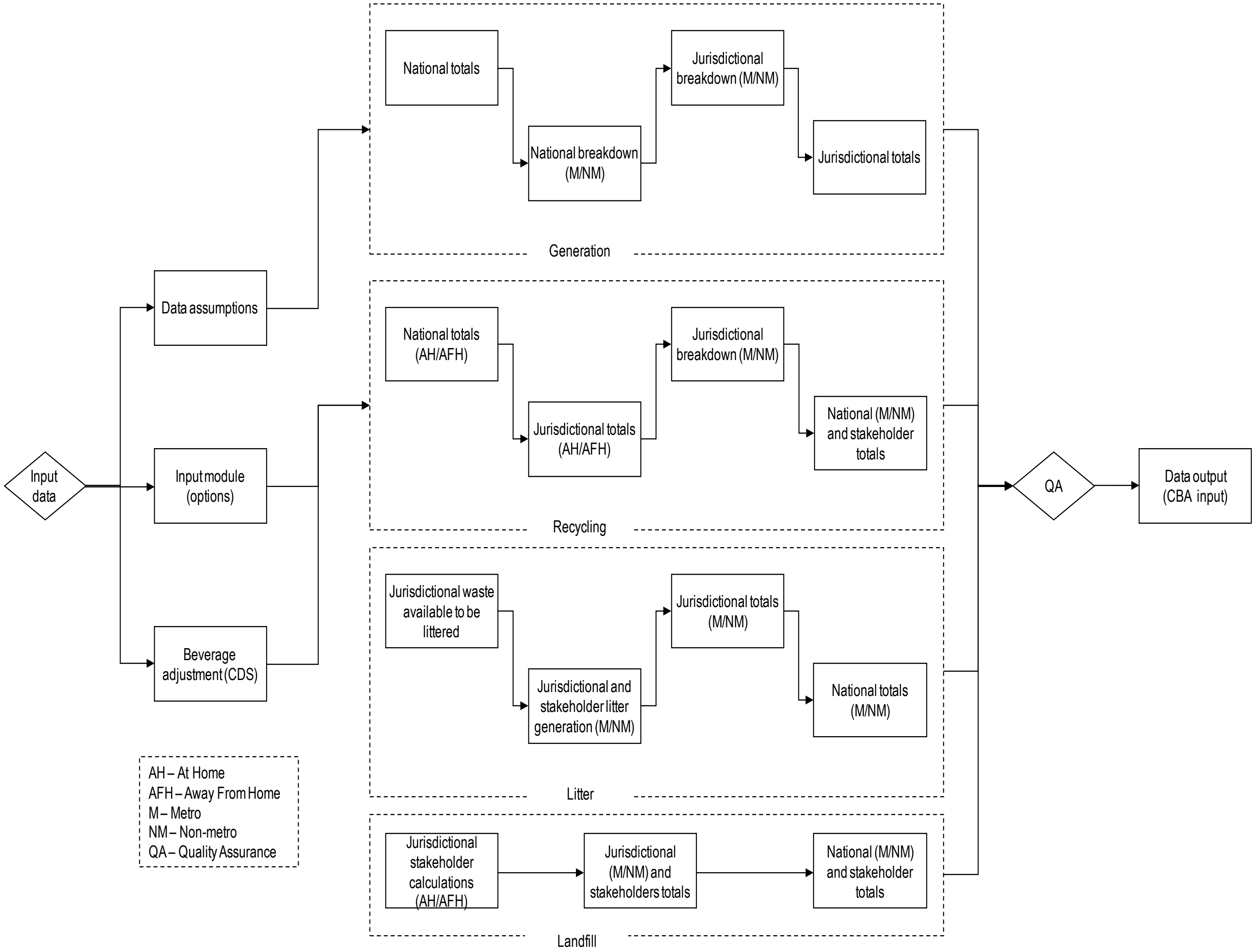
Building the Packaging MFA model

The two main considerations when building the packaging MFA model were that the MFA model worked from a materials flows perspective and that the outputs of the MFA could be integrated into the CBA model through an output interface with the CBA model.

Construction of the MFA model

The packaging MFA model was constructed using Excel as a software platform and built according to MFA principles. Data outputs from the CRIS analysis and reconciliation stage were transformed into a format that could be used in the MFA model. Data assumptions acted as levers controlling various parameters in the MFA model. These levers included consumption breakdown, growth in recycling, jurisdictional distribution and litter generation. Figure 38 shows a flowchart depicting the operation of the packaging MFA model and identifies the main inputs and outputs.

