DECISION REGULATORY IMPACT STATEMENT

Investigation of options to reduce the impacts of plastic bags

April 2008

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Executive Summary

Plastic bags impact on both the environment and society. While litter – and its consequent effects on wildlife, habitats and human settlements - is the major area of concern, the community also sees plastic bags as a form of unnecessary consumption. There is support within the community for action to reduce plastic bag use. Plastic bags are generally provided at no visible cost to the consumer. They are not priced to take into account externalities such as the impacts of litter on wildlife and aesthetic values, nor to cover the cost to the community in plastic bag litter clean up.

Since 2002, the Environment Protection and Heritage Council (EPHC) has been working to reduce the impacts of plastic bags on the environment. Efforts to achieve voluntary reductions have had substantial support from retailers, especially during the period of the Retailers Code (2003-2005). The Code saw bag use fall from 5.95 billion bags in 2002 to 3.92 billion bags in 2005, with a further fall to 3,36 billion in 2006. Consumption is now on the rise again. In 2007, consumption was back up to 3.93 billion. Further reductions are therefore considered unlikely in the absence of strong new measures.

In January 2007, a consultation Regulatory Impact Statement (RIS) was released for public comment. In June 2007, EPHC reaffirmed its commitment to phasing out plastic bags by 1 January 2009. EPHC sought a Decision Regulatory Impact Statement which would look at options including a ban and a mandatory retailer charge. This RIS fulfils that request and will inform an EPHC decision on a mechanism for phasing out plastic bags.

For the purpose of this RIS, a plastic bag is defined as:

> a carry bag, the body of which comprises polymers in whole or part, provided by the retailer for the carrying or transporting of goods, but does not include a carry bag which complies with prescribed design criteria.

The prescribed design criteria define features - the presence of any one of which indicates that the bag is not a 'plastic bag'- are:

- thickness greater than 45 microns,
- no handles,
- is the product's integral packaging,
- is designed for multiple use as a carry bag (i.e. greater than 10 re-uses).

This RIS provides an economic, social and environmental analysis of four options for action: a ban, a litter strategy, a levy and a mandatory retailer charge. The costings provided in the economic analysis (summarised in Table 16) are indicative only and are best used for comparison between the options.

A ban would prohibit the provision of plastic bags at point of sale. In practice it would not be a total ban, as exemptions in relation to a range of goods on health and safety grounds would be needed. These exemptions would make this option more complex for consumers, retailers and governments to understand and administer than other options. Exemptions for health and safety reasons may affect the costs and benefits of the ban option. The impact of exemptions has not been modelled in the RIS.

Depending on the extent to which exemptions to a ban are given, the options that use a price signal at the point of sale are arguably likely to result in a more significant reduction in plastic bag

consumption, and thus have a greater impact on plastic bag litter. Price based options also avoid the need to ban a product that is not of the same character as other banned items (e.g. hazardous chemicals). The ban may best be considered as a fall back measure should other measures fail over time to achieve Council's goal. A ban would reduce consumer choice on bag use and comes at an estimated total cost of $578 million over ten years.

The litter strategy involves jurisdictional expenditure to improve litter removal, prevention and infrastructure. This option balances the expenditure on litter with the value of removing plastic bags from the litter stream, and may provide a net economic benefit overall. It aims to remove 50% of plastic bag litter from the environment, and thus does not deliver the EPHC's desired phase out of plastic bags. It involves expenditure of $9.6 million per year. The litter strategy does not score well in a multi criteria analysis that takes into account a broader range of economic, social and environmental criteria, and it does not reduce use of plastic bags.

The remaining options provide market based mechanisms to achieve phase out of bag use. Market based mechanisms are preferable to mechanisms such as a ban because they can be implemented at cheaper net cost to the economy, arguably provide more effective levels of phase out, and retain choice for consumers about their bag use.

Using the modelling described in this RIS an Australian Government levy on the retail sale of plastic bags is the least cost phase out option at a total, over ten years, of $276 million for a 25c fee, $521 million for a 20c fee, and $449 million for 10c. This option would involve greater compliance costs for retailers than does the mandatory charge.

A retailer charge, mandated under state and territory law, has been estimated to have a net total cost of $436 million for a 25c fee, $745 million for a 20c fee and $645 million for 10c. A mandatory retailer charge on plastic bags is the option best able to meet the EPHC's objectives for a phase out.

Neither a levy nor a charge would involve exemptions on health and safety grounds, meaning these options would be simpler for retailers and the community to understand. In both cases, a 25 cent fee is expected to achieve closer to a complete phase out and lower net cost to the community than the application of lower fee levels (eg 10c or 20c).

The economic modelling has suggested that a retailer charge comes at greater cost to the economy than a levy. This is because retailers would keep the funds raised and the funds thus become a subsidy to the retail industry. The modelling also assumes that in the case of a levy the funds are passed benignly back to the community (as a transfer payment). It is policy that non cost-recovery levies go to Consolidated Revenue. Consolidated revenue can be used to fund a range of activities, including substantial direct expenditure by government, as opposed to transfer payments like unemployment benefits. Such spending, if not directly addressing a market failure, can distort the allocation of resources, removing the benign impact on the economy. Given this incorrect assumption about a levy, the net economic difference between a mandatory retailer charge and a levy would be substantially reduced. The Commonwealth Government has made it clear that it will not support a levy on plastic bags.

This RIS notes that the litter strategy has the potential to provide an economic net benefit, but does not identify a 'preferred' option.

1 INTRODUCTION

This document investigates suitable options for the Environment Protection and Heritage Council (EPHC) to reduce the environmental impacts of plastic bags. It follows the January 2007 Consultation Regulatory Impact Statement (RIS) and associated cost benefit reports: *Phasing out light-weight plastic bags, costs and benefits of alternative approaches (*Allen Consulting Group) and the *ANRA Proposal on plastic bag management, supplementary economic analysis to the EPHC report.* These earlier documents (available at <http://www.ephc.gov.au>) outline industry and government action to date and options for possible future intervention. The intention of this document is to enable EPHC to make an informed decision about the form of government intervention in the management of plastic bags.

1.1 DEFINITION OF A 'PLASTIC BAG'

The definition of a plastic bag needs to be broad enough to ensure that all problematic lightweight plastic bags are addressed by any legislation. The definition must also not be so narrow that a small change in manufacturing has the effect of moving bags outside the scope of the legislation by, for example, substituting lightweight plastic bags with slightly heavier plastic bags.
The definition of a plastic bag is:

> a carry bag, the body of which comprises polymers in whole or part, provided by the retailer for the carrying or transporting of goods, but does not include a carry bag which complies with prescribed design criteria.

The prescribed design criteria define features - the presence of any one of which indicating that the bag is not a 'plastic bag' for the purposes of regulatory action. They are:

- thickness greater than 45 microns,
- no handles,
- is the product's integral packaging,
- is designed for multiple use as a carry bag (i.e. greater than 10 re-uses).

Bin liners or 'bags on a roll' are therefore not plastic bags according to this definition because neither type of bag is provided at point of sale *for the purpose of carrying goods*. See Table 1 for more examples.

Table 1: Examples of what is and is not included in the definition of a plastic bag

Examples of plastic bags (as defined in this RIS)	**Examples of bags that are NOT plastic bags (as defined in this RIS)**
HDPE singlet-style bags	Bags on a roll/produce bags (no handles)
Degradable bags including oxodegradable and biodegradable carry bags	LDPE bags > 45 microns (e.g. department store branded bags)
Bags from small and major retailers	Bait bags (no handles, integral packaging)
Bags for take-away food	Polypropylene 'green' bags (designed for multiple use)

Biodegradable and other degradable bags would not be exempt from the current proposals. If they were shown to meet appropriate Australian Standards and governments were convinced that their use would decrease the environmental impacts associated with plastic bag litter, their exemption could be considered at that time.

It is proposed that small businesses be subject to the phase-out regulations because they are the source of a substantial proportion of the plastic bags in circulation. Also bags from some small businesses, notably takeaway food stores, are amongst those most likely to be littered.

The definition presented in this RIS has a focus on the purpose for which the bag will be used. A definition based on physical characteristics is more prone to 'loopholes', which could compromise any action to reduce plastic bag litter. For example a more prescriptive definition based on physical attributes such as dimensions or polymer type could enable plastic bag providers to avoid

complying with any regulatory action by using plastic bags that fall just outside the designated range. For example, if a definition that targeted plastic bags of 20 microns thickness or less, plastic bag providers could avoid compliance by using plastic bags of 25 microns thickness.

The terms of reference for this RIS have focused on single-use lightweight shopping bags. For this reason, this report does not propose regulation of thicker bags, such as department store, low-density polyethylene (LDPE) bags. To this end a thickness of 45 microns is suggested, as most LDPE bags are understood to be of >45 microns thickness. Consultation with industry on this figure is recommended prior to it being finalised.

1.2 PLASTIC BAGS IN AUSTRALIA

Plastic bags are popular with consumers and retailers because they provide a convenient, highly functional, lightweight, strong, cheap and hygienic way to transport food and other products. Plastic bags are commonly provided at the point of purchase with no transparent charge (although the charge is spread over the cost of all goods supplied by the retailer). Consumers have no economic signal to remind them to take other shopping bags with them. Plastic bags are also used for secondary purposes such as bin liners and barrier bags (for transporting wet swimmers, shoes, etc.). The widespread use of plastic bags has meant that they are ubiquitous in society and have the potential to be littered in numerous ways. Therefore their impact as litter needs to be considered.

In Australia, the predominant types of plastics used for plastic bags are high-density polyethylene (HDPE) and low-density polyethylene (LDPE). The HDPE 'singlet' bag is usually (but not always) a non-branded bag, used mainly in supermarkets, take-away food and fresh-produce outlets, but also in smaller retail outlets such as service stations and newsagents. The LDPE boutique-style bags are generally branded and are used by stores selling higher value goods, such as department stores and fashion outlets.

In 2006, the consumption of plastic bags in Australia was estimated to be 3.36 billion HDPE plastic bags[1] (see Section 2.1), of which 40 million are estimated (based on the National Litter Index) to have ended up in the litter stream[2]. In 2007, however, plastic bag consumption had increased to approximately 3.93 billion bags[3].

The Australian Retailers Association (ARA) *Code of Practice for the Management of Plastic Shopping Bags* (the ARA Code) operated from 2002 to 2005 and resulted in a major voluntary push by retailers to reduce bag use. Overall though, the recent plastic bag use figures since 2005 suggest that voluntary efforts are losing their impact.

Awareness raising measures by government and non-government agencies (such as the ARA Code, the Western Australian Bag Smart[4] initiative, Victorian Plastic Bag Challenge and national activities by Clean Up Australia and Planet Ark) have contributed to heightened community awareness of and concern about the number of plastic bags used and causing litter in Australia. This concern has led many consumers to choose reusable bags, with the result that, overall, bag use has declined since 2002 and sales of alternatives such as polypropylene 'green' bags have increased (see discussion at 2.2).

The impacts associated with plastic bags are discussed in Section 2.

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[1] The number of plastic bags was originally estimated at 6.9 billion (six billion HDPE, 0.9 billion LDPE) by Nolan ITU in 2002. This figure has since been revised.

[2] Hyder Consulting *Plastic Retail Carry Bag Use; Consumption 2006 – 2007,* February 2008, p26

[3] Hyder Consulting *Plastic Retail Carry Bag Use; Consumption 2006 – 2007,* February 2008, p1

[4] For more information on the ARA code see section 5.3. For more information on Bag smart, see <http://www.bagsmart.com.au/> (accessed 19 November 2006)

2 STATEMENT OF THE PROBLEM

The problem with plastic bags is their impacts on the environment and society.

Plastic bags are designed to be used once and then discarded. Despite community awareness and concern about plastic bags, almost four billion bags were used in Australia in 2007. Plastic bags have become a symbol for some of excessive consumption. Reducing plastic bag use is seen by them as something simple that everyone can do, as well as a potential gateway to community awareness of broader and more intractable issues affecting environmental quality and sustainability.

The very features that make plastic bags so useful contribute to their impacts on the environment. They are easily carried by the wind because they are so light. This makes plastic bags highly mobile, becoming widely distributed in terrestrial and marine environments. Littered bags cause harm to animals and habitats. They decrease the visual amenity of urban, rural and natural vistas. The eyesore they create can be reduced by the efforts of land managers, governments and volunteer organisations. Plastic bags also present a very visible reminder of what is widely perceived as unnecessary resource use, a point raised in submissions to the Consultation RIS[5]. As a result of all these factors combined, many Australians see plastic bags as an important environmental issue that governments should address.

2.1 MARKET FAILURE

Most of the environmental impacts of plastic bags are externalities associated with littering. Externalities are defined as the unintended costs and benefits of an activity that are experienced by people or organisations other than those directly involved in the activity. A littered plastic bag creates a negative externality because it imposes costs on parties other than the person who disposed of it. These costs can include environmental damage, loss of aesthetic value and damage to recreational equipment. This situation arises because the full cost of littering is not borne by the person doing the littering.

2.2 PLASTIC BAG CONSUMPTION IN AUSTRALIA

In 2002, the consumption of plastic bags in Australia was estimated to be 6.9 billion bags. Almost six billion were lightweight, HDPE, singlet-style bags (Table 2) and 0.9 billion were LDPE bags. The use of HDPE bags decreased overall to 3.93 billion bags in 2007 (Table 3).

Table 2: Consumption of HDPE plastic bags 2002–2005[6]

Retail Sector	Bag Consumption (billions)				
	2002	**2004**	**2005**	**2006**	**2007**
Supermarket	3.64	2.73	2.14	2.85	2.96
Other retailers	2.31	2.04	1.78	0.51	0.97
Total	**5.95**	**4.77**	**3.92**	**3.36**	**3.93**

Table 3: HDPE bag consumption in Australia 2002–2007[7]

	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Total (billions of bags)	5.95	5.24	4.73	3.92	3.36	3.93
% total decrease from 2002		11.9%	20.4%	34.2%	43.6%	33.9%

[5] Submissions commented that plastic use in bags should be seen as a non-renewable resource and linked to petroleum feedstock. See Section 7 for further discussion.

[6] Hyder Consulting *Plastic Retail Carry Bag Use 2006 Consumption*, February, 2008

[7] Hyder Consulting *Plastic Retail Carry Bag Use 2006 Consumption*, February, 2008

By the end of 2005, as a result of the ARA Code and consumer participation in that Code, bag use had been reduced by 34.2% (see Table 3)[8]. Despite the cessation of the code the reductions continued in 2006, reaching a peak of 43.6%. By 2007, it appears that the effect of the voluntary awareness campaigns was wearing off, with bag use rising to 2005 levels. In the absence of continual reminders, and/or a more persuasive method of encouraging alternatives, it seems likely that plastic bag use will continue to increase. Even people who are willing to use reusable bags do not always remember to take them shopping.

Evidence of the willingness of consumers to eschew plastic bags can be measured by the uptake of reusable bags. Woolworths indicated that it had sold more than seven million green bags in 2005; Coles sold more than four million in 2004[9].

Consumer market research undertaken by Sustainability Victoria in 2007 found that 94% of households have at least one reusable bag, with some having as many as 30 reusable bags. The average number of reusable bags per household was nine[10]. The most commonly identified reusable bag was the supermarket-purchased 'green bag'.

As the focus of recent bag reduction activities has been on HDPE bags; there is less information about the level of use of LDPE bags (the heavier gauge bags typically used by clothing and other retailers). Hyder Consulting note that LDPE bag imports were 0.56 billion in 2004, 0.2 billion in 2005, 0.12 billion in 2006 and 0.32 billion in 2007[11]. It appears that the trend in these figures roughly parallels the trend in HDPE bag use, and that 'say no to plastic bags' campaigns were resulting in consumers also choosing not to accept LDPE bags.

Various types of retailers are responsible for the distribution of plastic bags (Figure 1). Available data suggest that plastic bag use through the major supermarket groups has increased from 2006 to 2007 (2.85 to 2.96 billion bags). The data indicates that the supermarket consumption of carry bags as a percentage of overall retail consumption has increased from 55% in 2005 to 85% in 2006 and 75% in 2007[12].

[8] The supermarket bag use figures in this table are as reported by supermarkets. The other retailer figures are estimates.

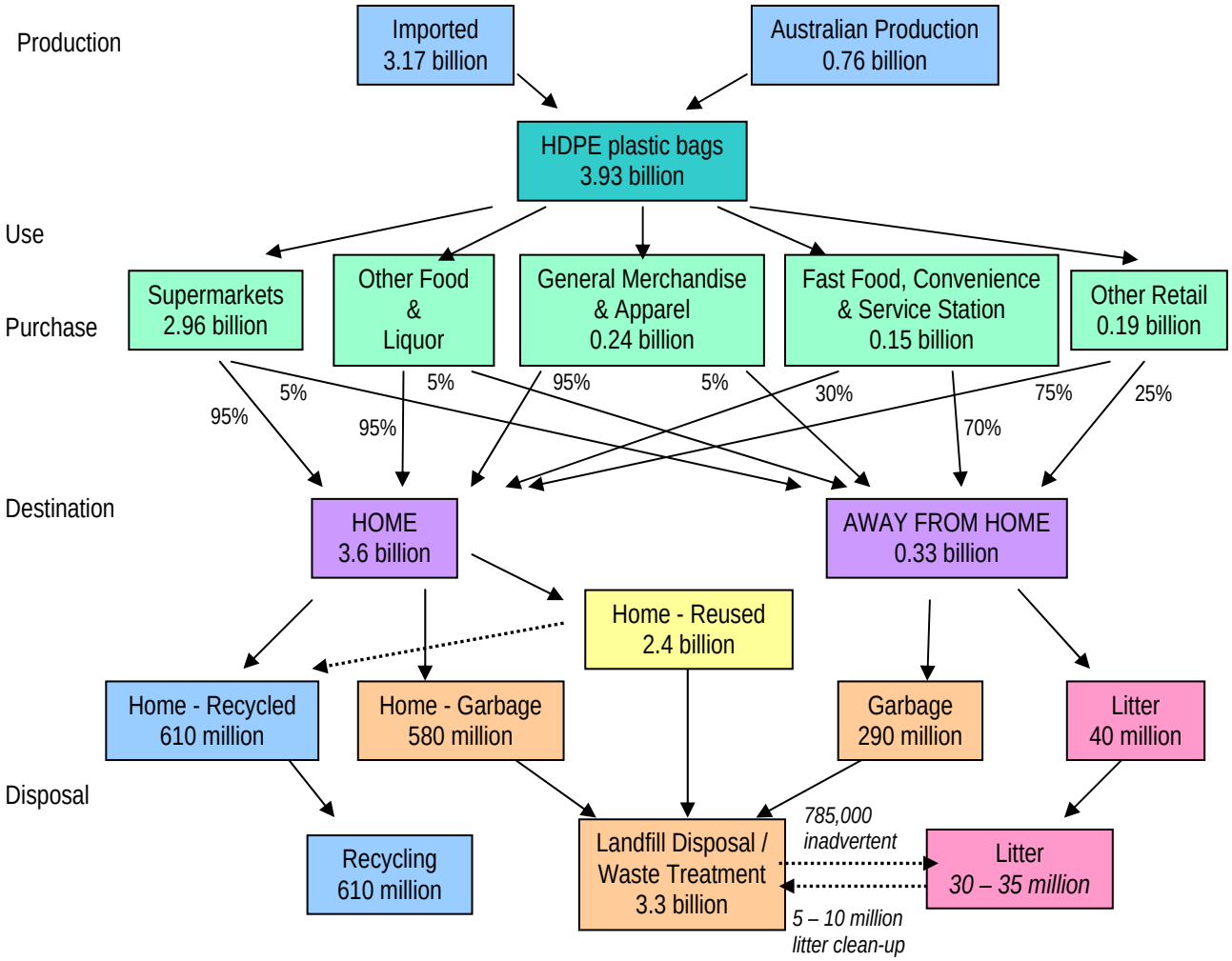
[9] How Green is your Bag April 25 2005, Sydney Morning Herald

[10] Hyder Consulting *Plastic Retail Carry Bag Use 2006 Consumption*, February, 2008, p. 16

[11] Hyder, Feb 2008, p8

[12] Hyder February 2008

Figure 1 – Summary of Plastic Bags Flows 2007



Source: The Allen Consulting Group Phasing Out Lightweight Bags Supplementary Analysis February 2008

With reduced consumption of plastic bags since 2002, Australian manufacturing of plastic bags has diminished (Table 4). There are two main plastic bag manufacturers in Australia—Detmark Poly Bags Pty Ltd and Andrew Kohn Pty Ltd—both located in Victoria. Most bags are now imported from China.

Despite the reductions achieved by retailers through the ARA Code and various national and state government public awareness campaigns, the number of HDPE bags issued in 2007 is estimated to be just under four billion a year.