Figure 38: Packaging Material Flows Analysis (MFA) model overview



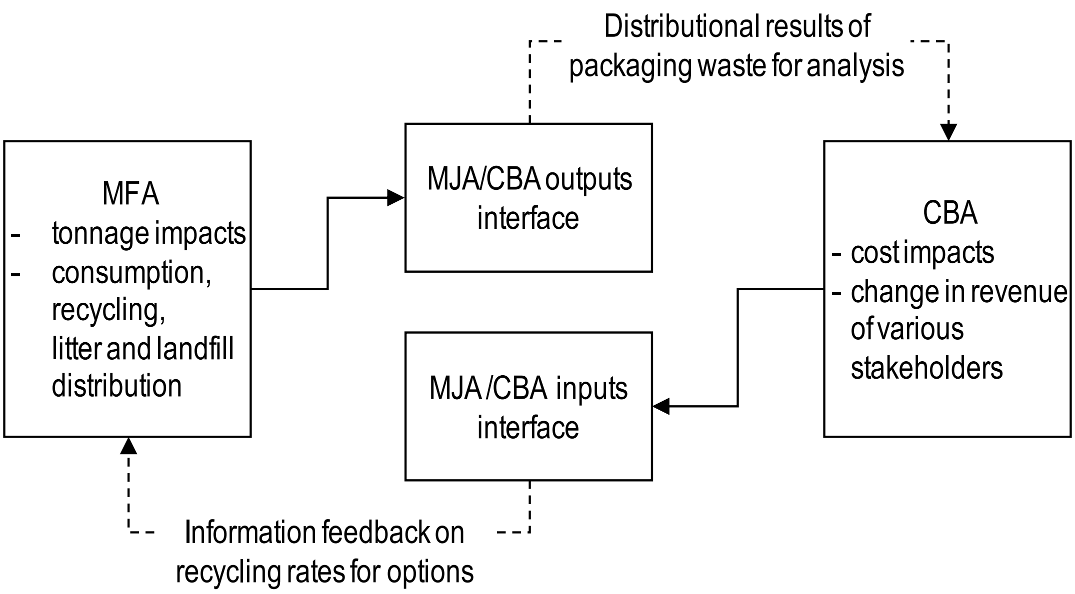
The logic and methodology used in the MFA model is explained further in the following sections. However in general:

- packaging waste generated was distributed on a top down basis from national metro and non-metro totals to each jurisdiction. Jurisdictional metro and non-metro totals were then summed to provide jurisdictional total packaging waste generated
- packaging recycling was also distributed on a top down basis (national totals to jurisdictional totals AH/AFH) by incorporation of a recycling distribution logic as described in later sections
- litter was calculated on a jurisdictional and sectoral basis, and then summed up to provide the national litter totals
- landfill acted as balancing categories in the MFA model and was calculated on jurisdictional and sectoral basis. These totals were then added to give national totals.

Integration of MJA Interface and Implementation

An MFA/CBA interface was created and integrated into the MFA model with significant MJA input in order to ensure that data outputs could be seamlessly processed by the MFA and CBA models. The interface ensured a smooth transition of mass-flow data across from the MFA into dollar-flow considerations in the CBA model while maintaining data integrity. **Figure 39**below illustrates how the interface links MFA and CBA together.

Figure 39: Model interface



Recycling rates for the various options were specified in the packaging MFA models based on input from CBA calculations. For example, CBA analysis predicts how much additional recycling according to packaging class would be achieved from a given amount of additional expenditure, but is unable to determine how this is distributed according to packaging material type, location and jurisdiction.

Data output for each option from the MFA model is processed by the interface and converted into a format that integrates with the CBA model. The interface also allows for linear interpolation to produce a yearly breakdown of material flows. The interface thus provides a critical role in allowing the MFA and CBA models to deliver key DRIS outcomes.

Consumption, Waste Generation, Recycling, Litter and Landfill Distribution

One of the key features of the packaging MFA model is the jurisdictional distribution of packaging consumption, waste generation, recycling, litter and landfill across Australia's states and territories and a regional distribution according to metro and non-metro areas. Further information on the jurisdictional distributions of these material flows is presented below.

Packaging Consumption

Packaging consumption was distributed on a top down basis from national metro and non-metro totals to a jurisdictional breakdown of metro and non-metro consumption undertaken on a population basis. Each jurisdictions' metro and non-metro totals were summed to provide total jurisdictional packaging consumption. Packaging consumption was presented in the MFA model on a AH/AFH basis both nationally and jurisdictionally.