Table 4: Australian plastic bag manufacturing since 2002[13]

Origin of bags	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Locally produced bags (billions)	1.98	1.75	1.58	0.97	0.76	0.76
Imported bags (billions)	3.97	3.49	3.16	2.95	2.6	3.17
Total	**5.95**	**5.24**	**4.74**	**3.92**	**3.36**	**3.93**

2.3 PLASTIC BAGS AND LITTER

Plastic bags are introduced into the market place by retailers as part of their normal commercial operations. Consumer choices about reuse or disposal determine where plastic bags go after they leave the shop. While most plastic bags end up in landfill (see Figure 1), there are many other

[13] Hyder February 2008

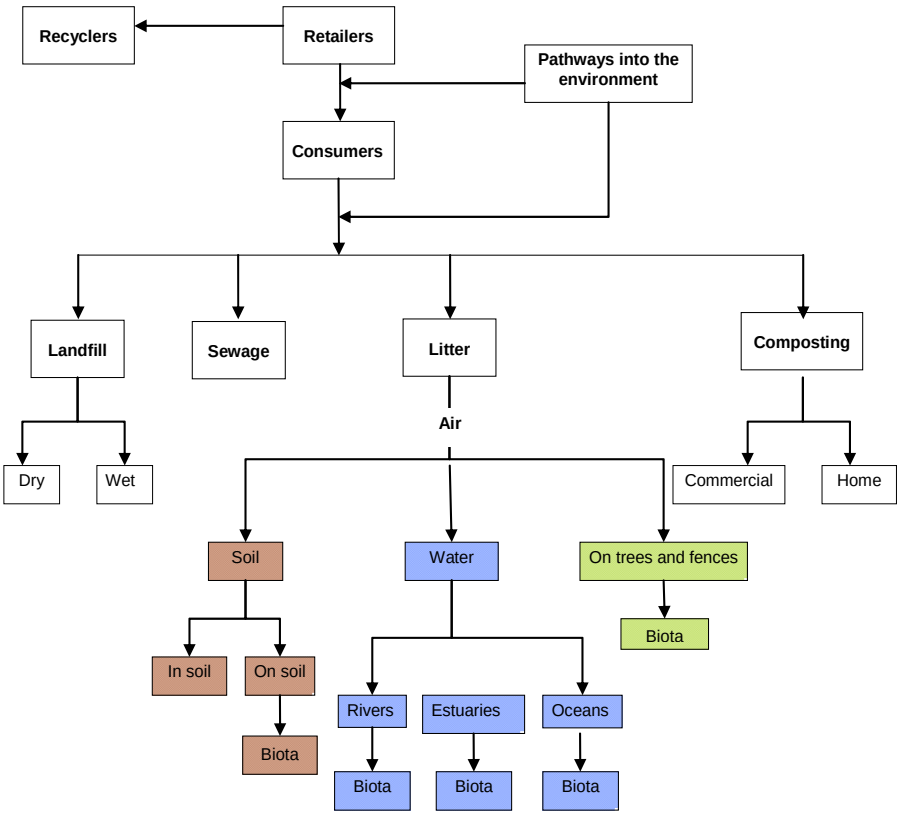
aquatic and terrestrial environments in which plastic bags are littered (Figure 2). This diversity in receiving environments makes measuring and preventing the impact of plastic bags complex. There is little data to accurately identify the duration of persistence of plastic bags in these divergent environments, likewise there is limited data to quantify their impact on the flora and fauna. This same diversity presents a barrier to degradable bags. To be effective they would need to be able to adequately degrade in all environmental conditions, e.g. ranging from wet to dry, or biologically active to inactive. Currently data only adequately describes the behaviour of biodegradable bags in compost. The duration of degradable bags in other environments is not well investigated, nor are aspects such as the ability of vertebrate and other organisms to digest bags in the marine environment.

Estimates of plastic bag litter vary, from less than one per cent of all litter collected[14, 15] to more than two per cent[16]. Although numerically less significant than other litter types, plastic bags are a prominent component of the litter stream because of a combination of three elements:

- high visibility
- persistence
- ease of dispersal.

Figure 2: Possible end environments for plastic bags

Table adapted from Hyder December 2007 page 8



Littered plastic bags are easily seen in the urban or natural environment because of their size, shape, colour and mobility. Littered bags can last for many years. Bags accumulate while others are still breaking down, increasing the potential negative impact on the environment. It should be noted, however, that a significant build-up of littered plastic bags in the Australian environment has not been observed. Numbers of littered bags quoted in this RIS are derived from Hyder and the Keep Australia Beautiful National Litter Index. These figures differentiate supermarket style,

[14] Keep Australia Beautiful National Litter Index 2005 and 2006
[15] McGregor Tan Research August 2007 *Plastic Bag Litter Tracking Report* prepared for Zero Waste SA
[16] Clean Up Australia Rubbish Report 2002 and 2005

HDPE, plastic bags from other plastic carry bags such as LDPE department store bags. Unless otherwise stated the numbers quoted in this RIS only concern HDPE shopping bags.

Because of their low weight and ability to be carried on the wind, plastic bags and fragments can be dispersed by the slightest of breezes. The resulting wide dispersal and lodgement in places that are difficult to access (such as tree branches, drain grills and fencing) makes cleaning up plastic-bag litter costly and time consuming. Even as they start to break down, plastic bags leave fragments of varying sizes. Littered bags and bag fragments may end up in highly sensitive natural environments and impact species already under stress.

In 2006, a study commissioned by the Department of the Environment and Heritage (DEH) tested eight designs and a number of plastic bag materials (including LDPE and HDPE) to determine whether any particular types were less prone to wide dispersal as litter. The study concluded that all the bag types tested were prone to being caught by the wind and dispersed long distances, that all bags were prone to being blown as inadvertent litter from bins, and that the lighter bags tended to snag more easily than heavier bags. The study noted that bag design needed to be appropriate for its application[17]. It also found that no bag design caused less of a problem when littered than others. Thus there are no grounds for discrimination between various designs of lightweight carry bags.

2.3.1 Litter legislation

Every state and territory has litter prevention legislation. The enforcement of this legislation largely relies on identifying the person littering. Littered objects are difficult to track back to an individual offender. This makes enforcement difficult and expensive, effectively limiting the usefulness of this legislation in changing behaviour. Local governments may choose to put in place ordnances or local laws relevant to litter. Given the potentially large number of these, Table 5 lists only state or commonwealth level legislation.

Table 5 – Litter Regulations

Jurisdiction	Legislation
All States and Territories	*National Environment Protection Measure for Used Packaging Materials 2005*
Australian Capital Territory	*Litter Act 2004;* Sect 8, 9, 20, 21
Commonwealth	Environment Protection and Biodiversity Conservation regulations 2000; Reg 12.14
New South Wales	*Protection of the Environment Operations Act 1997 Sect 145 -146E* and Penalty Notices Regulation 2004; Schedule 1
Northern Territory	*Litter Act 1999;* Sect 6
Queensland	*Environmental Protection Act 1994;* Part 2 of the Environmental Protection (Waste Management) Regulation 2000
South Australia	*Local Government Act 199;* Sect 235
Tasmania	*Litter Act 2007;* Sect 6, 9, 35 and Litter Regulations 2000
Victoria	*Environment Protection Act 1970;* Sect 45A - 45ZL
West Australia	*Litter Regulations 1;* Regulation 9 and Schedule 1

2.3.2 Degradable plastic bags

Degradable plastic bags have been promoted by some stakeholders as a means of reducing the environmental impacts of plastic bag litter. While their widespread adoption would not reduce the number of bags in use, it has been argued that degradable bags would last for a shorter time in the environment if littered, and thus have a lower impact. In the case of bags made from renewable resources (bioplastics), it could also be argued that these could reduce demand on fossil fuel resources. This position has been taken by a number of degradable bag manufacturers[18].

[17] K. Verghese et al, *Study of factors contributing to dispersal of littered plastic shopping bags*, RMIT University, June 2006, pp. 7-8
[18] See Section 7

It is appropriate, however, that industry and governments adopt a cautious approach to degradable plastic bags. Even degradable bags remain in the environment for some time when littered, and they do not provide a comprehensive solution to the plastic bag litter problem. Australian Standards to ensure that performance claims made about degradable plastics can be relied upon are currently being developed. A performance standard for commercial composting has already been published. However, standards are not in place for the other environments that plastic bags may be found in as litter.

It is not currently possible to verify marketing claims about the degradability of littered plastic bags. The amount of time they will remain in the environment if littered is unclear. The most common form of degradable bags, oxo-degradable bags (those which contain a prodegradant that catalyses faster breakdown) break into fragments in the environment and may take a very long time to completely degrade. The impact of these bags as litter may thus be greater than for normal plastic bags. Also, there are questions about the toxicity of residues from oxo-degradable bags.

Biodegradable bags can be expected to remain as litter for some time as in most cases they are unlikely to be subject to the biologically active conditions most conducive for rapid degradation.
A policy that could potentially see degradable bags as an alternative to plastic bags may send the wrong message to consumers. If consumers believe that the bags will degrade, they may not care as much if the bag becomes litter. This may have the perverse outcome of increasing the incidence of plastic bag litter.

Finally, a policy that encouraged a switch to degradable plastic bags would not address the broader concerns about plastic bags as a waste of resources and symbol of unnecessary consumption. Lifecycle analysis indicates that long-life, reusable bags give better overall environmental performance than single use bags, regardless of degradability.[19] This RIS therefore does not discriminate between degradable and non-degradable plastic bags. However, it is possible that, once appropriate standards are in place, there may be merit in favouring one bag type over another.

2.3.3 Sources of plastic bag litter

Most plastic bag litter results from inappropriate disposal by consumers. People may leave bags behind whether or not suitable infrastructure (such as bins) is available. Regardless of the mode of littering (inadvertent or intentional), plastic bags taken into outdoor settings are considered to have greater potential to become litter than plastic bags taken into the home and used for a secondary purpose such as bin liners.

Plastic bags that do not go directly to landfill appear in the litter stream as a result of both inadvertent and intentional littering behaviour. Inadvertent litter is usually associated with plastic bags that are wind blown from sources such as bins, uncovered loads on moving vehicles, kerbside waste collection, transfer stations, and material recovery facilities (MRFs). Even with the best of intentions, for instance, after eating takeaway food in a public place, consumers can forget the bag or have it blown away by the wind. Australian beaches, have more plastic bag litter than other places and lightweight plastic bags outnumber the heavier weight bags by about eight to one[20].This is attributed to the availability of nearby shops, people taking food to the beach, the ability of bags to find their own way to the coast through natural and artificial waterways and the generally more breezy nature of coastal areas.

[19] Nolan ITU, ExcelPlas Australia and Centre for Design at RMIT 2004 – *The Impacts of Degradable Plastic Bags in Australia*
[20] National Litter Index, Nov 2006

Consumer research surveys indicate that 67-75% of people reuse their plastic bags[21], although other reports have estimated re-use to be much lower. Re-use is one of the substantial benefits of plastic bags. The majority of plastic bags are re-used only once by householders to line rubbish bins. These plastic bags contain household waste when they enter landfill rather than being rubbish in their own right. This practice does not render plastic bags harmless because landfill management practices often tear open bags of rubbish, and winds can then move them away from landfill sites. This means that even properly disposed bags can become litter, causing an ongoing problem at landfill sites across the country, despite adoption of specific management practices to reduce plastic bag escape. For example, there was a mass breakout in the ACT in August 2007. Hyder estimated that practices have improved since 2002, with the result that only 758,000 bags were escapees from landfill in 2007[22].

2.3.4 The link between plastic bag consumption and litter

Nearly half a million littered plastic bags are collected on Clean Up Australia Day each year[23]. There is little evidence of a change in litter rates as a result of reductions in plastic bag consumption (Table 3).

A 100% reduction in plastic bag consumption is expected to lead to zero new plastic bag litter. Ireland achieved substantial litter reduction[24] through a 93% reduction in plastic bag consumption. This had an immediate benefit to the environment, with a marked decrease in in plastic bag litter[25]. The majority of legislative options considered in the Consultation RIS and this Decision RIS focus on significantly reducing bag use in order to reduce litter and other consequent problems.

The precise nature of the relationship between litter and bag use, however, is not clear. Available data are insufficient to identify the point at which reducing plastic bag consumption impacts most on plastic bag litter levels. In Australia, voluntary efforts have seen significant reductions in plastic bag consumption, but litter levels have not changed significantly.[26] This may reflect the fact that the major reduction in bag use was in the supermarket sector. The majority of bags given out in supermarkets are taken straight home so are less likely to end up as litter.
It could be argued that, while some people are careful to avoid deliberate littering, others are not. If most littered bags come from less fastidious people, then we may continue to see similar levels of plastic bag litter unless there is a radical reduction in the availability of bags. An alternative hypothesis is that littered bags tend to result from purchases from retailers other than the major supermarkets (i.e. those retailers who were not necessarily participants in the voluntary Retailers' Code). If this were the case, then the supply of bags likely to be littered did not substantially diminish as a result of voluntary bag reductions.

The Irish experience is that reductions in bag use of at least 90% were sufficient to substantially improve litter outcomes.

While littering behaviour will also influence how many plastic bags end up as litter, we do not know the relative impact of behaviour as compared with plastic bag availability. What is known is

[21] Hyder, February, 2007, p. 19
[22] Hyder February, 2008, p 23
[23] Australian Bureau of Statistics – Australia's Environment: Issues and Trends 2006 p 24
[24] Minister of State Pat Gallagher noted in an early 2007 statement that data showing that prior to the levy plastic bags comprised 5% of the litter stream. In August 2005, 0.22% of nation's litter (see www.envirn.ie/en/envirnoment/waste/plastic bags/)
In addition, National Litter Pollution Monitoring System Reports 2002-2007 can be seen at http://www.litter.ie/system_survey_results/index.shtml. These imply the pre-levy level of bag litter in Ireland was 0.75% rather than 5%.
[25] http://www.environ.ie/en/Environment/Waste/PlasticBags/
[26] Clean Up Australia estimates have been consistent at around 2% (Clean Up Australia Rubbish Report 2002 and 2005) and Keep Australia Beautiful estimates have been consistent at just below 1% (Keep Australia Beautiful National Litter Index 2005 and 2006)

that, nationally, the amount of litter increased slightly from November 2005 to May 2007.[27] In May 2007, plastic litter items were 19% of the total litter objects, with plastic bags comprising three per cent of plastic items, or 1.3% of all litter items.[28] The proportion of litter that is bags has been consistently in the range of one to two per cent from 2005.

2.3.5 Environmental impacts of plastic bag litter

The problem with assessing the impacts of plastic bag litter in the environment is the lack of data: on plastic bag longevity, on the impacts of fragmented plastic and on the nature and extent of species and habitats impacted by bags both globally and in Australia. We have limited data about the overall impacts on animal species. 'The problem is that there is no way to reliably sample for such deaths in the open ocean, and to relate what is observed on beaches to what happens unobserved at sea'[29]. This is particularly so for the Southern Hemisphere, which is more than 80% ocean that is less traversed than northern seas[30]. There is clear evidence of impacts on marine species (including seabirds, turtles and cetaceans), but a lack of information about overall impact. Hence a precautionary approach is appropriate.

Plastic bags can remain in the environment for many decades. There is no clear evidence about how long a plastic bag takes to break down. A popularly quoted figure is that bags may take as long as 1000 years to break down completely[31]. While this is an unlikely figure for a whole bag it is possible that fragments of bags may persist for many hundreds of years. We do not know with certainty how long the bags will last because they have been in use for less than 50 years. The long life of littered plastic bags (or fragments of bags) compounds their potential impact and results in a unique litter problem.

The rate of breakdown will depend on the manufacture of the bags and the moisture content, acidity, and oxygen availability in the receiving environment. Standard 'non-degradable' plastic bags can fragment when exposed over time to sunlight (particularly ultra violet B) and friction. It takes much longer for a plastic bag to break down in water than it does on land[32]. As polyethylene is a relatively new material which comprises large molecular weight polymers, no micro-organisms have evolved that are capable of digesting it [33].

Comprehensive and authoritative data on the number of plastic bags littered and the direct impact of this litter on the natural environment is difficult to obtain, although there are many reports of animal deaths caused by plastic bags[34]. Threats to marine species arise through ingestion, smothering or entanglement.

Additionally, it is difficult to accurately determine numbers of animals killed and harmed specifically by *plastic bag* litter[35]. There is evidence that plastic sheeting, plastic bags, mylar balloons, netting and monofilament line have the greatest impact on marine species.[36] Studies often refer to marine debris or plastic debris rather than plastic bags *per se*. Plastic bags are a small component of plastic marine debris with an arguably low impact compared with other plastic

[27] McGregor Tan Research August 2007, *Plastic bag Litter Tracking report*, (data derives from the Keep Australia Beautiful National Litter Index

[28] Hyder 2008, comments on National Litter Index

[29] Laist David, correspondence with Cwth Dept Environment. 10 October, 2006

[30] Lutgens and Tarbuck 1992, referenced p49 of Marine Debris Sources, Impacts and Solutions 1997 Ed Coe and Rogers

[31] Westaway, K., *The Scourge of Our Seas and Oceans* June 2004 <http://www.ecovoice.com.au/issues/issue%2010/X28ECO10_011P.pdf> (Accessed 19 November 2006)

[32] Andrady, AL, Plastics and their impacts in the marine environment, August 2000

[33] Nolan ITU, EPU, RMIT The impacts of degradable plastic bags in Australia 2003

[34] Nolan ITU 2002, *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts,* Melbourne, p. 30. The difficulty to determine numbers of animals deaths by entanglement in marine debris is noted in Laist 1997 *Marine Debris Entanglement and Ingestion* p101

[35] Nolan ITU 2002, *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts,* Melbourne, p. 30

[36] [36] Laist David, correspondence. !0 October, 2006

debris such as discarded fishing nets and lines. In addition, literature does not always make clear how a 'plastic bag' is defined.

Birds, sea turtles and marine mammals can swallow debris such as convenience food packaging and plastic bags, which interfere with their ability to eat, breathe, and move. This phenomenon is of greatest concern when it impacts endangered species such as whales, seabirds and turtles. Data on plastic ingestion by sea turtles indicates that they are unable to distinguish synthetic materials from prey.[37] Young turtles in the pelagic stage can die after eating plastic bags and other synthetic materials which researchers believe they mistake for squid and jellyfish.[38] Plastic bags , sheeting and plastic fragments are the predominant debris items found in turtle stomachs. In the case of turtles, internal blockages caused by plastic bags can make them more buoyant, thus impede their ability to dive deep to feed and avoid predation.

Marine debris is considered to be hazardous to all sea creatures, and an added danger to the survival of species already listed as threatened or endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). To address the negative impacts of litter in the marine environment, including plastic bag litter, the Australian Government has implemented measures to reduce the impacts of marine debris. For example, Australia is a signatory to the *International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78). Under this Convention, disposal of plastics (including plastic bags) at sea is totally prohibited.[39]

On 13 August 2003, the Australian Government listed 'injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris' as a key threatening process under the EPBC Act [Part 13 s183].[40]

The marine impacts of plastic bag litter in Australia need to be considered, given sensitive and highly-valued marine environments such as the Great Barrier Reef. Plastic litter, including bags, can accumulate on the sea floor and affect the functioning of ecosystems (for example, through 'smothering').[41] The US National Oceanic and Atmospheric Administration found that plastic bags may wrap around living corals and smother them.[42] This occurs worldwide.

Many examples of impacts on individual marine animals have been documented, but there is no reliable method for extrapolating this data to the overall impacts of this debris in the open ocean. It is also difficult to determine whether debris has originated from ships or from the land. Since ocean currents are not limited by terrestrial boundaries, international data provides useful guidance for the Australian situation. A variety of international and domestic sources have been used in this RIS to obtain a picture of the global problem.

Australian marine debris, including plastic bags may be causing impacts beyond our national jurisdiction i.e. outside the Australian Extended Economic Zone[43]. If plastic bags enter the marine environment, they can travel long distances in ocean currents, posing a threat to ecosystems far from where they were first released into the environment. Reports of a vast 'plastic soup' in the Northern Pacific gyre, and near Antarctica imply that plastic debris can travel long distances and

[37] Coe, Rogers (ed), Marine Debris, sources, impacts and solutions, 1997

[38] Bugoni, L etc (2001) Marine Pollution Bulletin 42 No 12. 1330-1334

[39] DEH (2003) , *Harmful Marine Debris,* <http://www.deh.gov.au/biodiversity/threatened/publications/marine-debris.html>

[40] DEWHA *Listed Key Threatening Processes* < http://www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pll> (accessed 11 February 2008)

[41] Derraik, 2002, *The pollution of the marine environment by plastic debris: a review*, Marine Pollution Bulletin 44:842-852

[42] NOAA National Ocean Service Education <http://www.nos.noaa.gov/education/kits/corals/coral09_humanthreats.html> (Accessed 19 November 2006)

[43] The Zone extends Australia's jurisdiction beyond the coastline to include 200 nautical miles of sea. The concept was established under international law by Australia being a signatory to the *United Nations Convention on the Law of the* Sea (1982).

accumulate far from its source.[44] As a signatory to a number of international conventions concerning marine and biological diversity protection[45], Australia's contribution to this global problem merits attention.

Some examples of the impacts of plastic bags on wildlife include:

- Northern Territory veterinary practice , the Ark Vet, reports that they treat approximately one turtle a month which they attribute to illness caused by plastic bags.[46] The ones that are found early enough are treated and released.
- 30 marine turtle strandings were studied in 2007 by Kathy Townsend of the Uni of Qld's Moreton Bay Research Station. Of these 23 were caused by the ingestion of marine rubbish, including common plastic shopping bags. "This is almost double the number for 2006 in which marine rubbish accounted for 12% of the strandings."[47]
- a Minke whale was stranded in France with plastic bags in its stomach[48]
- two sea turtles died after eating plastic bags off the coast of Brazil[49]
- necroscopies of three turtle species (50 individuals, including 38 Green Turtles) from Southern Brazil found that 60% had swallowed plastic bags, that white and transparent plastic bags were the main debris ingested, and that 13% of the green turtles had died as a result of the ingestion of those bags[50].
- One 1997 study found that at least 267 species worldwide had been affected through entanglement and ingestion of marine debris, including sea turtles, seabirds, marine mammals, as well as numerous fish and crustacea[51].

Floating marine debris on the Chilean coast has been found to be 47% plastic bags. In addition bags were often found submerged at between 10 and 200 metres[52]. In these cases, the origin of the plastic bags is thought to be commercial shipping activities, land based litter (for example, from beaches) and untreated sewage waters.

Ingestion of plastic marine debris, including bags, has the potential to increase exposure to hazardous chemicals. Pollutant chemicals such as polychlorinated biphenyls (PCBs) have been known to be absorbed by the plastic litter in the marine environment. This can have the effect of magnifying the background concentration of such chemicals many times. Thus transferring higher levels of contamination to the animal when ingested. PCBs are known to cause endocrine disruption in many species, such as seals and other mammals.[53]

In 2006, the International Coastal Clean-Up (which Australia did not participate in) found that plastic bags were nine per cent of all litter found (691,048 bags) and that two per cent of animals found were entangled in plastic bags. (Note, while the statistics in this particular report do not

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[44] Floating rubbish dump 'bigger than US' By Xavier La Canna http://www.news.com.au/story/0,23599,23156399-2,00.html

[45] For example Australia has signed and ratified the 1992 *Convention on Biological Diversity*, which obliges members to: "ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction" (Article 3). Similarly Australia is a member of the International Whaling Commission and has a role in policing its Southern Ocean Whale Sanctuary.

[46] Lisa Hanson, telephone conversation, 28 February 2008

[47] Environmental Manager No 664

[48] Mauger, G 2002 *The Culture of Whales, the animals, the people, the connections* Poster presented to American Cetacean Society, 8th International Conference

[49] Mascarenhas, R *et al*, *Plastic debris ingestion by sea turtle in Paraiba, Brazil*, Marine Pollution Bulletin 49 (2004) 354-355

[50] Bugoni, L etc (2001) Marine Pollution Bulletin 42 No 12. 1330-1334

[51] Laist, D.W. *Impacts of Marine Debris: Entanglement of Marine Life in Marine Debris, Including a Comprehensive List of Species with Entanglement and Ingestion Records*. In Marine *Debris: Sources, Impacts and Solutions*, ed. J.M. Coe and D.B. Rogers. New York, NY: Springer-Verlag, 1997 p102.

[52] Thiel, Vasquez, Macaya 2003 Marine Pollution Bulletin 46:224-231

[53] Derraik, J 2002 Marine Pollution Bulletin 44:842-852

directly relate to Australia, they provide an indication of the global presence and impact of plastic bags in coastal and marine environments.)

The impacts of plastic bags are not restricted to marine fauna. There have been instances of domestic animals dying after ingestion of plastic bags. The loss of domestic animals due to plastic bag ingestion also involves economic loss for the animals' owners.

- A farmer near Mudgee, in NSW, found eight plastic bags in the stomach of a dead calf (valued at $500).
- In April 2000 the Lucknow Times of India reported that local cows were dying at the rate of 100 per day as a result of discarded plastic bags[54]
- A cow found dead in the streets of New Delhi had some 35,000 plastic bags in its digestive system, according to Indian media reports[55]
- Seven per cent of goats at slaughterhouses in Irbid, Jordan contained plastic in their stomachs[56]
- Many animals necropsied at the Central Veterinary Research Laboratory in Dubai dies from the ingestion of plastic, in particular plastic bags and plastic rope[57].

This RIS does not attempt to place an explicit dollar value on wildlife or habitats adversely affected by plastic bag litter. A measure developed by Allen Consulting Group is the dollar value of community volunteer efforts as part of clean-up days, because this can be seen as a proxy for the value a litter free environment has for people. The estimated value of reducing the environmental damage attributable to plastic bag litter attempts to account for all of the potentially damaging aspects of a littered plastic bag. It assumes that the people who voluntarily pick up littered plastic bags do so because they are concerned about the potential of the bags to have negative impacts such as on:

- marine biodiversity
- other wildlife or livestock
- drains and sewers, especially blockages leading to flooding
- aesthetics of a neighbourhood or other valued locations.

This valuation, however, was unable to take into account the fact that local governments generally take responsibility for provision of public rubbish bins (to prevent litter by providing a more appropriate means for disposal of unwanted items) and clearing up litter in public places. These activities are costly.
Where governments take responsibility, individual members of society often do not perceive it as their role to undertake voluntary work[58]. Thus valuing efforts on clean-up days as a proxy for the value the entire community places on a litter free environment has its limitations.

2.4 NATURE OF THE PLASTIC BAG TRANSACTION

The value that consumers place on a plastic bag varies with context. Some consumers positively value plastic bags for carrying goods they have purchased as part of the shopping experience as well as for the potential reuses of those bags. Littered bags are, however, seen as undesirable items in the environment, with a negative value, because of aesthetic impacts and the potential harm to wildlife or domestic animal species. Littered plastic bags are seen by some as a symbol of people not caring about their environment.

[54] www.mindfully.org/Plastic/Recycling/India-Plastic-BagsNov00.htm
[55] CBC News *Blowing in the wind* 28 March 2007 <http://www.cbc.ca/news/background/environment/shoppingbags.html>
[56] Small Ruminant Research, Volume 30, Issue 2, 1 September 1988, pp 77-83
[57] www.alarabiya.net/articles/2008/01/24/44652.html
[58] Changing community perceptions about the ownership of public and private spaces is discussed in Reeve I, Ramasubramanian L. and McNeill J (2000) *Lessons From the Litter-ature, A review of New South Wales and overseas litter research*, the Rural Development Centre, University of New England.

The relationship between the consumption of plastic bags and the quantity of plastic bag litter in Australia is unclear. Plastic bags make up about one per cent of the litter stream. This proportion has not changed significantly despite a substantial reduction in bag use. Harsher measures can achieve results: the Irish levy on plastic bags, known as the Plastax, led to an over 90% reduction in plastic bag use and has caused a reduction in plastic bag litter levels from 0.75% to 0.22%[59].

Since being introduced into supermarkets and retail outlets, plastic bags have quickly become part of shoppers expectations regarding the service provided by the retailer. However, as plastic bags are not an integral packaging item in themselves, they are not essential to the integrity of the product purchased. They assist the carrying of an item, and are thus part of the shopping experience, but are not essential to it. While plastic bags may now be an accepted part of the shopping experience, a growing number of retailers are charging consumers for plastic bags, turning bags into a product rather than a service.

Unlike the majority of plastic bag transactions, packaging of most consumer goods is included in the cost of the item, and is intended to maintain the integrity of the item. It is largely for this reason that the definition of a 'plastic bag' in this report focuses on its nature as a carry bag. It is not the intention of the options for government action described and examined in this RIS to impact on bags used as the primary packaging of goods (that is, produce bags with no handles such as bread bags).

While most plastic bags appear to the consumer to be provided free of charge, it is reasonable to assume that the consumer is paying for them because the price of bags is spread across all goods on sale. The Allen Consulting Group (ACG) report of May 2006[60] noted that a plastic bag typically costs three cents, but that the hidden nature of this cost provides no monetary incentive for consumers to reduce their use.

It has been reported that supplying plastic bags costs the retail industry more than $173 million per year.[61] Consumers who choose to use a reusable bag are not seeing a reduction in the price of their groceries, so there is no economic incentive to use green bags. They are, in effect, still sharing the cost of plastic bags they no longer use or want. [62]

A consumer who opts out of paying for plastic bags by bringing their own bag to a retailer that charges explicitly for plastic bags (at say, two cents per bag) would save around $10 to $15 a year.[63] Most consumers are unable to make this saving because the majority of shops do not charge visibly for bags. Those retailers that charge for bags tend to price them above cost as a disincentive to bag use. For example, Aldi Supermarkets charges 15 cents, Bunnings Warehouse charges 10 cents and IKEA charges 25 cents a bag. Borders has also recently introduced a 10 cent charge. These models serve to demonstrate that it is possible for bags to be provided for a fee.

Consumer behaviour observations carried out by Hyder consulting in 2007 reveal that placing a visible charge on plastic bags has a profound impact on the consumption of plastic bags. They observed that in stores that do not charge for single–use bags, 72% of transactions involved a single–use bag, made of either HDPE, LDPE or paper. This dropped to 27% in stores that charge for plastic bags[64]. This is consistent with international experience which indicates that the price the consumer pays for plastic bags will impact on their use and re-use, the use of alternatives, and the

[59] See National Litter Pollution Monitoring System Reports 2002-2007 at http://www.litter.ie/system_survey_results/index.shtml. Note however, that Minister of State Pat Gallagher noted in an early 2007 statement that data showing that prior to the levy plastic bags comprised 5% of the litter stream,(see www.envirn.ie/en/envirnoment/waste/plastic bags/).

[60] See Appendix D

[61] Planet Ark, <http://www.planetark.com/campaignspage.cfm/newsid/56/newsDate/7/story.htm>

[62] ibid

[63] Nolan ITU 2002, *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts*, Melbourne, p. 4

[64] Hyder, 2008, p17

value people attribute to the bag after its initial use. Each of these factors may influence the number of plastic bags entering the litter stream.

The number of plastic bags distributed in the Republic of Ireland has decreased by over 90% since the enactment of the levy.[65]

The degree to which individuals have reduced their bag use varies. A recent Choice online survey shows that 28% of respondents always used plastic bags when shopping, 28% rarely used plastic bags, and only 2% never took the plastic bags they were offered[66]. ACG notes that consumers that are most sensitive to a price on plastic bags include those that put the lowest value on the availability of a bag. ACG also notes that it is likely that a disproportionate share of deliberately littered bags come from this group of consumers[67]. A well-targeted economic incentive will provide an effective motivator to change consumer behaviour.

A key part of the plastic bag transaction is that it is the consumer who transports the bag to the place where it is disposed of or littered. Bags are disposed of in a variety of ways that can have economic, social and environmental costs, whether disposed of correctly or littered accidentally or deliberately.

2.5 WASTE AND LITTER MANAGEMENT

The costs of cleaning up current levels of plastic bag litter are generally borne by governments, volunteers and the general community, not those who litter. This is a market failure.

2.5.1 Landfill

The majority of the 3.93 billion plastic bags used in 2007 ended up in landfill, even those reused by consumers.

The National Packaging Covenant Council (NPCC) concluded in 2002 that the major impact associated with the disposal of plastic bags was as litter, not their impact at landfills. Landfills are generally designed to be 'dry tombs' and as stable as possible. Thus the main problem with plastic bags in landfill is not the mass of plastic taking up space in landfill, or the fact that the bags do not rot in landfill, but their presence in letter[68]. Nolan-ITU noted in 2002 that 47% of the litter at or around landfills was plastic litter, with a significant proportion made up by plastic bags[69]. Costs associated with managing the bags at waste management sites include clearing anti-litter fences around landfill sites and addressing the complaints from neighbouring properties affected by wind-blown litter.

Substantial plastic bag litter (and resultant costs) can arise where litter management at landfills is inadequate. For example, in August 2007 the ACT experienced a very windy day that resulted in many plastic bags and other litter escaping landfill and needing to be recovered by the ACT Government and the landfill operator. Costs for the clean-up totalled $9 000[70]. This cost does not include additional infrastructure costs. The ACT landfill operator is purchasing a heavy duty removable cover for use on windy days to reduce bag escapes from the landfill, and taller fencing is being installed to assist in litter capture.

[65] Plastic Bag Litter Position Paper. Keep Wales Tidy.

[66] Choice online survey, <http://www.choice.com.au/viewPollResults2.aspx?id=105611&objid=122963&p=> accessed 1, Jan 2008

[67] ACG report May 2006 p 14

[68] Despite more recent assertions, the ability of a plastic bag to have a beneficial use in landfill by mitigating leachate is yet to be demonstrated.

[69] Nolan-ITU, 2002

[70] Graham Mannall, ACT TAMS, pers comm. 23 October 2007

To complement existing state and territory litter regulations, the EPHC released, in 2005, guidelines for public place litter management and for landfills.[71] The public place guidelines were developed for managers of outdoor public places such as shopping precincts and recreational parks, roadside rest stops, car parks, public transport nodes, sport venues and other places where large gatherings of people congregate. The landfill guidelines are designed to help managers of both unattended and attended landfills reduce generation of plastic bag litter so as to protect residents and the surrounding environment.

2.5.2 Compost and organics

Plastic bags are a major visual contaminant in commercial composting. The presence of plastic bags has forced operators to undertake manual sorting of kerbside collected organic material and invest in mechanical sorting and in specialised equipment to reduce contamination in the final product[72].

To deal with plastic bag contamination, shredders need to be used instead of grinders and manual picking of final spread compost or mulch material is often required to reduce plastic contamination of the product. While the weight of plastic bag contamination is very low, bags or bag fragments can be visually obvious in the final product. High levels of contamination can restrict markets for compost and reduce its economic value.

2.5.3 Clean up and infrastructure

Plastic bag litter has direct social and economic impacts on communities. Although local governments spend millions of dollars each year on litter prevention, management and clean-up, national data are scant. Where litter is allowed to build up, there are often flow-on social and economic effects in the local community. These relate to the aesthetics of public places and how they are perceived by the community. These factors can play a role in determining how, or even whether, public spaces will be used by various sectors of the community.

While there are insufficient data to enable a comprehensive assessment of the costs associated directly with plastic bag litter, there are indicative costs of litter management in general. This section outlines the current costs of litter management, from which inferences can be drawn in relation to plastic bags.

The Nolan-ITU report, *Plastic shopping bags: analysis of levies and environmental impacts* (December 2002), states that approximately $200 million per year is spent by local and state governments on litter clean-ups. This is in addition to the money spent by private sector landfill operators, and community organisations such as Clean Up Australia, and the time volunteered by individuals as contributions to clean-up activities. Assuming plastic bags are no more than two per cent of the litter stream, Nolan-ITU attributed a cost of $4 million to local and state governments for cleaning up plastic bag litter[73].

The national clean-up figures may not include all spending on litter. As one of the smaller Australian jurisdictions, the ACT Government spends approximately $3.5 million annually on cleaning, litter and rubbish removal. Expenditure on rubbish removal and maintenance of bins in public places is relevant to litter: it is a major cost of litter prevention.

[71] Environment Protection and Heritage Council Landfill Litter Guidelines (2005)
<http://www.ephc.gov.au/pdf/Plastic_Bags/Landfill_litter_guidelines_Jun05.pdf> (Accessed 9/11/2006)
[72] Communication from Jeffries Group to South Australia ZeroWaste 28/11/2006
[73] Nolan-ITU, 2002, Op. Cit, p. 8

Sustainability Victoria, has estimated Victoria's 2004–05 costs of maintenance of litter bins, traps and litter clean up (such as dumped rubbish) to be more than $21 million[74]. Litter and street sweeping maintenance cost Victorian councils $58 million in 2004-05, and road side litter cost local government nearly $2.7 million, with 8 958 tonnes of litter collected over the year. It has been estimated that stormwater gross pollutants are composed of approximately 20% litter (plastic, paper and metal), 80% organic material (such as leaves and twigs) and that about 100 000 cubic metres of gross pollutants (one billion items of litter) reach Melbourne's waterways each year.

In Queensland, Brisbane City Council has allowed nearly $9 million in their 2007/08 budget for litter - $8 million of which is spent on service provision such as street sweeping, litter bin installation, maintenance and clean up. Brisbane is also to spend $954 000 on litter prevention, excluding stormwater pollution prevention programs and infrastructure.

While these costs are significant, it is difficult to determine the percentage attributable to plastic bag litter, or indeed whether costs of clean-up would be reduced if all plastic bag litter were eliminated. An alternative perspective is that, even though these figures are not restricted to the plastic bag component of litter, plastic bags comprise a highly visible and mobile component of that litter and thus help to prompt the need for litter prevention and clean-up activity.

2.6 SOCIAL IMPACTS AND COMMUNITY EXPECTATIONS

There are unquantified aspects of the impacts and consumption of plastic bags that relate to community views and aspirations. The social aspect of the problem is important to many in the community, and for some people this can be more important than the direct harm caused by plastic bag litter.

Submissions to the Consultation RIS demonstrate community concern about the impacts of plastic bags, despite the limited scientific evidence illustrating these impacts. Further evidence could be gathered about the views and expectations of Australians, however, a lack of quantification of those views does not mean that those views do not exist[75].

2.6.1 Community participation in reducing plastic bag consumption

There is community concern about plastic bags in the environment, particularly in the form of litter. People are concerned about the impact of plastic bags in public places, parks, on beaches, in the countryside, and want these areas to be free of such litter.

A Newspoll survey commissioned by Clean Up Australia in April 2005 found that 81% of adult Australians favour a ban on single-use plastic bags. This sentiment is evident Australia-wide, with similar results among men and women across all age groups, and for white and blue collar workers. If shoppers use a plastic bag, 46% said it was because they were always given one by retailers, and 35% said they had been unable to buy an alternative at the time the plastic bag was needed[76]. Another 2005 Newspoll survey showed that 69% of South Australians now shop with a reusable bag and 87% say no to a plastic bag, which is on par with the national average[77]. A survey undertaken by Planet Ark in 2003 identified that eight out of ten Australians supported a levy on plastic bags. While these surveys asked differing questions, the common thread is that they indicate strong community support for action to reduce plastic bag use.

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[74] Sustainability Victoria *Other Council Services 2005-06* <http://www.sustainability.vic.gov.au/www/html/1587-other-council-waste-and-recycling-services.asp>

[75] See Section 7.

[76] Clean Up media, 29 May 2005 <http://www.cleanup.com.au/main.asp?RequestType=MediaReleaseInandSubRequestType=DetailandMediaRelID=248>

[77] Source: Cleanup Media 29 July 2005 <http://www.cleanup.com.au/main.asp?RequestType=MediaReleaseInandSubRequestType=DetailandMediaRelID=270>

Support for phasing out plastic bags is evident in the success of community-based reduction programs in communities across Australia such as Coles Bay (Tasmania), Huskisson and Lord Howe Island (both in New South Wales). Additionally, the *New South Wales' Environment and Ethnic Communities in 2004* survey asked respondents to self-nominate their own environmentally damaging behaviour. Eleven per cent nominated using too many plastic bags[78].

A nationwide government survey conducted in April 2006 confirmed that community concern remained widespread .[79] It found that 37% of respondents had taken action to reduce their use of plastic bags in the previous 12 months, with an additional 43% having taken action more than 12 months prior.

Clearly, there is broad community concern about plastic bags, which is translating into a willingness to take action on the part of retailers, governments, non-government organisations, and the wider community. Policy measures to reduce consumption of plastic bags—aimed at ultimately reducing litter impacts—are likely to be well received by many in the community. However, it should also be noted that single-use plastic carry bags are highly valued by some consumers for transport and reuse purposes.[80]

The high level of community interest does not necessarily mean that plastic bags should be placed as a higher priority than other policy issues to be considered by governments. It does mean, however, that the development of policy solutions will need to consider social issues and views as well as environmental and financial impacts.

2.6.2 Loss of aesthetic values and reduced public amenity

It is difficult to place a value on the beauty and integrity of public spaces. Plastic bag litter, along with other litter, makes places look unclean, unattractive and uninviting. This is true in urban, rural and more natural landscapes. Communities expect governments to provide safe and pleasurable (including litter free) locations for entertainment and leisure activities.

Money spent on public art, and the maintenance of parks and gardens are some indicators of the value that communities place on aesthetic values. Expenditure on litter prevention and management, including provision of litter bins, their emptying and maintenance, anti-litter campaigns, and the support for organisations solely devoted to litter prevention are also indicators of the importance of a litter-free environment to society and the impact that litter has on aesthetic values. The costs associated with the impacts of plastic bag litter on the visual amenity of an area are largely intangible, however, the clean-up costs are generally borne by the manager of a public place or by volunteers.