Packaging Waste Generation

Packaging waste generation is calculated based on the application of a 100 per cent material pass factor (as specified in the data assumptions report). The distribution of packaging waste generation materials was undertaken in the same manner as for packaging consumption. Specifically:

- national metro and non-metro totals calculated based on the distribution of national population were distributed top down jurisdictionally
- jurisdictional packaging waste generation totals were calculated by adding metro and non-metro totals
- proportions used in the distribution were based on population data from the Australian Bureau of Statistics (ABS) and are specified in MFA data assumptions.

Packaging Waste Recycling

The distribution of packaging waste recycling was a two-step process. The first step was a jurisdictional distribution that took national recycling tonnages and allocated these to each state and territory. The second step was to allocate jurisdictional totals to metro and non-metro regions.

Jurisdictional Distribution

The jurisdictional distribution of national recycling involved a first pass allocation followed by six rounds of distribution to ensure MFA principles were preserved and realistic recycling data projections were achieved. The first pass allocations were calculated using proportions from NEPC and Hyder Consulting. The recycling proportions were also adjusted in the MFA model for CDS beverage recycling by incorporating jurisdictional performance data for South Australia (SA) and Northern Territory (NT). These proportions are shown in Table 37 below.

Table 37: First pass recycling distribution proportions

Data source	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Total
NEPC (At home)	34.87%	31.66%	15.66%	9.28%	6.77%	1.29%	0.17%	0.31%	100.00%
Hyder (Away from home)	41.26%	27.42%	14.17%	6.88%	7.40%	0.21%	2.56%	0.09%	100.00%

The six rounds of recycling distribution were required to compensate for the fact that the NEPC and Hyder national recycling distributions over allocated recycling amounts to jurisdictions. For example, application of the national distributions would have meant that NSW was recycling more packaging than was consumed for some packaging and material types. The reallocation was based on a logic that recycling rates for a particular material type, packaging class, AH/AFH and jurisdiction could not exceed their theoretical maximum recycling rates.

The theoretical maximum recycling rate for the packaging MFA model was defined to be a function of:

- a minimum direct-to-landfill factor: 4 per cent (held constant across all jurisdictions) to ensure that the model reflected a direct-to-landfill component. This prevented instances where all packaging materials were collected for recycling as contamination rates exceeded 10 per cent
- respective jurisdictional kerbside collection and deposited contamination rates were applied to ensure that reported jurisdictional variations were incorporated into the model
- maximum deviation (set at 15 per cent) from national recycling rate for that particular material type, packaging class and AH/AFH so that the model did not over allocate a jump in recycling to a jurisdiction on the basis of initial allocation proportions
- maximum threshold recycling rate of 90 per cent from the CRIS was preserved if the result of the above calculation lead to a rate higher than 90 per cent.

Specific categories of packaging recycling that exceeded theoretical thresholds were capped to determine the quantity of surplus tonnage in excess of the maximum recycling amount that were available for re-distribution. Total surpluses across categories were re-distributed to under-threshold categories in each round iteratively until no breaches of theoretical maximum recycling rates were reported.

This logic ensured that recycling rates were within realistic margins (not greater than 90 per cent) thereby avoiding outcomes such as negative landfilling, which occurred when recycling amounts are greater than consumption amounts. The jurisdictional distribution logic also had a

CDS mode configured so that beverage recycling for CDS jurisdictions could be accurately represented in the MFA model.

Metro and Non-metro Distribution

Jurisdictional total recycling tonnages were distributed across metro and non-metro regions using the following approach:

- AH distribution based on proportions derived from an assumed 99 per cent metro access rate and calculated non-metro access rate based on overall access rates published by NEPC for each jurisdiction
- AFH distribution based on proportions of population distribution obtained from ABS.

Packaging Litter

Litter generation in the MFA model was specified by additional research undertaken by the project team (see Data Assumptions report). Litter is assumed to be a function of the packaging waste available to be littered which is dependent on the following:

- packaging waste generation
- total quantity recycled.

Litter propensities reflect that tendency for a particular quantity of waste to end up as litter. Two different littering propensities for public place and other litter generation were used in the MFA model. Litter generation was calculated on a jurisdictional, regional and sectoral basis using the prescribed litter function. National litter totals were then calculated by summing up the jurisdictional totals.

Packaging Waste Landfill

All landfill quantities in the MFA are 'balancing' categories and are a function of packaging waste consumption, less recycling and litter generation.[25] The two main sources of landfill quantities in the packaging MFA model are packaging material sent direct to landfill and contamination within packaging materials that are collected for recycling, but that are then sent from the recycling centre to landfill. Both of these sources add up to produce the total quantity of packaging waste landfilled.