Litter collection undertaken by governments or volunteers provides a cleaner environment which benefits the entire community. As noted in the ACG report, it is difficult for individuals to

[78] Dept Environment and Conservation (2004) <www.environment.nsw.gov.au/resources/eecintro05213.pdf>; p 44

[79] OmniAccess Consumer Survey prepared on behalf of Department of Environment and Conservation, NSW and conducted during 22-23 April 2006 nationwide of 1,000 households. Respondents were asked, "which of the following best describes you and any actions you may have taken to reduce your use of light weight plastic shopping bags." 13% Within the last 6 months, 24% in the last 6 to 12 months, 23% between 1 to 2 years ago; 20% over 2 years ago, 16% I do not do anything to reduce my use and 3% NA or I don't use bags

[80] The triennial social research surveys, *Who Cares about the Environment?* are conducted by the NSW DECC (formerly by the EPA) as part of its mission to monitor social indicators in order to measure the impact and relevance of its environment protection actions. The first was conducted in 1994, followed by 1997, 2000 and 2003. Each survey covered over one thousand NSW residents aged from 15 to 70 years in Sydney, Newcastle, Wollongong and Regional NSW and are designed to provide information about specific aspects of knowledge, attitudes, and behaviours of a cross section of the NSW population. More recent surveys in the studies have specifically tracked attitudes to plastic bags.

articulate a reliable 'willingness to pay' for a cleaner environment[81]. It is harder still to allocate a value to achieving a plastic bag litter-free environment.

Once a public place is littered, perceptions of it can alter. It is a well-known phenomenon amongst litter management professionals that 'litter begets litter'.[82] If action is not taken to reduce litter levels, people perceive that an area is not cared for and that its cleanliness is not valued, thus reducing the social inhibition against littering and other negative behaviours such as graffiti. Urban public places with continuing high levels of litter can become perceived as being dirty and unsafe to visit, leading to changes in the demographics of people visiting them. Considerable research has been undertaken on the issue of litter and graffiti as being indicators of the care people take in an area, how safe people feel and whether people want to visit an area.[83]

Impacts of plastic bag litter on site amenity are likely to differ depending on the site and the population: the same bag will impact more people in populous areas. The actual impacts are likely to be greater in otherwise pristine environments or very clean urban areas (because of the magnitude of impact on amenity). Litter from plastic bags may reduce land values in the vicinity of waste management (landfill) sites if not managed appropriately.

2.6.3 Plastic bags as an awareness raiser

Many environmental associations have promoted plastic bag awareness and reduction campaigns for two reasons. Firstly, there are the harmful effects of litter, particularly on wildlife; and secondly, there is a view that action on plastic bag litter is an entrée into other, more important, environmental actions because everyone can relate to and help solve the plastic bag problem. The idea is that when people think and act on plastic bags they may be more open to taking other more significant steps towards sustainability. [84]

2.6.4 Litter as a disincentive to tourism and other outdoor recreational activities

Litter in scenic places can have negative impacts on tourism, particularly in roadside areas. This is particularly the case for plastic bags because of their visibility. Degraded scenic areas are less likely to attract visitors. No information is available on such impacts in Australia. Before a plastic bag levy was introduced in Ireland, however, litter (especially plastic bag litter) was seen as having a negative impact on perceptions of that country as a tourist destination:

> The litter problem was a prominent issue for the [Irish] government because of the severe damage it was inflicting on the Irish 'green image'. It was feared that tourism, one of Ireland's largest industries, would be negatively affected as a consequence of the degradation of the environment. The food industry, which based a significant amount of their marketing strategies on a healthy, wholesome reputation, also suffered as a result of the increased litter and pollution. The most visible element of litter was plastic bags[85].

The Irish Department of Environment, Heritage and Local Government states that:

> Plastic bag consumption increased alarmingly in Ireland in the 1990s. One of the most significant side effects of this trend was the careless disposal of plastic bag by consumers after use – a significant proportion of which ended up as highly visible components of litter. In addition to being highly visible because of the volumes being carelessly disposed, they also became highly persistent pollutants in urban, rural and coastal settings. This trend was also undermining Ireland's clean, green image on which the Irish tourism industry depends.[86]

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[81] ACG Report May 2006, p. 18 (Appendix D)

[82] McAndrew 1993 Environmental Psychology

[83] Educating the Community about Litter: Changing Knowledge, Attitudes and Behaviour 2000 to 2003. (NSW DECC. http://www.environment.nsw.gov.au/resources/community/2005608_litterreport.pdf

[84] "There is a need for a behavioural change generally within the community away from disposal and towards waste avoidance. Plastic bags can provide the opportunity to show how this can be done". Parliament of South Australia. Plastic Bags. 53rd Report of the Environment, Resources and Development Committee

[85] <http://www.colby.edu/personal/t/thtieten/litter/htm> (Accessed on 29/01/2006)

[86] <http://www.environ.ie/en/Environment/Waste/PlasticBags/>

With a level of plastic bag litter apparently higher than in Australia, Ireland put in place an economic instrument to reduce plastic bag consumption and thus plastic bag litter. An important aspect of this was the desire to protect Ireland's second largest industry (tourism). In Ireland, the effect of the plastic bag tax on the use of plastic bags in retail outlets has been dramatic—a reduction in use in the order of over 90%, and an associated gain in the form of reduced littering and negative landscape effects.[87]

2.6.5 Impacts on recreational equipment

Plastic debris, including plastic film (which includes plastic bags), can damage vessels' propellers and clog seawater intakes and evaporators, causing engine failure and costly repairs. This type of disablement can be life-threatening if a boat is stranded a long way from land. The proportion of disablements due directly to plastic bags is not known. Though, according to 1998 Royal National Lifeboat Institution (United Kingdom) figures, 11% of damaged propeller incidents they attended were life-threatening[88].

Similar breakdown incidents have been reported in Australia although, again, the proportion due to plastic bags has not been determined. A Western Australian paper reported 'flotsam, jetsam, especially plastic bags' can result in costly repairs[89]. In 2002, the Boating Industry Association of New South Wales and the Boating Industry Association of Queensland reported that plastic bags caused millions of dollars worth of damage to boat engines each year, when they become wrapped around propellers, or clog water intakes or engine cooling systems, 'cooking' the engine[9091].
Plastic bags are the leading external cause of marine engine damage in Massachusetts.[92]

In 2003, racing driver Mark Skaife, with the support of Federal Liberal MP, Bruce Billson, launched an anti-litter campaign aimed at plastic bags. This occurred after Skaife's Commodore V8 Supercar engine overheated during the 2002 Bathurst 100 car race when three littered plastic bags were caught by his vehicle and covered the radiator. Although Skaife went on to eventually win the race, Craig Lowndes' vehicle was disabled by a plastic shopping bag in the same event. Mr Billson pressed for action by industry and the community to reduce litter of all types[93].

2.6.6 Plastic bags as a symbol of the throw-away society

In recent years there have been changes in community attitudes about litter. The New South Wales Department of Environment and Conservation has reported:[94]

- 'a trend for the community to connect litter to wider environmental issues of waste management, illegal dumping and recycling'
- growth in people's concern that litter is damaging to the environment, particularly wildlife affected by water-borne litter.

Community feedback on the Consultation RIS has identified consumption of plastic bags as being the problem associated with plastic bags, as well as their impact as litter. This has led to consumption being addressed as a problem in more detail in this Decision RIS. The public is also concerned at dumping of products in landfill that could have been recycled, or were never needed.

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[87] Convery,Frank, McDonnell, Simon and Ferreira, Susan. *The most popular tax in Europe? Lessons from the Irish plastic bags levy*. Environmental and Resource Economics. 13 January 2007

[88] Maine Conservation Society, *Long Term Impacts of Plastic Bags in the Marine Environment,* Ross-on-Wye, UK, August 2004.

[89] Barry Wiseman, Breakdown service 'bags' rubbish, The West Australian Saturday 11/03/06

[90] Simon Kearney, 'Boat Industry Backs Levy', Sunday Telegraph (Sydney), p4, 6/10/02

[91] Farrell, Joe. *Plastic pollution in the marine environment: Boaters can help contro a growing problem.* http://www.ocean.udel.edu/seagrant/publications/plasticpollution.html

[92] The Triton MegaYacht News. April 2005. http://www.the-triton.com/megayachtnews/index.php?news=427

[93] V8 News*Skaife Launches Antilitter Campaign* 27 February 2003 <http://www.v8supercar.com.au/news/latestnews/newsdisplay.asp?gid=5849> (Accessed 9/1/2007)

[94] Educating the Community About Litter. Changing Knowledge, Attitudes and Behaviour 2000 to 2003

Plastic bags, due to their high visibility, are seen by people as indicators ans symbols of this wasteful consumption.

2.6.7 International action on plastic bags

The social phenomenon of focusing on plastic bags as an environmental issue is international. Various countries have introduced plastic bag taxes or prohibited the sale of free bags (for example, Ireland, Malta, Taiwan, South Africa). Others have banned or are about to ban lightweight bags completely (for example, Bangladesh, China) and some have recently considered plastic bag taxes or are still considering them (for example, Scotland[95], England and Spain). Hong Kong's levy on bags aims to reduce the indiscriminate use of plastic shopping bags, implying it is not focused on litter alone.

The UK Prime Minister, Gordon Brown, has announced that he would like to 'eliminate' single-use plastic bags from Britain as well as the flimsy paper equivalent. In his first major speech on the environment and climate change since taking office, Mr Brown said supermarkets had already promised to reduce the 'environmental impact' of plastic bags by 25% during the next year. He said: 'I believe we can go further. Indeed, I am convinced that we can eliminate single-use plastic bags altogether in favour of long-lasting and more sustainable alternatives.'[96]

Although plastic bags are a very efficient means of carrying goods, the very large numbers of plastic bags used amounts to a wasteful use of resources compared with using long-life bags. It has been estimated that the energy consumed for each plastic bag for its life cycle is equivalent to about 13.8 millilitres of crude oil.[97] With 3.93 billion bags currently being used in Australia annually,[98] this equates to equivalent of 54 million litres of crude oil consumption that could be substantially reduced if consumers used long-life bags more often.

Life cycle analysis shows that over a two year period (the estimated life of a "green' bag) five "green" bags would be sufficient to replace 1040 plastic bags. This is based on a weekly shopping trip that uses 10 single use carry bags.[99]

Some argue that the fact that plastic bags are made from a by-product of petroleum manufacture means that this an efficient use of this resource. However, milk bottles, milk crates and other products that have a longer life or a greater chance of being recycled may also be made from HDPE.

2.6.8 Unintended outcomes of phasing out plastic bags

Many plastic bags are currently re-used once as bin liners for household rubbish. Reducing the availability of plastic bags might lead to increased use of heavier gauge bin liners (garbage bags) or alternative lightweight kitchen tidy bags. This may have happened in Ireland following the introduction of the Plastax,[100] with the result that there may have been a net increase in plastic use. Some commentators have argued that the Plastax has therefore failed, but the Irish Government's position is that its primary objective of reducing visible plastic bag litter has been achieved.

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[95] Scotland has determined not to put in place a levy on plastic bags as the levy was considered unable to achieve the unambiguous benefits that were expected.

[96] Charles Clover Telegraph Brown urges ban on plastic bags, 20 November 2007
<http://www.telegraph.co.uk/earth/main.jhtml?xml=/earth/2007/11/20/eabrown120.xml> (Accessed 11/2/2008)

[97] Japan for Sustainability Newsletter 61, September 2007

[98] Hyder December 2007

[99] A "green" bag weighs 95 grams and is made of polyethylene, a plastic shopping bag weighs 7 grams and is made of HDPE.

[100] The claim that a net increase in plastic consumption in Ireland was made by representatives of the Ireland Department of the Environment, Heritage and Local Government in evidence given to the Scottish Parliament's Environment Committee in 2005. Note however, that no figures were provided as evidence of this claim.

The Irish Government reported around a 77% increase in bin liner use. Nevertheless, a 93% reduction in plastic check-out bag use resulted in an estimated 1.15 billion less plastic bags being given away at the checkout every year. The increase in kitchen bin liner sales amounted to only an estimated maximum of 70 million plastic bags. Therefore there is an overall reduction in plastic bag usage of over 1.08 billion plastic bags per year. [101]

Similar results could be expected in Australia. Data so far indicates that the reduction in the use of plastic shopping bags achieved since 2004 significantly outweighs the increase in kitchen tidy bag sales. For example, Hyder reports that during 2006 HDPE plastic bag use decreased by 560 million units or 3 455 tonnes and the number of kitchen tidy bags sold increased by just 38 million units or 364 tonnes[102].

The resource impacts of a shift to purpose-made bin liners in Australia would depend on the types of liner favoured by consumers. Since resource efficiency is given by many people as a reason for taking action to reduce plastic bag use, the community's selection of replacement bin liners may need some guidance to ensure that perverse outcomes do not result if access to plastic bags is restricted by economic or other measures.

3 OBJECTIVES OF REGULATION OF PLASTIC BAGS

The objectives of government regulation are to:

- reduce the impacts of plastic bags including litter
- satisfy community expectations for government intervention
- balance consumer choice with environmental protection
- redress the market failure associated with plastic bag usage.

4 NEED FOR GOVERNMENT INTERVENTION

4.1 MARKET FAILURE

A role exists for government to address the market failures outlined in Chapter Two. The primary rationale for government intervention lies in the externalities associated with littered plastic bags. A littered plastic bag creates a negative externality because it imposes costs on parties other than the person who disposed of it, i.e. the full cost of littering is not borne by the person doing the littering. As discussed in Chapter Two, these costs can include environmental damage, loss of aesthetic value and damage to recreational equipment. Government intervention targeted at reducing littering of plastic bags will produce a more efficient allocation of resources than the market, providing that the benefits of intervention outweigh the costs.

Information asymmetries also exist in the market for plastic bags, whereby consumers do not have full information on the goods they are purchasing. The cost of plastic bags is amortised across the cost of groceries generally, making them seem free of charge. This pricing arrangement provides no monetary incentive for consumers to reduce their bag use.

4.2 COMMUNITY EXPECTATIONS OF INTERVENTION

Many people in the community expect the government to intervene to take action on plastic bags. This was clearly demonstrated during the public consultation phase of the RIS process. The majority of submissions to the Consultation RIS asked the government to transfer the cost burden for plastic bag consumption to those who use and consume bags.[103] As discussed in the Statement of the Problem, public demand for action on plastic bags is based not only on the externalities associated with littered bags, but also on the perception that plastic bags are symbolic of a

[101] http://www.planetark.com/campaignspage.cfm/newsid/61/newsDate/7/story.htm#11
[102] Hyder 2008 Plastic Retail Carry Bag Use 2006 Consumption
[103] 23 submissions in favour of further action, 11 in support of no further action.

wasteful, throw-away society. Whilst the economic rationale for government intervention is based on littering, there is community demand for action on the broader issue of consumption.

4.3 COUNCIL COMMITMENTS TO TAKE ACTION

The EPHC has been committed to action on plastic bags since 2002. In June 2006, ministers reiterated their commitment to the phase-out of lightweight single use plastic bags. This commitment signalled the ministers' intentions to address the impacts of plastic bags.

5 DESCRIPTION OF OPTIONS

5.1 IDENTIFICATION OF VIABLE OPTIONS

EPHC has explored voluntary measures as a means of reducing the environmental impacts of plastic bags through the Retailers Voluntary Code 2003-2005. The target for this scheme was to reduce plastic bag use by 50%. Continued support for further voluntary phase out action by ministers was dependent on retailers being able to achieve this target by the end of 2005. The Code only reduced bag use by 34% over all retailers. As a result, in June 2006, ministers reaffirmed their commitment to phasing out plastic bags by the end of 2008. They also reaffirmed their intention to work towards nationally consistent regulatory options.
EPHC in November 2006 reiterated its commitment to reduce the impacts of plastic bag litter, and agreed to complete further analysis of regulatory options, including a ban and retailer charge.
In response to this a Consultation Regulatory Impact Statement (RIS) was released in January 2007. This RIS examined 17 options for dealing with plastic bags. These were presented in three general groups: no further action, options focussed on litter abatement and litter clean up, and options focussed on reducing plastic bag consumption in order to reduce plastic bag litter:

Litter focussed options

A) Enforcement

(B) Behaviour Change

(C) Litter Clean Up

(D) Litter Infrastructure

(E) Advanced disposal fee (cost recovery)

No further action option

(F) Baseline option – no further action baseline

Plastic bag consumption focussed options

(G) Extend ARA Code

(H) Escalated charge

(I) Voluntary phase-out to 2009; mandatory beyond after 2009

(J) Regulated price (25c) (kept by retailers) from 1 Jan 2009

(K) Levy on plastic bags (10c) from 1 Jan 2009

(L) Eliminate plastic bags from 1 Jan 2009

(M) Out-right ban prior to 2009

(Na) ANRA proposal for further voluntary action

(Nb) ANRA proposal for further voluntary action

(Oa) ANRA proposal with added targets.

(Ob) ANRA proposal with added targets

These 17 options explored a variety of voluntary, non-regulatory, and regulatory measures. The ACG analysis presented in the Consultation RIS showed that the economic and environmental costs of the legislative options considered outweighed the potential economic and environmental benefits by a substantial margin.

Major retailers and their representatives have indicated that they do not support a voluntary phase-out agreement as projected in Option I. Rejuvenating the ARA Code, as analysed in Option G, is an option unacceptable to governments as they perceive that voluntary efforts are unable to deliver satisfactory cuts in bag use. In May 2006, the proposal put forward by the Australian National Retailers Association (ANRA) took the focus as the main voluntary proposal coming from the retail sector but as this is largely based on the ARA Code, it was not supported by governments.

In considering what form regulatory action could take, the Consultation RIS highlighted two of the remaining options: a mandatory charge or a ban on plastic bags implemented at state level in a nationally consistent manner. These were selected in part on the basis that these options could be implemented with less administrative complexity than the others. The modelling undertaken also indicated that these two options could provide substantial reductions in plastic bag use and hence litter.
Community feedback on the consultation RIS identified consumption of plastic bags rather than litter enforcement as the matter that should be considered by governments. Litter enforcement was seen as less likely to successfully reduce the environmental impacts of plastic bags.

The inclusion of an option based on the replacement of HDPE bags with biodegradable plastic bags has not been included in this RIS as there is very limited information about how biodegradable plastic behaves in any environment other than commercial compost, and because this RIS also seeks to investigate options that encourage use of long life bags (which have lower life cycle impacts).

In June 2007 EPHC agreed to proceed with a Decision RIS which was to include the ban and mandatory retailer charge options. As it was known that neither of these options delivers a net economic benefit, a net benefit option has also been included in this RIS to comply with Council of Australian Governments (COAG) Guidelines. For completeness, and as it is an option that has some support, a levy has also been included in this analysis. It should be noted, however, that a levy has been ruled out by the Australian Government, which is the only jurisdiction able to enact it.

The four options in this RIS reflect those options assessed as being the most feasible options in each of the option categories considered in the Consultation RIS. (Indeed, the litter strategy is an amalgam of the previous litter strategies).

5.2 OPTION 1: LITTER MANAGEMENT

This option targets litter reduction through a combination of behaviour change, enforcement and infrastructure improvements. It is designed to deliver a net economic benefit to the community - its cost matches the value of the bags it aims to remove from the litter stream. The litter management program aims to reduce litter by 50% from current levels within a two year period and to maintain that level for eight years.
The activities listed below would run in parallel with existing littering offences and penalties as outlined in Table 5. The strategies that would be implemented under this option are:

- **Target unintentional litter,** through:
  - a national survey to identify causes of litter problems and gauge the adequacy of existing infrastructure

- enhanced enforcement of landfill regulations, including enforcement blitzes
- requiring the provision of adequate numbers of properly designed rubbish receptacles in public places
- requiring that these public rubbish receptacles be checked regularly, particularly in sensitive areas and at peak times.

  Cost: $4.4 million

- Improve **education and awareness** and change consumer behaviour, through:
  - media and public event promotion of new enforcement requirements
  - advisory campaigns on how to minimise inadvertent litter
  - sponsoring a National Day of Action, focussing on both deliberate and inadvertent litter
  - grant programme to support local initiatives

    Cost: $1.5 million

- **Direct litter clean-up**, through:
  - grants to community organisations and local groups to clean up sensitive sites (for example, coastal areas, near landfills, urban areas, indigenous and remote communities). There is some overlap in this with the above initiative.

    Cost: $0.7 million

- **Improvements to infrastructure**, through:
  - grants to support better placement and design of public rubbish receptacles (some overlap with targeting unintentional litter)
  - grants to local governments to ensure bins are cleared regularly (some overlap with targeting unintentional litter)
  - commissioning a national study to investigate the design of rubbish bins and garbage collection trucks.
    - **Cost: $3.1 million**

If this option were chosen for implementation by EPHC more detailed design and consultation would need to be carried out with stakeholders to ensure the programs effectiveness.
While the annual cost of these initiatives totals $9.6 million of state and territory expenditure, the actual annual costs are likely to be lower than this because some of the initiatives have overlapping components. In addition, there would be flow-on benefits in addition to reducing litter from plastic bags because it is likely that the amount of other littered items such as cigarette butts, plastic bottles, wrappers and cans would also be reduced.

It is also possible, however, that the actual funds needed to achieve a 50% cut in plastic bag litter would need to be increased should plastic bag consumption grow. This may be likely as plastic bag usage is not addressed as part of the litter strategy.

5.3 OPTION 2: MANDATORY RETAILER CHARGE AT POINT OF SALE

This option is a mandatory charge for single use carry bags at the point of sale. Retailers would be required to apply a minimum charge to consumers who choose to use a plastic carry bag, with the revenue to be retained by retailers. This amounts to a ban on free bags.

Under Australia's Constitution, the Commonwealth Government can impose a mandatory charge on corporations only, and many small retail businesses are not incorporated. Therefore if the Australian Government were to legislate for a mandatory retailer charge the jurisdictions would also have to legislate to cover the other retailers. To be implemented most efficiently, therefore, this option would best be achieved through state and territory legislation alone.

National consistency of jurisdictional legislation would be ensured through a Memorandum of Understanding. While the jurisdictions' legislation need not be identical in format (for example, a stand-alone Act or a primary head of power coupled with detailed regulations), the content must be consistent across jurisdictions, to reduce the burden on business and provide certainty. Laws of states and territories that differ in their application of the mandatory charge could be challenged under the *Mutual Recognition Act 1992*.

Currently the cost of plastic bags is spread across the price of all items sold by each retailer, leaving the impression to the shopper that bags are free. This option utilises a market instrument (a visible price for a bag) to encourage consumers to bring their own carry bags and avoid paying the charge. The charge would be recorded for the consumer according to fair trading regulations[104]. This would include a sign at the checkout showing the price, and inclusion of the price on the customer's receipt (if a receipt is provided).

The minimum charge to the consumer should be set at 25 cents to achieve a modelled level of 99+% reduction in plastic bag use within two years. This level of charge is also cheapest to the economy overall. The other modelled charges (10c and 20c) are at greater cost to the economy and are expected to achieve 80-90% phase out of bag use. The charge includes the goods and services tax (GST). There would be no exclusions or exemptions.

In order to achieve an effective phase out, the minimum price of a plastic bag needs to be set at a sufficiently high level to effect changes in consumer behaviour. The effectiveness of the charge would need to be monitored and reviewed regularly to ensure its continuing relevance and effectiveness. Ireland has recently increased its Plastax from 15 to 22 Euro cents.

Competition between retailers should be effective in keeping the prices low, with the possible exception of rural and remote communities where there are a limited number of retailers. Individual jurisdictions can monitor the pricing in remote communities, and they can provide assistance or intervene where necessary to ensure retailers apply a fair and reasonable charge.
Retailer reporting to governments on plastic bag use would not be required. This would minimise costs to businesses, and simplify enforcement for the estimated 125 000 to 200 000 Australian retailers. Estimates of bag consumption would be able to be generated in a cost-effective way through customs data, surveys and research tools.

Allen Consulting Group has shown that government enforcement costs are a minor component of the overall cost of plastic bag phase out measures, including the mandatory retailer charge[105]. This RIS assumes that costs for nine jurisdictions would total $99 000. This figure is likely to be an underestimate, for example South Australia has recently estimated that their annual cost of enforcement will be $30 000 (on the basis of existing infrastructure for enforcement of container deposit legislation). Sensitivity analysis conducted by The Allen Consulting Group (see Appendix C, pages 5-6) shows that even if the total figure were increased tenfold so that annual costs were $1

[104] In many states, the requirement to display prices is a requirement under fair trading legislation. For example, section 40 of the South Australian Fair Trading Act provides that:

> Where any statement of price or conditions of sale (relating to the availability of discounts or trade-in or other allowances) imprinted on, attached to or exhibited with any goods offered for sale by retail does not set out in a prominent position and in clear and legible figures the price at which the goods can be bought for cash, the trader who offers the goods is guilty of an offence. Maximum penalty: $2 500.

[105] Allen Consulting Group (2008)

million (thus providing a generous overestimate of costs), the *overall* net costs are unlikely to vary by more than one per cent.

A key advantage of a mandated charge is its potential to encourage retailer compliance. There is no benefit in non-compliance for retailers as they would profit from the sale of bags. Also, retailers are likely to check on each other. Even so, two possible offences are envisaged for non-compliance:

- failing to apply the minimum price for the bag(s) for a transaction in which plastic bag(s) are provided
- failing to display the minimum charge and failing to print the charge on the receipt (where a receipt is provided).

This option anticipates a three-month transition period, from 1 January 2009, to enable retailers to make any required changes to registers or processes. Plastic bags retained by shops after the transition period will be subject to a fee when they are supplied to customers.

5.4 OPTION 3: GOVERNMENT LEVY

Under this option, an Australian Government levy would be placed on plastic bags at the point of sale. It is important to note that the Australian Government has publicly stated that it is not prepared to put in place a levy on plastic bags[106].

This option would be similar to the system applied in Ireland, where the government imposed a mandatory 15 Euro cents plastic bag levy (increased to 22 Euro cents in 2007 in order to maintain its effectiveness at reducing bag consumption). This charge is paid by the consumer at the point of sale to provide a visible price signal to induce behaviour change—that is, to reduce plastic bag use.

This option would involve a regulation that includes:

- a charge to be applied at the point of sale in all retail outlets
- a requirement that retailers pass on the full amount of the levy as a charge to customers at the checkout
- the charge for a plastic bag to be itemised on all invoices, receipts or dockets issued to customers
- the levy to be set at a specified amount (see below)
- administration of the levy by government
- retailer administration
  - maintaining records
  - reporting to government
  - paying levies to the ATO
- penalties for non-payment or non-compliance, and guidelines for addressing issues involving under-payment
- appeal rights for retailers and management of complaints against retailers
- enforcement by authorised officers.

For consumers, this option is similar in impact to the mandatory retailer charge, but with monies from the levy being retained by the Australian Government.

The levy would be set at a level that would be most likely to deliver significant reduction in plastic bag use and litter, which is between 10 and 25 cents per plastic bag. This would achieve a target of between 80% and 99+% reduction in plastic bag use within two years. There would be no

[106] '…we will not be imposing a Commonwealth levy on plastic bags" Kevin Rudd, Hansard, March 17 2008

exclusions or exemptions. The effectiveness of the levy would need to be monitored and reviewed regularly to ensure its continuing relevance and effectiveness.

5.5 OPTION 4: BAN ON PLASTIC BAGS

Under this option, the supply of plastic bags at the point of sale would be prohibited. Although this option has been modelled to provide elimination of bags, a 100% reduction would not be achieved in practice due to the need for exemptions on health and safety grounds.
It is likely that exemptions would be defined in regulations if a legislative option for a ban were pursued. Possible exemptions could include plastic bags that are used for:

- containing raw produce, including fruit, nuts and vegetables
- packaged raw fish and raw fish products
- packaged raw meat and raw meat products
- packaged raw poultry and raw poultry products
- ready-to-eat food, whether hot or cold
- frozen or refrigerated products, or any other product that may leak liquid or create condensation
- household and garden chemicals.

The extent of this list suggests that most supermarket purchases would be likely to involve at least one exempt bag, thereby reducing the practicality of this option as a phase-out mechanism.
As the ban would need to be imposed at the state and territory level, enforcement would be the responsibility of each jurisdiction.

ACG have shown that government enforcement costs are a minor component of the overall cost of a ban.[107] This RIS assumes that costs for all phase out options for nine jurisdictions would total $99 000, however, enforcement of a ban with exemptions is likely to be more complex and thus costly than enforcement of a mandatory retailer charge option. This figure is likely to be an underestimate, for example South Australia has recently estimated that their annual cost of enforcement will be $30 000 (on the basis of existing infrastructure for enforcement of container deposit legislation). Sensitivity analysis conducted by ACG indicates that even if the total figure were increased tenfold so that annual costs were $1 million, the overall net costs are unlikely to vary by more than one per cent.

6 OPTIONS - IMPACT ANALYSIS

This section describes the options for government action to reduce the impacts of plastic bags. It also provides an economic, social and environmental analysis of the impacts of those options.
A detailed description of the economic modelling prepared for this RIS can be found in the Allen Consulting Group's (2008) *Phasing Out Lightweight Plastic Bags – Supplementary Analysis (see Appendix C)*. It is recommended that readers of this RIS read the ACG report in order to understand the underlying assumptions and methodology used. The following points summarise some important underpinnings to the analysis in this chapter:

- All costs are indicative only and are presented so that the options can be compared against one another.
- References to total costs refer to the ten year period 2006-2016. References to annual costs refer to the ongoing annual costs from 2010 (i.e. they do not include the initial year which may include set-up costs.)
- Net costs of options are for the seven years starting 2009, discounted over the 10 years from 2006. There are no costs for options in the years 2006-2008. This has been done to ensure

[107] ACG (2008)

consistency in approach, and thus allow comparison, with the figures in the Consultation RIS, which provided 10 year cost estimates starting in 2006.

- The net costs reported by this RIS are expected to be substantially lower in practice. The ACG sensitivity analysis indicates that actual net costs would be significantly lower because the following assumptions do not include the most up to date or accurate information, i.e.:
  - *charging nothing for plastic bags is efficient* and that any change to this would produce a net cost to the economy. However, if providing 'free' plastic bags is not efficient, then the costs of a phase out would be overstated.
  - *reusable 'green' bags retail for $1.40.* This was the price at the time of the original modelling in 2006. However, the current price of a reusable bag from a major retailer is typically $1. Sensitivity analysis undertaken by ACG indicates that using the higher price has the effect of artificially raising the modelled costs of legislative action by 5-10%.
  - *transaction times at the checkout will be slower* with reusable bags. However, a study by Environment Victoria indicates that transaction times are no slower. Removing the costs associated with increased transaction times could reduce the net cost of regulatory options.
  - *the number of bags used in 2007 was estimated at 4.2 billion bags*, whereas the actual figure is now estimated at 3.9 billion. This results in an overestimation of the costs and benefits of the retailer charge, levy and ban options.
  - *the ban results in a 100% reduction in plastic bag use.* However, plastic bags may be desirable as barrier bags to avoid cross-contamination of food. This may be as a result of the Food Safety Code of Food Standards Australia New Zealand or as a result of safe food handling processes followed by a retail outlet. The need for exemptions which may be required under a ban has not been included in the modelling.
  - *funds raised by a government levy would be expended benignly* while a mandatory retailer charge is effectively a retailer subsidy that would result in a negative distortion to the economy. If retailers voluntarily donate whole or part of the charge, this would have the effect of reducing the modelled cost as it would reduce the impact of the assumed subsidy. (Jurisdictions do not have the power to require donation of funds.) The Commonwealth does not support a levy. However, even if a levy were supported, it would be absorbed into Consolidated Revenue as it would not meet the criteria for potential hypothecation. Levy expenditure may or may not be benign.
- Impacts on Australian manufacturers of plastic bags are likely to be lower than modelled due to a reduction in the estimate of total current bag usage, and an increase in the proportion of bags being imported since the modelling was done.
- Consumers' willingness to pay various prices for plastic bags is unknown. It has been assumed that a 25 cent fee will result in close to a 100% reduction in bag use, that a 20 cent fee would result in a 90% reduction, and a 10c fee in an 80% reduction. Under this model most consumers are expected to purchase alternative bags when the price difference between an alternative carry bag and a plastic bag is 10 cents or more.
- It is assumed that single-use alternatives are available at 15 cents (which is not necessarily going to be the case), and it is also assumed that 95% of transactions will involve consumers choosing reusable bags such as 'green bags' as these are economically superior108.

[108] The economic 'superiority' of a green bag is demonstrated by considering that at $1 it will carry twice the goods as a single use bag, on over 100 occasions. Consumers are therefore given an economically rational choice of purchasing and reusing green bags rather than choosing to pay for single use bags at every transaction. For more detail see Appendix C page 7.

- Removal of a plastic bag from the litter stream has been valued at one dollar. The Productivity Commission consider this may be an overestimate. The $1 is an attempt to take into account environmental issues but does not completely take into account social elements of the problem.

For the retailer charge, government levy and ban options, the dominance of the economic costs over the environmental benefits is because those policy scenarios are aimed at reducing the consumption of plastic bags whereas the benefits arise only from the reduction in littered bags.

The relevant industry association has signalled that regulatory action may have significant impact on the domestic plastic bag manufacturing industry. The potential impacts on the plastic bag industry are detailed elsewhere in this analysis. However, in weighing up the industry case for structural adjustment, that current data indicate that local manufacture has decreased as a result of market forces, with imports now dominating[109]. This means the need for structural adjustment may be reducing.

Multi Criteria Decision Analysis (MCDA) is an internationally recognised tool for the analysis of issues which have more than an economic dimension. It is a comprehensive method to assess the full range of impacts arising from an environmental policy proposal, and allows comparison of "apples and oranges" without having to reduce all elements to an economic valuation. Multi Criteria Decision Analysis (MCDA) is a tool used in many overseas jurisdictions, including the UK.

Like all valuation methods MCDA is not without its limitations. A list of citations discussing the framework and its limitations has been included in the References Section.

While the COAG Guidelines for decision making state that Cost Benefit Analysis (CBA) is a recognised method for evaluation of options, it is not the only method accepted under the Guidelines. Analysis of options in this RIS includes evaluation by CBA and MCDA in order to provide additional perspectives on the issues covered.

6.1 BASE CASE

6.1.1 Description

Since the establishment of the ARA Code in 2002, many retailers have established voluntary measures to encourage consumers to use alternatives to lightweight plastic bags. The base case scenario for this 2007 analysis assumes that such measures have been continued. This means that the previous investment that has been made by government and retailers such as staff training, advertising and other infrastructure is now considered as 'business as usual'.

The actual level of investment made by the retail industry in these continuing voluntary efforts is not known.

The base case assumes that there is an increase in retailers' transaction times, bag use in 2007 is at 4.2 billion,[110] and that 'green bags' are available at $1.40. In reality, bag use in 2007 was lower (at 3.9 billion), green bags average around $1 and there is likely to be no increase in retailers transaction times. These assumptions apply to all to the options modelled with the result that all the costs and benefits in this RIS for all the options are conservatively high.
The base case is provided to allow comparison of the alternative means of achieving a phase-out. Business as usual would not make a substantial contribution to the community's and the

[109] Hyder 2008 page 10
[110] This figure was based on the draft 2007 figures estimated from consumption levels up until September 2007, Hyder draft report, December 2007

Environment Protection and Heritage Council's goal of a phase out of plastic bags in order to reduce their environmental impact.

6.1.2 Impacts

Under the base case scenario, bag use declined from 2002 to 2006, but began recovering in 2007. A continuation of the base case can be expected to maintain bag use levels and continuation of the current plastic bag litter problem.

6.2 OPTION 1: LITTER MANAGEMENT

There are substantial uncertainties about impacts of this option—litter management—because there are no data available to indicate whether the proposed $9.6 million annual expenditure will result in a 50% reduction of plastic bag litter. The net present value of the environmental benefits from a 50% reduction in littered light-weight plastic bags is estimated to be $102 million[111].

Targeting littered plastic bags is a very direct way of addressing the litter concerns about plastic bag use. It is estimated that less than one per cent of lightweight plastic bags are littered[112].

This option aims to reduce plastic bag litter by only 50% of current levels (see Table 6); it therefore has a limited capacity to address the environmental and social impacts of littered bags. The long life of plastic bag litter means that this may not translate into a meaningful reduction of the hazard posed by litter (such as risk of ingestion by turtles). Furthermore, because plastic bag litter is distinctive, highly visible and mobile, a litter-based option will not meaningfully reduce the aesthetic harm caused by plastic bags. That is, a view can be equally spoiled by three plastic bags as by six. Because this option also tackles litter as it enters the environment, it does not aim to reduce plastic bag consumption. Therefore it does not address public concerns about plastic bags as an unnecessary use of resources.

This option focuses on litter prevention and enforcement rather than on removing the potential for plastic bags to be used and littered. It therefore does not effectively address community concerns about the impact of plastic bags on the environment. It does not provide a long-term solution that will steer consumers towards use of bags with the least overall environmental impact (long-life bags).

Estimating the net present value of costs associated with this option is more complicated than might first appear. This option was not included in the initial analysis (Consultation RIS) and consequently the flow-on impact (multiplier) in the economy of spending $9.6 million on litter reduction has not been estimated using the general equilibrium model. Other model scenarios resulted in multipliers of between 2.0 and 0.4 with an average of 1.2: this means the resulting total cost to the economy of an initial shock was between double and 40%, with an average of 120%. If the actual multiplier is less than 1.2, this option results in a net present value of costs of less than $102 million, which is a positive overall net benefit.

This option involves considerable government expenditure but does not give consumers an economic incentive to change their bag use behaviour to reduce litter outcomes and improve resource use efficiency. By focusing entirely on initiatives that operate outside of the view of consumers, consumption and litter may actually start to increase as consumers are not reminded that littering and wasteful consumption of plastic bags is undesirable. The litter strategy therefore needs to target litter in a way that can be seen and noted by consumers.

[111] ACG 2008

[112] See Figure 1

The option does, however, allow for continuing personal choice. Consumers still have the convenience of a plastic bag and can choose between a long life reusable bag and a single use bag.

Table 6: Summary of compliance costs associated with the litter option[113].

Option	Retail industry	Households	Government	Environment
Litter targeted strategy *ACG Scenario K* Aust. wide per annum: • total net cost $0m • average total cost/person <$1 • average cost/littered plastic bag <$1 **NB** this has been modelled as the net benefit option where costs = benefits	No additional costs to current situation	No additional costs to shopping transactions Possible increase in Govt taxes/council rates to fund litter activities	National Litter strategy $9.6m p.a.	50% litter reduction No change in number of bags sold Litter strategy will reduce the number of bags littered to 20 million p.a.
Total Aust. wide Net PV -$0 for 2009-2016	Total Aust. wide economic cost for retailers, householders, state & local government -$102 million for 2009-2016			Total Aust. wide environmental benefit $102 million for 2009-2016

6.3 OPTION 2: MANDATORY RETAILER CHARGE AT POINT OF SALE

A range of charges were considered to explore the impacts of various price points on the economy and on plastic bag consumption rates. The three price points of 10, 20 and 25 cents were modelled to give the demand curve below in Figure 3. [114]

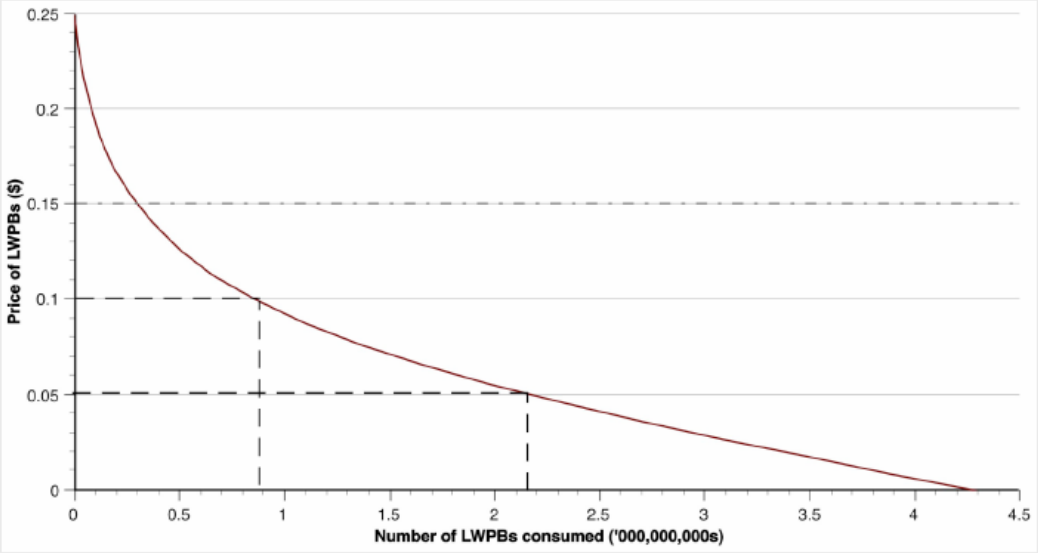
[113] The system wide figures included (net costs, average cost/person and average cost/littered bag) are for annual national activities over the period 2010-2016. The Business Cost Calculator estimates are indicative one off costs for small business only. A sensitivity analysis of the enforcement cost estimate found that even if increased by a factor of 10 i.e. to $1 million across all 9 jurisdictions the overall net cost of the scenarios is unlikely to vary by more than 1 per cent. (ACG 2008, page 5)

Assumptions:
40 million plastic bags littered annually. Bag usage figures based on 2007 results of 3.93 billion bags used.