Direct to Landfill

Direct to landfill waste refers to packaging waste that was sent directly to landfill bypassing any recycling collection infrastructure. This amount is shown in the MFA as the difference between the amount of packaging waste generated and the amount collected or the amount deposited into a CDS scheme. In order to make the model realistic, a minimum of 4 per cent direct to landfill was set by default across all jurisdictions and AH/AFH. AH and AFH quantities of packaging waste materials sent direct to landfill were added to calculate the total direct to landfill amounts at a jurisdiction and national level.

[25] Landfill = Waste Generation less (Recycling + Litter)

Contamination to Landfill

Contamination to landfill is waste packaging materials that are sent to landfill after processing collected and deposited packaging waste. The quantity is controlled by a set of defined contamination rates in the packaging MFA model. Table 38 summarises the various contamination rates used in MFA.

Table 38: Contamination rates

Location	Type	Source	Value
AH	Kerbside recycling	Modified NEPC	4.00% – 20.00%
AH/AFH	CDS	Assumed	2%
AFH	C&I	Assumed	5%
	Public place	Assumed	5%

Raw data for kerbside recycling contamination rates were obtained from NEPC reports were mapped onto a defined range of (4 per cent – 20 per cent) in order to address the great degree of variance across jurisdictions in the raw data (1.5 per cent to approximately 35 per cent). Jurisdictions with the maximum and minimum rate were set at 20 and 4 per cent respectively (WA and TAS) and other jurisdictions were distributed proportionately within this range.

Kerbside contamination rates were halved from 2015 until each jurisdiction reached the minimum contamination rate of 4 per cent was achieved.[26] This rate was then applied to 2035. This reflected the reasonable expectation that contamination rates would decrease over time and would converge across jurisdictions at the 'best practice' rate within the MFA of 4 per cent.

PP and non-PP recycling contamination rates are held constant at 5 per cent across jurisdictions and the forecast period of the MFA as detailed in the data assumptions of the MFA model.

Integrity Checks and Modelling Evaluation

A variety of integrity checks and stress testing operations were undertaken to ensure the MFA model produced valid results, data integrity was preserved and in order to detect any computational errors. This was increasingly important given the size of the packaging MFA model developed where over one million data output cells needed to be managed for each of the ten options and the base case.

Integrity checks conducted on the MFA model included:

- mass balances (jurisdictional and national basis): ensured that overall mass inputs into the MFA model were equal to the outputs. These mass balance checks were performed on a national and jurisdictional level and ensured that the overall mass balance was preserved
- recycling rates dashboard (threshold check and deviation from national average): checked for any anomalous recycling rates that defied the assumptions of the MFA model. This

[26] The minimum of four per cent was chosen to give additional detail on the CRIS maximum recycling rate of 90 per cent. A recycling rate of 90 per cent further broken down to mean that there will be at least four per cent contamination, four per cent send directly to landfill and an amount of litter.

dashboard presented recycling rates by jurisdiction, AH/AFH, material type and packaging class

- summary graphs (consumption, recycling, landfill, litter): macro trends from the MFA model were checked to ensure that they were consistent with logic of the MFA model
- jurisdictional recycling distribution check (to ensure national recycling has been completely distributed).

The integrity checks carried out ensure that the MFA model produces reliable data outputs based on the data assumptions specified. In the process, any computational errors were detected and removed accordingly.

Stress testing for the packaging MFA model was undertaken through preliminary runs of the ten recycling options. The outputs from the MFA model were also analysed with regards to the CBA model in collaboration with MJA. This iterative process of fine-tuning also ensured that improvements to the MFA model were applied across to each option.

Limitations of the Model

This is the first time a comprehensive analysis of Australian packaging waste has been developed and modelled at a high level of granularity using the principles of MFA. The result is a detailed view of what happens to packaging waste as it arises on a national and jurisdictional basis in Australia.

This approach has allowed the development of a CBA model that uses distributional outputs from the MFA to fulfil the requirements of the DRIS for national packaging waste. However, all MFA models rely on the quality of data and inputs used. The stated limitations of the packaging MFA model are as follows:

- data assumptions underpinning the MFA model. Packaging consumption, waste generation, recycling, litter and landfill data were not available at the level of granularity that the MFA model required
- reconciliation of available input data sources to be 'MFA ready'. The MFA is limited to the extent that the accuracy of the reconciliation of packaging data deviates from the actual state of packaging consumption, waste generation, recycling, litter and landfill in Australia
- inadequacies of existing data sets for distributional analysis. A significant amount of additional time and effort was required to establish 'work-arounds' within the MFA to compensate for the lack of a consistent data set that would allow jurisdictional allocations of packaging generation, recycling, litter and landfill in Australia
- underlying logic and set of rules within the MFA. For example, the top-down national recycling distribution across jurisdictions was based on a defined logic that did not allow the inclusion of jurisdiction specific recycling initiatives.
- data reconciliation at the jurisdictional level were not undertaken. The jurisdictional breakdowns of packaging waste recycling were generated by the MFA model. Due to time and resourcing constraints, the outputs of this jurisdictional distribution were not reconciled with jurisdictional data. As such there was no bottom-up analysis undertaken
- modelling was undertaken on a mass basis and not a per-unit basis. The MFA operated on the basis of modelling packaging waste materials on a weight basis. No modelling was