[114] The Allen Consulting Group Supplementary analysis 2008 box 2.1 p15

Figure 3: Estimated Consumer Demand for Plastic Bags, 2005[115]

Establishing a consumer demand curve for plastic bags is a fundamental requirement of the policy assessment exercise. It is a key determinant of the revenues associated with bag sales and the costs that would be imposed on consumers through a ban. The following demand curve has been estimated for modelling purposes.



Its construction relies on the following data estimates:

- 4.3 billion bags at $0.00[8];
- a reduction in consumption of around 80 per cent at $0.10[9]; and
- a reduction of close to 100 per cent at $0.25[10].

While not shown as a point on the demand curve, for the purposes of this supplementary analysis, it has been assumed that a 20 cent price will result in a conservative 90 per cent reduction in demand for LWPBs, rather than the 98 per cent reduction implied in the above diagram.

Source: J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005a, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 1: Main Report*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh; Nolan ITU 2002 *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts, Final Report*, Dept of the Environment and Heritage, Canberra.

Table 7: Cost-benefit Analysis of Mandatory Retailer Charge at 10, 20 and 25 cents[116]

Mandatory Charge Level	Benefits (PV, $m)	Costs (PV, $m)	Net Cost (PV, $m)	Percentage reduction in plastic bag use
10c	177	-822	-645	80%
20c	191	-936	-745	90%
25c	204	-640	-436	99%+

Table 7 shows the economic impact of plastic bag prices at 10, 20 and 25 cents. The costs are a function of quantity of bags purchased multiplied by their price. At 10 cents it is assumed that many consumers will choose to buy a plastic bag, thus the impact on consumers is high (as they are paying for many bags). At 25 cents, however, it is assumed that most consumers will use reusable bags most of the time, buying plastic bags only on rare occasions. This means the impact on consumers is small as few bags are purchased. The 20 cent price imposes higher costs on

[116] ACG report, Feb. 2008, Table 1.5, p 14

consumers overall, as it is assumed that consumers will still buy a substantial number of bags at this price. 25 cents is thus the most cost effective fee for phasing out plastic bags.

The environmental benefit is valued at $1 per bag not littered, as modelled in the Consultation RIS. The social benefits have not been quantified and are therefore not included in this cost-benefit analysis. Business Cost Calculator findings are attached in Attachment B.

The ACG analysis found that the benefits of imposing a minimum charge on plastic bags would equate to between $177 and $204 million in present value terms for the period 2006–2016. Identified costs would be a total of $640–$822 million for the same period. Retailers would keep the revenue derived from charging for bags, thus defraying any costs associated with applying a charge.

While the net cost of a mandatory retailer charge is higher than that of a levy, the difference would be reduced if the funds raised were voluntarily donated to charitable causes rather than providing a subsidy to retailers.

An additional method of assessing the impact of this option is multi-criteria decision analysis, (Table 8) which aims to quantify the wider benefits, placing social, economic and environmental benefits on an equal basis.

Table 8: Multi-criteria decision analysis—mandatory retailer charge at 10, 20, and 25 cents

Criteria	RC 10¢	RC 20¢	RC 25¢
Socio-environmental impacts			
(a) 1. Reduce consumption of light weight plastic bags and associated non-renewable resources	3	4	5
(b) 2. Support behaviour change in other environmental resource and waste minimisation aims	3	3	3
(c) 3. Support community empowerment and facilitate consumer choice	5	5	5
Directly attributable environmental and amenity impacts			
(d) 4. Reduction in deliberate LWPB litter output (and associated environmental impacts)	4	4	5
(e) 5. Reduction in non-deliberate litter output (e.g. animals and windblown)	4	4	5
(f) 6. Reduce upstream (production related) environmental impact	4	4	5
Economic impacts			
(g) 7. Minimise economic impact on retailers	4	4	3
(h) 8. Minimise economic impact on consumers	3	2	3
(i) 9. Minimise other economic costs/ inefficiencies/ adverse incentives	1	1	2
TOTAL	**31**	**31**	**36**
Scale: 1-5 – 1 for poor performance through to 5 for high performance			

The scoring of this option reflects the anticipated social, environmental and economic outcomes as modelled by the ACG Supplementary Analysis. The detail of how these benefits have been generated and scored is outlined in *Phasing out lightweight plastic bags Supplementary Analysis February 2008* (The Allen Consulting Group). Table 8 indicates that a mandatory retailer charge at all price points scores very well in the environmental benefits while also scoring well for minimising the economic impact on retailers. Table 8 shows the impact of the increasing reduction in plastic bag use associated with the increasing price point has positive social and environmental outcomes. Since this option would significantly reduce plastic bag consumption, it is expected to significantly reduce bag litter.

Key benefits of a mandatory retailer charge at the point of sale are that it:

- provides a market instrument to phase out plastic bags
- addresses community concerns about the impact of plastic bags on the environment including:

  - visual amenity
  - wildlife and domestic species safety
  - resources used in plastic bags
  - resource efficiency and unnecessary consumption
  - a first step to stimulate behaviour change in the broader community for other more significant environmental issues
- maximises consumer choice because the community:
  - still has the choice of a plastic bag
  - can choose between a reusable bag and a single use bag
  - can avoid paying a fee by using other bags
- minimises impact on retailers
- provides retailers with the opportunity to voluntarily direct funds raised to environmental causes.

If plastic bag use is substantially reduced by a charge then the availability of shopping bags for secondary uses such as bin liners would be reduced. This may lead to greater purchase of purpose designed bin liners, although not necessarily to greater plastic use overall. The modelling assumes that one bin liner replaces seven shopping bags.

This option effectively addresses the Environment Protection and Heritage Council goal of phasing out plastic bags.

Table 9 provides a summary of compliance costs associated with the 10c, 20c and 25c mandatory retailer charge.

Table 9: Summary of compliance costs associated with the mandatory retailer charge
(see footnote 80 for details).

Option	Retail industry	Households	Government	Environment
Mandatory retailer charge of $0.10 *(ACG Scenario H)*				
Mandatory retailer charge of $0.10 applied at point of sale Aust. wide per annum: • total net cost $104m • average total cost/person $7 • average cost/littered $4	Business Cost Calculator one off cost estimates: $65.7m education and training $120m theft $29m increased transaction times/enforcement $29.01m in-store education, promotion and enforcement $1.71m Equipment modifications No additional administrative costs on an ongoing basis	Reduced consumption plastic bags Costs for: • consumption of alternatives • some purchase of bin liners	Increased Austn, state & local govt enforcement and monitoring expenses (modelled assumed a total of $99 000 across all 9 jurisdictions) Reduced litter clean-up expenses for state & local govt	86% reduction in litter 80% fewer bags sold 10c retailer charge will reduce the number of bags littered by 34.4 million and usage by 3.1 billion p.a.
Total Aust. wide Net PV -$645 million for 2009-2016;	Total Aust. wide economic cost for retailers, householders, state & local government -$822 million for 2009-2016			Total Aust wide environmental benefit $177 million for 2009-2016

Option	Retail industry	Households	Government	Environment
Mandatory retailer charge of $0.20 *(ACG Scenario I)*				
Mandatory retailer charge of $0.20 applied at point of sale Aust. wide per annum: • total net cost $125m • average total cost/person $8 • average cost/littered $4	Business Cost Calculator one off cost estimates: $65m education and training $120m theft $29m increased transaction times/enforcement $29.01m in-store education, promotion and enforcement $1.71m Equipment modifications No additional administrative costs on an ongoing basis	Reduced consumption plastic bags Costs for: • consumption of alternatives • some purchase of bin liners	Increased Austn, state & local govt enforcement and monitoring expenses (modelled assumed a total of $99 000 across all 9 jurisdictions) Reduced litter clean-up expenses for state & local govt	93% reduction in litter 90% fewer bags sold 20c retailer charge will reduce the number of bags littered by 37.2 million and usage by 3.5 billion p.a.
Total Aust. wide Net PV -$745 million for 2009-2016;	Total Aust. wide economic cost for retailers, householders, state & local government -$936 million for 2009-2016			Total Aust wide environmental benefit $191 million for 2009-2016
Mandatory retailer charge of $0.25 *(ACG Scenario J)*				
Mandatory retailer charge of $0.25 applied at point of sale Aust. wide per annum: • total net cost $60m • average total cost/person $5 • average cost/littered $3	Business Cost Calculator one off cost estimates: $65m education and training $120m theft $29m increased transaction times/enforcement $29.01m in-store education, promotion and enforcement $1.71m Equipment modifications No additional administrative costs on an ongoing basis	Reduced consumption plastic bags Costs for: • consumption of alternatives • some purchase of bin liners	Increased Austn, state & local govt enforcement and monitoring expenses (modelled assumed a total of $99 000 across all 9 jurisdictions) Reduced litter clean-up expenses for state & local govt	>95% reduction in litter >95% fewer bags sold 25c retailer charge will reduce the number of bags littered by >38 million and usage by >3.7 billion p.a.
Total Aust. wide Net PV -$436 million for 2009-2016;	Total Aust. wide economic cost for retailers, householders, state & local government -$640 million for 2009-2016			Total Aust wide environmental benefit $204 million for 2009-2016

The Plastics and Chemicals Industries Association (PACIA) have identified 13 companies that may be economically impacted by EPHC intervention to phase out plastic bags. Of these companies, PACIA believes that five will suffer a significant degree of impact, and eight will be impacted in a relatively minor way. These include raw materials and additives suppliers as well as bag manufacturers and importers. [117]

There are two plastic bag manufacturers in Australia that would be affected: Detmark and Andrew Kohn, with the former being the company likely to be more significantly impacted. Some detail of Detmark's situation is therefore provided to illustrate some of the impacts on industry that could arise from a phase out of plastic bags.

Detmark manufacture only checkout plastic bags, and are not tooled to manufacture other products. As the business is based on a cheap product produced at high volume, reduction in production volume raises unit prices - making it more difficult to compete against imported product. [118] A relatively small change in customer purchases from Detmark has been identified by them as being likely to result in the company being unviable. Indeed, they have reported that voluntary bag reductions achieved within Australia in recent years have already substantially negatively impacted on the business. Detmark directly employs 30-35 people. Raw polymer is sourced from Qenos, who manufacture polyethylene in Victoria, although Detmark also uses up to 40% recycled material. Unless alternative domestic or international markets are found for this post consumer and post industrial waste it is possible that landfilling of waste plastic would increase.

PACIA has in the past signalled that the industry may wish to seek structural adjustment to assist the industry to cope with changes brought on by bag regulation, and has noted that the National Packaging Covenant boosts the case for structural adjustment. PACIA's view is that it would be against the spirit of the voluntary Covenant - to which Detmark is a signatory - to externally regulate matters covered in the Covenant during the life of the Covenant.

The Covenant is of relevance here as it was extended to include plastic carry bags as a form of 'packaging' at a time when voluntary action on plastic bags was still being actively pursued by governments. The Retailers' Voluntary Code was included as Schedule 7 to the Covenant, however the Code expired in 2005, leaving only residual references to bags in the Covenant (such as the possibility of funding projects which measure the impacts and reduction in use of plastic bags).

6.4 OPTION 3: GOVERNMENT LEVY

A range of levies was modelled to explore the impacts of various price points on the economy and on plastic bag consumption rates. The three price points of 10, 20 and 25 cents were modelled to give the demand curve for plastic bags (see Figure 3). The Commonwealth Government is the only government with the power to impose such a levy. The Prime Minister has ruled out the imposition a federal levy on plastic bags.

Table 10: Cost-benefit analysis of Australian Government levy charge at 10, 20 and 25 cents[119]

Levy	Benefits (PV, $m)	Costs (PV, $m)	Net Cost (PV, $m)	Percentage reduction in plastic bag use
10c	177	-626	-449	80%
20c	191	-711	-521	90%
25c	204	-480	-276	99%+

[117] Correspondence with DEWHA, March 28, 2008
[118] Correspondence with DEWHA, March 27,2008
[119] ACG, Feb. 2008, Table 1.5, p 14

The costs are a function of quantity of bags purchased multiplied by their price. At 10 cents it is assumed that many consumers will choose to buy a plastic bag, thus the impact on consumers is high (as they are paying for many bags). At 25 cents, however, it is assumed that most consumers will use reusable bags most of the time, buying plastic bags only on rare occasions [120]. This means the impact on consumers is small as few bags are purchased. The 20 cent price imposes higher costs on consumers overall, as it is assumed that consumers will still buy a substantial number of bags at this price. The 25 cent fee is the most cost effective price level for phasing out plastic bags. Allen Consulting Group have shown that government enforcement costs are a minor component of the overall cost of plastic bag phase out measures.[121] Funds raised from a levy could potentially offset the Government administration costs.

Under this modelling scenario, the Australian Government levy is the most cost-effective of the four options. This is due to the depiction (within the MMRF-Green model, the economic tool used by Allen Consulting Group) of the previous option—the retailer charge—as a *de facto* subsidy that enables retailers to charge considerably more than the actual cost of plastic bags and keep the proceeds. This is a subsidy that erodes competition and efficiency in the economy. In contrast, the assumptions inherent in the modelling see the revenue raised from a government levy returned to the community in the most benign way possible (generally entered as a lump sum transfer to the household sector)[122]. A more likely scenario is that funds from a levy would flow to consolidated revenue. This would reduce the benefits of this option and reduce the difference between the levy and the mandatory charge options.

The environmental benefit is valued at $1 per bag not littered, as modelled in the Consultation RIS. The social benefits have not been quantified and included in this cost-benefit analysis. The levy imposes high costs on business for administration (record keeping), whereas a mandatory retailer charge would not require the same high level of compliance costs. Business Cost Calculator findings are in Attachment B.

The Allen Consulting Group analysis found that the benefits of imposing a government levy on plastic bags would equate to between $177 and $204 million in net present value terms for the period 2006–2016. The identified costs would be between a total of $480 and $626 million for the same period.

An additional method of assessing the impact of this option is multi-criteria decision analysis. Table 11 aims to quantify the wider benefits, placing social, economic and environmental benefits on an equal basis.

[120] Allen Consulting Group assumed 1 in 20 trips would result in the plastic bag purchase. See ACG 2008, p6.
[121] Allen Consulting Group (2008)
[122] Allen Consulting Group, Feb. 2008, p 14

Table 11: Multi-criteria decision analysis—Australian Government levy at 10, 20 and 25 cents

Criteria	GL 10¢	GL 20¢	GL 25¢
Socio-environmental impacts			
(j) 1. Reduce consumption of light weight plastic bags and associated non-renewable resources	3	4	5
(k) 2. Support behaviour change in other environmental resource and waste minimisation aims	3	3	3
(l) 3. Support community empowerment and facilitate consumer choice	5	5	5
Directly attributable environmental and amenity impacts			
(m) 4. Reduction in deliberate LWPB litter output (and associated environmental impacts)	4	4	5
(n) 5. Reduction in non-deliberate litter output (e.g. animals and windblown)	4	4	5
(o) 6. Reduce upstream (production related) environmental impact	4	4	5
Economic impacts			
(p) 7. Minimise economic impact on retailers	1	1	1
(q) 8. Minimise economic impact on consumers	3	2	3
(r) 9. Minimise other economic costs/ inefficiencies/ adverse incentives	1	1	2
TOTAL	**28**	**28**	**34**
Scale: 1-5 to 1 for poor performance through to 5 for high performance			

The scoring of this option reflects the anticipated social, environmental and economic outcomes as modelled by the ACG Supplementary Analysis. The detail of how these benefits have been generated and scored is outlined in *Phasing out lightweight plastic bags Supplementary Analysis February 2008* (The Allen Consulting Group). Table 11 indicates that a levy scores well on the social and environmental benefits but has more significant impacts on retailers. It also shows the impact of the increasing reduction in plastic bag use associated with the increasing price point has positive social and environmental outcomes. As this option would significantly reduce plastic bag consumption it is expected to significantly reduce bag litter.

A key disadvantage of this option is the administrative and reporting requirements placed on retailers. These would impact most heavily on small retailers.

Key benefits of this option are that it:

- provides a market instrument to phase out plastic bags
- addresses community concerns about the impact of plastic bags on the environment, including:
  - visual amenity
  - wildlife and domestic species safety
  - resource efficiency and unnecessary consumption
  - first step to stimulate behaviour change in the broader community for other more significant environmental issues
- maximises consumer choice because consumers:
  - still have the choice of a plastic bag
  - can choose between a reusable bag and a single-use bag
  - can avoid paying a fee by using other (eg reusable) bags
- provides the most cost-effective option as modelled in the ACG Supplementary Analysis
- as a single piece of legislation, it guarantees national consistency.

This option effectively addresses the EPHC goal of phasing out plastic bags.

Table 12 provides a summary of compliance costs associated with the 10c, 20c and 25c levy.

Table 12: Summary of compliance costs associated with the levy option
(see footnote 80 for details)

Option	Retail industry	Households	Government	Environment
Levy $0.10				
Levy of $0.10 applied at point of sale *ACG Scenario E* Aust.. wide per annum: • total net cost $68m • average total cost/person $5 • average cost/littered $3	Business Cost Calculator one off cost estimates: $65.7m education and training $120m theft $29m increased transaction times/enforcement $29.01m in-store education, promotion and enforcement $1.71m Equipment modifications Business Cost Calculator one off cost estimate: $55.9m additional administrative costs	Reduced consumption plastic bags Costs for: • consumption of alternatives • some purchase of bin liners	Reduced litter clean-up expenses for state & local govt Austn govt benefits associated with levy revenue	86% Reduction in litter 80% fewer bags sold 10c levy will reduce the number of bags littered by 34.4 million and usage by 3.1 billion p.a
Total Aust. wide Net PV -$449 million for 2009-2016;	Total Aust. wide economic cost for retailers, householders, state & local government -$626 million for 2009-2016			Total Aust. wide environmental benefit $177 million for 2009-2016
Levy of $0.20				
Levy of $0.20 applied at point of sale *ACG Scenario F* Aust. wide per annum: • total net cost $82m • average total cost/person $6 • average cost/littered $3	Business Cost Calculator one off cost estimates: $65.7m education and training $120m theft $29m increased transaction times/enforcement $29.01m in-store education, promotion and enforcement $1.71m Equipment modifications Business Cost Calculator one off cost estimate: $55.9m additional administrative costs	Reduced consumption plastic bags Costs for: • consumption of alternatives • some purchase of bin liners	Reduced litter clean-up expenses Austn govt benefits associated with levy revenue	93% reduction in litter 90% fewer bags sold 20c levy will reduce the number of bags littered by 37.2 million and usage by 3.5 billion p.a.
Total Aust. wide Net PV -$521 million for 2009-2016	Total Aust. wide economic cost for retailers, householders, state & local government -$711 million for 2009-2016			Total Aust. wide environmental benefit $191 million for 2009-2016
Levy of $0.25				
Levy of $0.25 applied at point of sale	Business Cost Calculator one off cost estimates: $65.7m ed and training $120m theft	Reduced consumption plastic bags Costs for:	Reduced litter clean-up expenses	>95% reduction in litter >95% fewer bags sold

Option	Retail industry	Households	Government	Environment
ACG Scenario G Aust. wide per annum: • total net cost $31m • average total cost/person $4 • average cost/littered $2	$29m increased transaction times/enforcement $29.01m in-store education, promotion and enforcement $1.71m Equipment modifications Business Cost Calculator one off cost estimate: $19.5m additional administrative costs	• consumption of alternatives • some purchase of bin liners	Austn govt benefits associated with levy revenue	25c levy will reduce the number of bags littered by >38 million and usage by >3.7 billion p.a
Total Aust. wide Net PV -$276 million for 2009-2016	Total Aust. wide economic cost for retailers, householders, state & local government -$480 million for 2009-2016			Total Aust. wide environmental benefit $204 million for 2009-2016

The Plastics and Chemicals Industries Association (PACIA) have identified 13 companies that may be economically impacted by EPHC intervention to phase out plastic bags.[123] Of these companies PACIA believes that five will suffer a significant degree of impact, and eight will be impacted in a relatively minor way. These include raw materials and additives suppliers as well as bag manufacturers and importers.

There are two plastic bag manufacturers in Australia that would be affected: Detmark and Andrew Kohn, with the former being the company likely to be more significantly impacted. Some detail of Detmark's situation is therefore provided to illustrate some of the impacts on industry that could arise from a phase out of plastic bags.

Detmark manufacture only checkout plastic bags, and are not tooled to manufacture other products. [124]As the business is based on a cheap product produced at high volume, reduction in production volume raises unit prices - making it more difficult to compete against imported product. A relatively small change in customer purchases from Detmark has been identified by them as being likely to result in the company being unviable. Indeed, they have reported that voluntary bag reductions achieved within Australia in recent years have already substantially negatively impacted on the business. Detmark directly employs 30-35 people. Raw polymer is sourced from Qenos, who manufacture polyethylene in Victoria, although Detmark also uses up to 40% recycled material. Unless alternative domestic or international markets are found for this post consumer and post industrial waste it is possible that landfilling of waste plastic would increase.

PACIA has in the past signalled that the industry may wish to seek structural adjustment to assist the industry to cope with changes brought on by bag regulation, and has noted that the National Packaging Covenant boosts the case for structural adjustment. PACIA's view is that it would be against the spirit of the voluntary Covenant - to which Detmark is a signatory - to externally regulate matters covered in the Covenant during the life of the Covenant.

The Covenant is of relevance here as it was extended to include plastic carry bags as a form of 'packaging' at a time when voluntary action on plastic bags was still being actively pursued by governments. The Retailers' Voluntary Code was included as Schedule 7 to the Covenant, however the Code expired in 2005, leaving only residual references to bags in the Covenant (such

[123] Correspondence with DEWHA, March 28, 2008
[124] Correspondence with DEWHA, March 27,2008

as the possibility of funding projects which measure the impacts and reduction in use of plastic bags).

6.5 OPTION 4: BAN ON PLASTIC BAGS

Table 13: Cost-benefit analysis of Australian ban[125]

Ban	Benefits (PV, $m)	Costs (PV, $m)	Net Cost (PV, $m)	Percentage reduction in plastic bag use
	204	-782	-578	Modelled as 100%, but exemptions would reduce this substantially

For a summary of the Business Cost Calculator see Appendix B. Full details can be found in *Phasing out lightweight plastic bags Supplementary Analysis February 2008* (The Allen Consulting Group).

In comparison to the other options, the ban would place a significant enforcement burden on government due to the difficulty in identifying and enforcing non-compliance. The likely number of retailers to whom the ban would apply and the range of potential exemptions may make 'normal' compliance enforcement complex. It may also be well beyond the scope of current resourcing levels.

In terms of environmental impacts, this option partially addresses the resource efficiency issues by:

- reducing the consumption of single-use plastic bags (this has implications for energy use as well as the use of raw materials for plastic bags)
- encouraging the use of long-life bags, although the free availability of bags exempted from a ban would reduce the extent to which long-life bags are encouraged
- addressing community concerns about the impact of plastic bags on the environment.

This option has the capacity to reduce the litter problem as it would reduce the consumption of bags, however the residual bags provided for health and safety reasons will still be available to be littered. Many of these would be provided for transactions most likely to result in bag litter (eg for food consumed away from home) thereby weakening the ban's capacity to reduce plastic bag litter.

It should also be noted that a ban is a 'blunt instrument' for achieving the objective of reducing the environmental impact of plastic bag litter. A market-based mechanism such as a mandated retailer charge would be a more efficient means of achieving the stated objectives. As indicated above, bans are generally reserved for those products that pose a significant risk to human health and the environment. Products that have been banned include Dichlorodiphenyltrichloroethane (DDT) and Polychlorinated biphenyls (PCBs), which have had demonstrated impacts on human health and the environment due to toxicity, persistence, and bioaccumulation.

An additional method of assessing the impact of this option is multi-criteria decision analysis. Table 14 aims to quantify the wider benefits, placing social, economic and environmental benefits on an equal basis.

[125] ACG, Feb. 2008, Table 1.5, p 14

Table 14: Option 4: Ban on plastic bags from 2009

Criteria	Ban
Socio-environmental impacts	
1. Reduce consumption of light weight plastic bags and associated non-renewable resources	5
2. Support behaviour change in other environmental resource and waste minimisation aims	1
3. Support community empowerment and facilitate consumer choice	2
Directly attributable environmental and amenity impacts	
(s) 4. Reduction in deliberate LWPB litter output (and associated environmental impacts)	5
(t) 5. Reduction in non-deliberate litter output (e.g. animals and windblown)	5
(u) 6. Reduce upstream (production related) environmental impact	5
Economic impacts	
(v) 7. Minimise economic impact on retailers	1
(w) 8. Minimise economic impact on consumers	2
(x) 9. Minimise other economic costs/ inefficiencies/ adverse incentives	1
TOTAL	**27**
Scale: 1-5 – 1 for poor performance through to 5 for high performance	

The scoring of this option reflects the anticipated social, environmental and economic outcomes as modelled by the ACG Supplementary analysis. The detail of scoring of how these benefits have been generated and scored is outlined in *Phasing out lightweight plastic bags Supplementary Analysis February 2008* (The Allen Consulting Group). Table 14 indicates that this option scored well on the social and environmental aspects, but poorly on the economic aspects.

The imposition of a ban removes consumer choice about plastic bag usage. Consumers can become disconnected from the impact of the ban and therefore the opportunity for consumers to feel encouraged to take on further environmental changes to their behaviour may be diluted or removed.

This option provides a significant step towards phase out of plastic bags but is not considered to be as effective at achieving the EPHC goal of phase out as the market based mechanisms.

Table 15 provides a summary of compliance costs associated with the ban option.

Table 15 Summary of compliance costs associated with the ban option
(see footnote 80 for details).

Option	Retail industry	Households	Government	Environment
Ban ***ACG Scenario B*** Aust. wide per annum: • total net cost $78m • average total cost/person $5 • average cost/littered $3	Business Cost Calculator one off cost estimates: $23m education and training $42m theft $10.2m increased transaction times/enforcement $10.2m in-store education, promotion and enforcement No additional administrative costs on an ongoing basis	Reduced consumption plastic bags Costs for: • consumption of alternatives • some purchase of bin liners	Increased Austn, state govt administrative expenses for monitoring and enforcement (modelled assumed a total of $99 000 across all 9 jurisdictions) Reduced litter clean-up expenses	80% reduction in litter 80% fewer bags sold bags A ban will reduce the number of bags littered by 32 million and used by 3.1 billion p.a
Total Aust. wide Net PV -$578 million for 2009-2016	Total Aust. wide economic cost for retailers, householders, state & local government -$782 million for 2009-2016			Total Aust. wide environmental benefit $204 million for 2009-2016

The Plastics and Chemicals Industries Association (PACIA) have identified 13 companies that may be economically impacted by EPHC intervention to phase out plastic bags.[126] Of these companies PACIA believes that five will suffer a significant degree of impact, and eight will be impacted in a relatively minor way. These include raw materials and additives suppliers as well as bag manufacturers and importers.

There are two plastic bag manufacturers in Australia that would be affected: Detmark and Andrew Kohn, with the former being the company likely to be more significantly impacted. Some detail of Detmark's situation is therefore provided to illustrate some of the impacts on industry that could arise from a phase out of plastic bags.

Detmark manufacture only checkout plastic bags, and are not tooled to manufacture other products. [127]As the business is based on a cheap product produced at high volume, reduction in production volume raises unit prices - making it more difficult to compete against imported product. A relatively small change in customer purchases from Detmark has been identified by them as being likely to result in the company being unviable. Indeed, they have reported that voluntary bag reductions achieved within Australia in recent years have already substantially negatively impacted on the business. Detmark directly employs 30-35 people. Raw polymer is sourced from Qenos, who manufacture polyethylene in Victoria, although Detmark also uses up to 40% recycled material. Unless alternative domestic or international markets are found for this post consumer and post industrial waste it is possible that landfilling of waste plastic would increase.

PACIA has in the past signalled that the industry may wish to seek structural adjustment to assist the industry to cope with changes brought on by bag regulation, and has noted that the National Packaging Covenant boosts the case for structural adjustment. PACIA's view is that it would be against the spirit of the voluntary Covenant - to which Detmark is a signatory - to externally regulate matters covered in the Covenant during the life of the Covenant.

The Covenant is of relevance here as it was extended to include plastic carry bags as a form of 'packaging' at a time when voluntary action on plastic bags was still being actively pursued by governments. The Retailers' Voluntary Code was included as Schedule 7 to the Covenant, however the Code expired in 2005, leaving only residual references to bags in the Covenant (such as the possibility of funding projects which measure the impacts and reduction in use of plastic bags).

7 RESPONSE TO THE CONSULTATION RIS

The Consultation RIS was released in January 2007 for public comment. A total of 251 public submissions were received. A summary of public submissions is included in Appendix A.
Prior to this, extensive consultation was undertaken between governments and other stakeholders in 2002 through the Plastic Bag Working Group. This included discussions between government officials and the major Australian manufacturers of plastic bags on the impacts of further reductions in demand for single-use plastic bags, brought about either by further regulation or voluntary action. In addition, the Plastics and Chemicals Industries Association has been an observer in the working group discussions that led to the development of the draft voluntary plastic bags phase-out agreement considered by the Environment Protection and Heritage Council in 2005. Details about these activities along with environment group interaction were discussed in the previous Consultation RIS.

[126] Correspondence with DEWHA, March 28, 2008
[127] Correspondence with DEWHA, March 27,2008

Substantial consultations with retailers over the development and implementation of the Australian Retailers Association's Voluntary Code, which aimed to reduce bag use by 50% between 2002 and 2005 were also held.

7.1 STAKEHOLDER REPRESENTATION

Of the 251 submissions received, 212 were part of a campaign organised by Environment Victoria. The remainder (39) were from a mixture of environmental (10, including the campaign submission from Environment Victoria with 212 campaign letters) and community bodies (6) industry associations, retailers, plastic bag manufacturers (11) and members of the public (12). The submissions provide a good sample of key stakeholder views.

7.2 THE OPTION PREFERRED BY SUBMISSIONS

Opinion was divided as to the preferred option. All of the campaign letters (212) called for regulatory action. Of the remaining submissions, 23 favoured some sort of regulatory action, 12 supported no further action and 4 did not call for any specific action. No submissions supported a litter based option as their first choice. Where a litter option was supported, this was as a supplementary measure to their preferred option.

The most supported option for further action, a national levy imposed by governments, was not one of the two preferred by the Consultation RIS. The suggested fee for the levy varied from five cents to fifty cents. Many of the submissions argued the levy should be imposed by the Australian Government, with the revenue raised to be hypothecated for environmental measures.

Some submissions suggested a combination of a levy and a ban be used.

All but one of the 'no further action' submissions suggested litter clean up should be pursued instead and considered that action should focus on all types of litter not just plastic bags.

8 EVALUATION OF OPTIONS/CONCLUSION

The case for government intervention is based on the existence of market failures and the community's expectations of intervention. It acknowledges the political context where governments have committed to phase out plastic bags.

8.1 MARKET FAILURE

A role exists for government to address the market failures outlined in the Statement of the Problem. The primary rationale for government intervention lies in the externalities associated with littered plastic bags. A littered plastic bag creates a negative externality because it imposes costs on parties other than the person who disposed of it, i.e. the full cost of littering is not borne by the person doing the littering. As discussed in the Statement of the Problem, these costs can include environmental damage, loss of aesthetic value and damage to recreational equipment. Government intervention targeted at reducing littering of plastic bags will produce a more efficient allocation of resources than the market, providing that the benefits of intervention outweigh the costs.

Information asymmetries also exist in the market for plastic bags, whereby consumers do not have full information on the goods they are purchasing. The cost of plastic bags is amortised across the cost of groceries generally, making them seem free of charge. This pricing arrangement provides no monetary incentive for consumers to reduce their bag use.

8.2 COMMUNITY EXPECTATIONS OF INTERVENTION

There is community support for the government to intervene to take action on plastic bags. This was demonstrated during the public consultation phase of the RIS process, and in survey results reported elsewhere in this RIS. The majority of submissions to the Consultation RIS asked the government to transfer the cost burden for plastic bag consumption and resultant litter to those who use and consume bags (what could be termed a user pays approach).[128] As discussed in the

[128] 23 submissions in favour of further action, 11 in support of no further action.

Statement of the Problem, public demand for action on plastic bags is based not only on the externalities associated with littered bags, but also on the perception that plastic bags are symbolic of a wasteful, throw-away society. Whilst the economic rationale for government intervention is based on littering, there is community demand for action on the broader issue of consumption.

8.3 COUNCIL COMMITMENTS TO TAKE ACTION

The EPHC has been committed to action on plastic bags since 2002. During this time ministers have reiterated their commitment to phase-out of lightweight single use plastic bags.

9 EVALUATION OF OPTIONS

A comparison of each option's environmental benefit and economic costs is provided in Table 16.

Table 16: Comparison of Net Costs

Scenario Description	Environmental Benefit ($m, PV)	Economic Cost ($m, PV)	Net cost ($m, PV)	Total cost per littered plastic bag ($)	Total cost per person ($)	Annual net cost (from 2010) ($)
Base case	0	0	0	0	0	0 m
Ban	204	-782	-578	-3	-5	-78 m
10c Government levy	177	-626	-449	-3	-5	-68 m
20c Government levy	191	-711	-521	-3	-6	-82 m
25c Government levy	204	-480	-276	-2	-4	-31 m
10c Mandatory retailer charge	177	-822	-645	-4	-7	-104 m
20c Mandatory retailer charge	191	-936	-745	-4	-8	-125 m
25c Mandatory retailer charge	204	-640	-436	-3	-5	-60 m
Targeted litter strategy*	102	-102	0	< -1	<- 1	-9.6m

Note: Costs and benefits for Enviro. Benefit ($m, PV), Econ. Cost ($m, PV) and Net ($m, PV) are calculated in comparison to the 2007 revised base case (see Allen 2008 for more information).

Note: As costs and benefits vary from year to year, the estimates presented in Total cost per littered LWPB ($), Total cost per person ($) and Annual net cost ($) are approximate averages calculated over the period 2010 to 2016. The year 2009 is excluded, because this is the implementation year for all of the scenarios, and there will be significant one-off start-up costs that are not representative of the on-going costs of the scenarios.

*This is the cost of the litter option rather than the modelled net cost to the economy.

From Allen Consulting Group 2008

From Table 16 it can be seen that all options involve costs that substantially outweigh the costed benefits. It has been argued by the Office of Best Practice Regulation (OBPR) that these costs are out of proportion to the benefits, however according to Allens Consulting Group, the analysis has not rigorously costed all social issues.

OBPR have also noted that threshold analysis could be employed to determine the merits of governments intervening on plastic bags. Threshold analysis answers the question: how small could the value of the non-quantified benefits be (or how large would the value of the non quantified costs need to be) before the proposed intervention would yield zero net benefits? In other words, if the social elements have a higher value than the net cost, then action is warranted. This RIS leaves it up to decision makers to decide whether action is warranted in this case.

While the litter option is described as the economic 'net benefit option' this RIS has already noted that it is more likely to be cost neutral. It should also be noted that none of the options in this RIS have been designed from the perspective of maximising the net benefit to the community. Rather, they have aimed to fulfil the three criteria of addressing the market failure, responding to community expectations of intervention and giving effect to EPHC's commitment to phase out plastic bags by 2009.

A summary of the multi criteria decision analysis of options is provided in Table 17.

Table 17: Multi-criteria decision analysis—summary of options

Criteria	Base case	Retailer charge 10¢	Retailer charge 20¢	Retailer charge 25¢	Levy 10¢	Levy 20¢	Levy 25¢	Ban	Litter Strategy.
Socio-environmental impacts									
(y) 1. Reduce consumption of light weight plastic bags and associated non-renewable resources	1	3	4	5	3	4	5	5	2
(z) 2. Support behaviour change in other environmental resource and waste minimisation aims	2	3	3	3	3	3	3	1	3
(aa) 3. Support community empowerment and facilitate consumer choice	3	5	5	5	5	5	5	2	3
Directly attributable environmental and amenity impacts									
(bb) 4. Reduction in deliberate LWPB litter output (and associated environmental impacts)	1	4	4	5	4	4	5	5	4
(cc) 5. Reduction in non-deliberate litter output (e.g. animals and windblown)	1	4	4	5	4	4	5	5	5
(dd) 6. Reduce upstream (production related) environmental impact	2	4	4	5	4	4	5	5	1
Economic impacts									
(ee) 7. Minimise economic impact on retailers	4	4	4	3	1	1	1	1	5
(ff) 8. Minimise economic impact on consumers	5	3	2	3	3	2	3	2	5
(gg) 9. Minimise other economic costs/ inefficiencies/ adverse incentives	5	1	1	2	1	1	2	1	4
TOTAL Scale: 1-5 – 1 for poor performance through to 5 for high performance	**24**	**31**	**31**	**36**	**28**	**28**	**34**	**27**	**32**

The litter amelioration option has been designed to provide an economic net benefit option, and thus aims to achieve an outcome which is proportionate to the costs. By improving litter management infrastructure and potentially influencing littering behaviour, the initiative also has the potential to reduce other forms of litter.

The litter option reduces the environmental impacts of litter, but does not do so through an economic mechanism directed at consumers. Thus the market failure continues: bags are still being littered because they are not sufficiently valued. The cost of the littered bag is borne by the community generally through governments and volunteers and not by the litterer.
The 50% reduction in litter only partially meets the EPHC goals, in that it does not phase out plastic bags and makes only a 50% contribution to reducing the impacts of bags on the environment. The option also does not fully respond to the community's desire for government action to reduce the use and impacts of plastic bags.

A mandatory retailer charge constitutes an effective method of significantly reducing the consumption of plastic bags. A retailer charge addresses the market failure by pricing bags to better take into account the environmental externalities associated with plastic bag litter. This

higher price of bags should be reflected in reduced litter rates. A mandatory retailer charge also effectively addresses community concern about reducing the impact of plastic bags on the environment.

A mandatory retailer charge is clear and relatively simple to administer by governments and implement by retailers and the public. A mandatory retailer charge offers a self-sustaining mechanism that requires minimal government intervention.
The mandatory retailer charge is the option which scores highest in the multi-criteria decision analysis (Table 17) based on its good performance in delivering on a broader range of environmental, social and economic criteria.

Of the three different levels of charge that have been modelled, both as a mandatory retailer charge or a levy, the 25 cent fee is the level with least cost to the economy. These economic instruments will also most effectively deliver the goal of a plastic bag phase out.

The mandatory retailer charge is not the cheapest overall in terms of net cost to the economy. This is because the economic modelling assumes that the funds raised through sale of plastic bags are a subsidy to retailers, and a subsidy is considered a negative disruption to the economy. The difference between the overall economic costs of a retailer charge and those of a levy would be diminished if the retailers were to voluntarily donate funds raised to support environmental causes.

As a corollary, the modelling also assumes that in the case of a levy the funds are passed benignly back to the community (as a transfer payment). It is policy that non cost-recovery levies go to Consolidated Revenue. Consolidated revenue can be used to fund a range of activities, including substantial direct expenditure by government, as opposed to transfer payments like unemployment benefits, Such spending, if not directly addressing a market failure, can distort the allocation of resources, removing the benign impact on the economy.

Although an Australian Government levy is a cheaper option overall, it would subject retailers to increased costs for compliance. The administrative burden on small retailers in this respect would be significant. Governments would also have increased administration costs under this option. Government Consolidated Revenue would benefit, however, from any funds generated by the levy. This option would effectively address community concern about reducing the environmental impact of plastic bag. The option does not score as well based on the broader range of criteria included in the multi-criteria decision analysis.

To most effectively achieve the Environment Protection and Heritage Council goal of phase-out, the analysis indicates that the most suitable options are a mandatory retailer charge and a levy.
A total ban on bags would be an effective option, but is amongst the most expensive modelled. A total ban of plastic bags would be out of proportion to the extent of the problem, in comparison to other more life threatening objects such as drugs and firearms.

While the economic modelling for this RIS assumes a total ban i.e. a 100% reduction in bag use, in practice there would be a need for bags to be exempted for a variety of health and safety purposes. A ban would not in practice create a higher consumer value on plastic bags (because exempted bags would be supplied at no charge). Exemptions will mean that bags will still need to be supplied at point of sale, and thus the market failure is not addressed. A ban therefore will not achieve total elimination of bags, and it is likely to be less effective in practice at phasing out plastic bags than either the levy or mandatory retailer charge. It therefore only partially addresses the community's desire for government intervention, as well as only partially meeting the EPHC's commitment to phasing out plastic bags.

The option also removes much of the element of choice in bag use, as it is not a market-based approach and needs to be prescriptive. As a result it would be more complex in defining exemptions and exclusions.

9.1 CONCLUSION

The litter amelioration option is the net economic benefit option. While the cheapest option, the litter option is not the most effective at addressing the market failure, the community desire for action, nor the EPHC's commitments to phase out plastic bags.

If a mandatory retailer charge is selected as the preferred mechanism 25c has been modelled as being cheaper for the economy than the 10 or 20c options. It should also be noted that this option has least impact on business of the regulatory options and scores best in the Multi Criteria Decision Analysis which takes into account a broader scope of variables than Cost Benefit Analysis. Options that substantially reduce plastic bag consumption have a greater chance of reducing plastic bag litter. This is particularly the case where an economic signal makes consumers think before purchasing otherwise 'free' plastic bags.