undertaken on a per-unit basis. Thus the impacts of light-weighting of packaging materials are implicit as opposed to explicit. For example, moderate increases of packaging consumption on a mass basis, combined with light-weighting on a per-unit basis, will understate the underlying increase in consumption on a per-unit basis

In spite of the limitations of the packaging MFA model, the strength of the approach taken is that all assumptions and information gaps are detailed within the model. Therefore as data quality increases over time, the accuracy of the packaging MFA model can also be increased as a result.

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26 February 2014

Mr Jeremy Coghlan
Project Manager - Packaging Impacts Decision Regulation Impact Statement
Department of the Environment
GPO Box 787 Canberra, ACT 2601

Dear Jeremy,

Completion of Distributional and Cost Benefit Analysis

This letter confirms completion by Marsden Jacob of Distributional and Cost Benefit Analysis work for the Packaging Impacts Decision Regulation Impact Statement.

Marsden Jacob has now considered and incorporated feedback from the jurisdictional Working Group and ABARES. We have completed our internal review processes commensurate with the nature and scope of our engagement and can confirm that the results of the analysis are accurate given underlying assumptions. Results of the sensitivity analysis are also accurate and reflect uncertainties around key data assumptions.

Our work included: a methodology report; a data assumptions report; a co-benefits report; a model of costs and benefits; and a regulation impacts report. Our work has been prepared for the National Environment Protection Council Service Corporation for the purposes of the Packaging Impacts Decision RIS and with the understanding that our reports will be published. On this basis, our work is now completed and is suitable for release.

Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and Marsden Jacob Associates accepts no responsibility for its use by other parties.

Yours sincerely

Dr Jeremy Cheesman
Project Director
Marsden Jacob Associates

Australian Government

Department of Agriculture

ABARES

Peer review of the packaging Decision Regulation Impact Statement (RIS) reports

ABARES was engaged to provide feedback on four reports that have been prepared for a Decision RIS which examine a range of options to address packaging waste impacts:

Distributional and Cost-Benefit Analysis Methodology Report
Data Assumptions Report
Co-benefits Report
Regulation impacts Report

In each case ABARES has provided comments on draft versions which have contributed to the final versions.

The reports improve on those produced for the Consultation RIS and provide a consistent approach for determining the net benefits to the community of the proposed options to increase packaging recycling and to minimise the pollution resulting from packaging litter. Within the limits of available data and using reasonable assumptions these reports offer useful guidance to the Standing Council on Environment and Water in making its determinations.

Such analysis is always subject to a high level of uncertainty as the impacts of policies will lead to changes in consumer and producer behaviour which are also affected by changes in other economic, technological and social parameters. As noted in the regulation impacts report these effects will depend on how packaging policies are implemented and, in particular, what incentives they provide to industry, consumers and the waste industry. Getting these incentives right is necessary for the potential net social benefits identified in the analysis to be realised. Furthermore, such incentives could reduce packaging consumption below the projected levels and lead to additional net benefits.

The reports adopt a reasonably conservative approach to the treatment of the non-market values associated with recycling and litter. The sensitivity analyses indicate that the highest net benefit option(s) change to more ambitious options when these values are increased. Otherwise the ranking appears reasonably stable with the national container deposit scheme options representing a net social cost.

The options assessed to produce a net social benefit involve a significant level of discretion as to the ranking and implementation of different measures. While this flexibility is a strength of these options it also necessitates regular review and appropriate oversight to ensure the implementation (and the incentives faced by product stewardship organisations) is appropriately aligned with the public interest. An effective monitoring and evaluation program will allow government opportunities to refine different agents' incentives as required.

The reports document the limits of our understanding of packaging consumption, recycling and littering behaviour. Targeted research, including trials of potential measures, could improve the overall net benefits of the different policy options. The assessment of potential measures used to develop the marginal recycling cost curves provides a useful starting point for the selection of measures under future packaging management policies. This data should be made available for further policy development.

It should be noted that the distributional analysis is only a partial analysis of the sectoral incidence of costs and benefits and does not assess the effects on, for example, different income groups.

11/10/2013