Regardless of which option is chosen, its implementation will require regular review to ensure continuing effectiveness and to minimise any unintended adverse impacts. For all options, the level of effectiveness has been estimated and is not certain. In the case of the economic instruments, we are able to draw conclusions about likely effectiveness from overseas experience, and that from Australian retailers who already charge for bags. In the case of a ban (involving exemptions) and the litter strategy, however, we have very little data on which to base assumptions, and thus the results of these options are more uncertain.

ACRONYMS

ACG	The Allen Consulting Group
ANRA	Australian National Retailers Association
ARA	Australian Retailers Association
ARA code	*Australian Retailers Association code of practice for the management of plastic shopping bags, 2003–05*
DEH	Department of the Environment and Heritage
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPHC	Environment Protection and Heritage Council
GDP	gross domestic product
HDPE	High-density polyethylene
LDPE	Low-density polyethylene
MP	Member of Parliament
NEPM	National Environment Protection Measure
NGOs	non-government organisations
NPCC	National Packaging Covenant Council
NPV	net present value (see glossary for explanation)
RIS	Regulatory Impact Statement

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APPENDIX A: PLASTIC BAG CONSTULTATION RIS SUBMISSIONS

Comments made in submissions have been examined entirely on the cogency of points raised. No subjective weighting has been given to any submission for reasons of its origin or any other factor that would give cause to elevate the importance of any submission above another.

In addition, a number of identical campaigns submissions were received on behalf of Environment Victoria (submission numbers 12, 13, 14, 15, 16, 17, 18, 19 ,20 ,21 , 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 80, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129-139, 141-189, 204,205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 232, 233, 234, 235, 236). For ease of reference, these submissions have been cited as 'Campaign'.

For the purposes of this document submission comments have been grouped into eight categories:

1. The content of the Discussion Regulatory Impact Statement
2. Definition of a plastic bag – Which bags should be the subject of concern?
3. Exemptions
4. Implementation Issues
5. Role of degradable bags
6. Manufacturer and Retailer Impacts
7. Litter related comments
8. Other issues

A.1 THE CONTENT OF THE REGULATORY IMPACT STATEMENT

A.1.1 Issues

Submissions made a range of comments about the content of the Discussion Regulatory Impact Statement (RIS), including the interpretation of the economic analysis and the factual interpretation. None of the comments were substantive in nature, but views were divided as to the scope of the plastic bag problem. For example some questioned whether the RIS had addressed the correct issue, arguing that plastic bag litter should be broadened to more general litter [6, 198, 238, 240] or that litter is likely to be under estimated [11, 194]. Others cited additional plastic bag litter information that supported the need for further plastic bag reductions [192, 228].

A few industry submissions considered that the document "failed" to show due cause for further intervention on plastic bags or that the document tone was one of "presumption" and as a result the scenarios were wrongly targeted [6, 149, 229, 238, 240]. One non-government organisation (NGO) considered that not enough priority had been given to the environmental impact of plastic bags [202].

A small cross section of submissions questioned the validity of some of the data used in the impact statement [6, 190, 194, 228] or suggested that the Consultation RIS did not satisfy the objective of examining "alternative solutions" [6, 140, 198, 230, 240]. One NGO considered the litter costings to be conservative [196], another that the environment was presented as less of a priority to human considerations [202].

Some retail industry submissions and one NGOs suggested the definition of the environmental problems needed reframing to focus on reducing litter more generally [6, 190, 198, 230, 240].
A few submissions also argued that wildlife deaths were exaggerated or misquoted [6, 140, 195], that impacts on one individual animal is difficult to extrapolate to an entire population [238] or

that deaths are more likely to reflect plastic based marine debris more generally rather than plastic bags specifically [11, 228].

Additional information or data on plastic bag social and environmental impacts was provided by a small number of submissions [1, 8, 10, 11, 230]. Other impacts occurring within stores and at the checkout [9, 194, 198, 200] were also raised. These included manual handling problems, cleanliness and safety of reusable bags for checkout operators, extended delays at the checkout, the use of alternative packaging or a switch to paper bags instead.

NGOs also raised the broader issue of using a petroleum based product given increasing climate change concerns [7, 192, 194, 201, 202, 230]. These submissions considered plastic bags to be an inappropriate use of dwindling petroleum resources which were also contributing to global warming.

A.1.2 Response

The measures being canvassed in the Consultation RIS were designed to be additional to broad litter reduction initiatives implemented by jurisdictions. The discussion was solely framed around the plastic bag portion of the litter stream. The *Statement of the Problem*, Section 3 of the Consultation RIS used information from the National Litter Index, Clean Up Australia Day tallies and other similar community activities relating to plastic bag numbers. It is however recognised that in seeking to reduce the amount of plastic bag litter, more general litter is likely to be reduced.

All comments concerning the validity of data used in the modelling were referred to The Allen Consulting Group who have reiterated their soundness. A detailed response from ACG's forms Chapter 5: "Module five- responses to public submission" in their Phasing out lightweight plastic bags Supplementary Analysis February 2008.

With regard to comments about the marine debris impacts on wildlife, data from annual reports from the Queensland Environmental Protection Agency marine wildlife stranding and mortality database has been used. In addition, the marine debris expert nominated in submissions, Dr Colin Limpus, has been contacted.

Dr Limpus confirmed that plastic bags do occur as marine litter but are only a portion of a wide variety of marine debris made from plastic. Dr Limpus advised that other plastics are also a major concern in terms of choking or blocking the guts of turtles found stranded. Regarding turtles and mammals found out in the ocean, he cautioned that the contents of their stomachs are not necessarily from Queensland, they could be from ships or other countries. Additionally he stated that biodegradable bags do not break down in the guts of turtles because of the anti-wetting agents in the bags themselves. (Issues concerning this type of bag are discussed later in section five of this document.)

The Australian Government has recognised the significance of plastic marine debris, listing it as a Threatening Process to marine animals under the *Environment Protection and Biodiversity Act 1999*. In accordance with this Act, a Threat Abatement Plan is being prepared for plastic marine debris. The Plan:

> must provide for the research, management and other actions necessary to reduce the key threatening process concerned to an acceptable level in order to maximise the chances of the long-term survival in nature of native species and ecological communities affected by the process.[129]

Any action agreed by the Environment Protection and Heritage Council to manage plastic bags supply and distribution would be complemented by this Threat Abatement Plan.

[129] Environment Protection and Biodiversity Conservation Act 1999 s 271 sub s 1.

Concerning the social benefits and social outcomes covered by the Consultation RIS, the difficulties in quantifying these are acknowledged. Further research into plastic bag litter was undertaken on current national plastic bag reduction levels including the geographical spread of theses reductions to establish whether the level of social benefit generated by reductions has been uniform. These results have been incorporated into the final RIS and whether the social costs from undertaking further action would be equally borne by all. The Consultation RIS' economic analysis did however apply charges for other costs such as administration, infrastructure, training, theft etc, to each of the scenarios. Figures used were based on information supplied by industry the Australian Bureau of Statistics.

A.2 DEFINITION OF A PLASTIC BAG – WHICH BAGS SHOULD BE THE SUBJECT OF CONCERN?

A.2.1 Issues

The type of bags targeted in the Consultation RIS were generally understood to be plastic 'supermarket' or 'singlet' type bags. Submissions which offered definitions of these bags, focused on their structure (such as bags made of specified material and 'with handles' so as to exclude barrier bags) [194, 198, 224] or their material (high density polyethylene) or their function [79, 199, 200, 238]. For example one definition offered was "single use light weight plastic high density polyethylene (HDPE) bags designed for the general carriage of goods by consumers, commonly referred to as 'singlet bags' (and does not include non-handled cross-contamination/barrier bags)" [238]. Another submission argued that the definition should be based on the "thickness or other physical attributes," as in South Africa [228]. Some submissions argued that the definition should be broader and include bags made from both HDPE and low density polyethylene (LDPE) – the latter being the thicker and more substantial department store bags [11, 196, 228] or not include any type of bag [229]. Comment on the definition of the 'target' bags also included discussion of bag categories that should be exempted from any regulation (discussed separately below).

Overall, the submissions pointed to the need to be aware of the material properties of bags, their construction and their function, as relevant issues in arriving at a definition.

A.2.2 Response

All of the descriptors of the target bags capture important possible elements of the definition and it is accepted that, whichever option is adopted, it is important that a commonly agreed definition is achieved. Based on the feedback received, the following working definition has been adopted:

> A plastic bag is a carry bag, the body of which comprises polymers in whole or part, provided by a retailer for the carrying or transporting of goods, but does not include a carry bag which complies with prescribed design criteria.

Some overseas examples have prescribed the material used, in this case HDPE and/or the thickness of the plastic; some have even included a nominated bag size. However, such an approach does not come without potential loopholes and considerable enforcement difficulties. For example the definition would need reviewing to establish whether technology had produced new designs and materials.

A.3 EXEMPTIONS

A.3.1 Issues

A number of submissions expressed views about whether some bags should be exempted from the regulation options being considered. One retail industry group felt there was some argument to allow bags as a 'barrier' to prevent contamination or as airport duty free bags like the Irish legislation but that on the whole any exemptions were impractical [229]. Some non-government organisations thought there was grounds for exemptions in order to protect the user from hot foods [199, 202]; other NGOs and one local government submission took the opposite view [79, 192, 194]. Some submissions accepted the need for exemptions [78], others stated that they were unnecessary [192]. Some warned against giving exemptions in areas [Campaign], such as take

away food, where it is known that the risks of littering are the greatest [79]. A number of submissions argued for exempting biodegradable bags. This issue is discussed in Section 5 – Role of degradable bags.

A.3.2 Response

If a regulatory option were adopted (such as a ban or charge), it is accepted that any exemptions would need to be clearly identified. This would need to be specified in the regulation and reviewed periodically to allow for any changes in technology.

In considering exemptions, it will be necessary to strike a workable balance between health and safety issues and exempting to minimise the potential for the bag to become litter. A large number of exemptions could negate the effective of a regulations as well as limiting the effectiveness of enforcement.

A.4. IMPLEMENTATION ISSUES

A.4.1 Issues

Submissions supported a range of options for the implementing a phase out of plastic bags: 12 favoured no action other than voluntary measures to reduce plastic bag use; 23 supported legislative approaches (12 supporting a tax, 6 supporting a ban and 5 supporting a combination of a ban and a tax) ; a remaining four were not clear. Submissions opposed to a legislative phase out tended to be from industry. They made the point that plastic bags had a range of secondary uses such as to contain litter or as bin liners [2, 195, 229, 238]. Bag manufacturers indicated that the phase out of plastic bags would lead to the use of more bags made of other material, with paper bags having a larger environmental footprint than HDPE [10, 195].

Only a small number of submissions commented on the use of penalties (fines) as a deterrent for plastic bag littering. Two supporters of further action thought penalties should also be increased in order to curb plastic bag littering behaviour [10, 196] and another two opposed any increase in penalties [7, 228] while one degradable bag manufacturer who opposed further legislation did support stronger litter laws [195]. Overall there was support for a legislative response on the grounds that voluntary measures would not lead to phase out.

Submissions supporting legislation focused mainly on a phase out through a ban or though a charge, though some submissions supported a ban on the target plastic bags with a levy (charge) on bags that were not banned [79, 90]. Of the 23 submissions favouring legislation (mix of NGO, individuals, local government as well as Campaign), 13 supported a national levy, six supported a ban. Five submissions supported a combination of a levy and ban. Where a charge was supported, submissions argued that the charge set for the bag would need to be reviewed and kept at a sufficiently high figure to make it a real disincentive to purchasing a bag. 25 cents was suggested in some submissions; less in others [194, 197].

A number of submissions were opposed to the idea that the retailers kept any money received from a charge on plastic bags and argued that it should be channelled into environmental purposes [Campaign, 90, 194]. As a general point relating to legislation, one submission stated the need to ensure that any models developed across Australia should comply with the accepted principles of good regulation [238].

A.4.2 Response

The range of preferences and reasons are acknowledged. There was some confusion between an option that imposed a tax (levy) and a mandated charge. The mandated charge was often described as a 'levy' by submissions. As stated in the Consultation RIS, a mandated charge would be imposed through State or Territory legislation and the retailer would retain any monies received. This is a consequence of constitutional limitations on the taxing powers of States and

Territories, who could not collect the money or direct how it might be spent. The situation would be different if the chosen option were implemented by Commonwealth legislation. A levy could be imposed as an environmental tax, collected by government and used as it saw fit. The other legislative option of a phase out by banning plastic bags would also need to be implemented individually by States and Territories.

If a mandatory charge was adopted, the key issue would be: setting the charge at the right amount to act as a incentive to achieve regular use of alternative bags. As the Consultation RIS observed:

> The quantum of the levy would need to be established and the price elasticity understood. The levy would need to be large enough to make the consumer think about whether they need the plastic bag or not – or whether alternatives such as reusable bags are more attractive. For example, if a reusable bag costs $1.00 and, on average, a reusable bag replaces four plastic bags, then the levy would need to be in the order of $0.25 per bag.[130]

Consumers can become conditioned to paying the fee so it may be necessary to increase it over time. This has been the case in Ireland.

A ban on bags would have the most immediate impact, however there are issues to consider such as shoppers who don't have an alternative or 'green' bag with them and press for exemptions. As with other options, the potentially perverse outcome arising from substitution with different types of bags e.g. replacing plastic with paper bags or the heavier LDPE bags, will need to be considered as well as increased use of other plastic bags for bin liners and storage.

A.5. ROLE OF DEGRADABLE BAGS

A.5.1 Issues

Submissions that referred specifically to degradable plastics were generally from representatives of non-government organisations and individuals, with a small number of submissions from local government and the plastics industry. The majority expressed support for there being no degradability based exemptions to any regulation to reduce the environmental impacts of plastic bags [1, 79, 192, 193, 197, 227, 230]. Others were only in favour of exemptions for degradable bags that meet appropriate standards [3, 231, 11, 196, 200, 200, 228]. As Australian performance standards are currently in place for biodegradability of plastic in commercial compost, these tended to favour exemptions for biodegradable bags.

Submissions from the plastics industry expressed the view that degradable plastics had been given inadequate attention in the Consultation RIS. They noted the merits of exemptions for degradable plastics bags [10, 198] particularly for those bags able to meet standards [10].

Concerns raised about degradable plastics included that single use degradable bags were less sustainable overall than longer life bags, that they would contribute to plastic litter and contaminate recycling streams. It was also raised that they would continue to encourage a single use bag culture [197, 79, 194, 230]. One NGO submission noted that there was scope for biodegradable plastics to be an important new industry, based on renewable resources, and that a broader suite of standards for degradability in a range of disposal environments needed to be developed [199]. It was also suggested that a levy on bags could be used to educate stakeholders about degradable plastics [199, 200].

A.5.2 Responses

The focus of the environmental problem posed by plastic bags described in the Consultation RIS was plastic bag litter. As biodegradable and oxodegradable bags remain in the environment for

[130] RIS *Option K: Impose a government levy on lightweight single-use plastic bags (ACG scenario 9),* Description and assumptions, page 69.

some time when littered and in the case of oxodegradables may remain as fragments for extended periods of time, neither is considered to be a complete solution to the plastic bag litter problem. Exemption of degradable bags from a measure to reduce plastic bag use has the potential to exacerbate the litter problem and has the potential to reduce the use of reusable bags.

As there is currently no Australian performance standard for degradation of oxodegradable bags the safety of the resulting breakdown products has not been verified. Their method of degradation, fragmentation, means these bags will contribute particles of plastic to the environment. This also means the process could take a very long time for complete degradation and may leave toxic residues. The acceptability of plastic fragments in the environment to the public is also untested. The speed with which these bags break down in the marine or aquatic environments, areas where plastic bag litter are of particular concern, is also noted. A clear case for exemption of oxodegradable bags from any future measure to reduce the impact of plastic bags on the environment has therefore not yet been made.

An Australian performance standard for biodegradability in commercial composting exists, however, so there can be confidence that the breakdown residues of degradable bags that meet this standard are safe, and that the plastic will be completely converted to carbon dioxide, water etc. Nonetheless, even these bags could take many months to break down if littered because the optimal composting conditions will not be present. Use of these bags will reduce the life of each bag in the litter stream (and thus the potential harm caused by it) rather than resolving the plastic bag litter problem. Labelling bags as biodegradable will potentially result in increased litter as consumers may assume it will rapidly breakdown in the natural environment and therefore make less effort to correctly dispose of the bag.

Banning production of all single use plastic bags was not considered as an option, as even single use bags are an effective and efficient means of carrying goods, particularly for unplanned purchases. Longer life bags will tend to have reduced environmental impacts overall when compared to any single use bags.

A full life cycle assessment of conventional, biodegradable and oxodegradable bags has not been undertaken, however, so it is not possible to comment on which of these has the greater impacts.
The role of compostable plastic shopping bags in composting needs to be carefully thought through. Where commercial composting is concerned the re-use of compostable shopping bags as means of containing compostable scrap may be useful, but contamination with non compostable plastics is problematic. Contamination of plastic products by degradable plastics is also an issue, although the impacts are variable depending on the type of degradable plastic and the product to be produced.

The Environment Protection and Heritage Council is working with Standards Australia to ensure a suite of standards for various disposal conditions is developed. These include commercial and home composting, fresh and marine water, landfill and litter.

A.6. MANUFACTURER AND RETAILER IMPACTS

A.6.1 Issues

The manufacturer and retailer impacts and implementation issues raised were wide ranging. Some submissions queried whether the proposed changes were beneficial [195,198, 229, 230, 238], others commented on the likelihood of further impacts. For example manufacturers of bin liner bags may benefit from any changes due to increased purchase [1, 2] but other manufacturers could lose sales and hence viability [2, 6, 195, 238]. One submission considered plastic bags to provide beneficial security and privacy attributes [198] which were grounds for the bags being retained, another that shoppers who reuse bags as bin liners would be penalised [1]. It was also raised that small

businesses would be negatively impacted [7, 229] and it would be an unnecessary burden for all retailers [229] but large retailers could absorb the costs themselves [230] or would be unlikely to support further changes [194].

Increased transaction times at the supermarket checkout were also discussed. Some considered there would be no impact [194, Campaign] while others argued there would be more delays and staffing issues [195, 198]. Concerns about the health and safety implications for using reusable bags were also raised in terms of bag cleanliness or manual handling injuries [9].

A.6.2 Response

The economic modelling in the Consultation RIS has taken into account the impacts on retailers in terms of staff training, advertising and other infrastructure. It assumed a certain amount of these actions have already occurred during retailer implementation of the *Code of Practice for the Management of Plastic Bags*, providing a base for future policy to build on. The costs and benefits estimated reflect those that would be additional to the current situation.[131]

Small business is an important source of light weight shopping bags. It is therefore acknowledged this retail segment will face impacts and require assistance in order to change their usage of plastic bags. Any decision to implement a regulated approach to phase out plastic bags will require a coordinated education and information campaign targeting many sectors. This can include small business.

Similarly education campaigns can be held to minimise checkout handling issues. Such a campaign could include messages that encourage reusable bags users to adopt better housekeeping practices so bags presented are clean and undamaged.

In response to the comments raised about negative impacts within store, retailers in Ireland are reported to have found the effects on their well being from the carrier bag levy as either neutral or positive. Implementation costs have been modest and generally less than the savings resulting from not having to purchase bags. For example Tesco Ireland have reported that "customers are telling us that they broadly welcome the introduction of the levy. We have seen a marked change in customers behaviour in anticipation of the new levy, reflected in the significant increase in sales of re-usable bags."[132]

A.7. COMMENTS RELATING TO PLASTIC BAG LITTER GENERALLY

A.7.1 Issues

The amount of plastic bag litter was the subject of differing options in the submissions, though little additional quantitative information about litter costs and effectiveness was supplied. Not all were convinced about the degree to which plastic bag litter was an issue [5, 6, 195, 198, 202, 229]. In contrast, some submissions confirmed observing plastic litter in locations suggested by the Consultation RIS [75, 191, 200, 201, 202, 225, 228]. Others focussed on the complexity of managing litter in terms of costs or the amount of effort required to remove litter and restore the environment [6, 11, 196, 197, 229, 240] and what elements a litter based approach should include [6, 7, 79, 194, 228, 238]. The need for further action based on the number and actual percentage of overall litter stream was a point of contention for some [6, 8, 140, 194, 229, 230, 237].

There was considerable discussion about the impacts of litter and the extent to which these have occurred. Some confirmed the presence of litter [75, 191, 196, 197, 198, 200, 201] or offered further sources of information [202, 228]. Others argued that environmentally sensitive areas should be addressed [7, 194] along with human behaviour [11]. Two submissions disputed the baseline used

[131] Allen Consulting Group Plastic Bag Report, 2.
[132] Friends of the Earth, Scotland

in the modelling [6, 229]. Others suggested broadening the issue to general litter [5, 229, 238, 240]. The plastic industry's submission spoke in favour of the usefulness of plastic bags as bin liners [238].

Discussion about the litter based approaches included concerns that these approaches do not impose the cost burden those who use plastic bags [194], that controlling inadvertent litter is difficult [6, 230, 237] and efforts should focus on the total litter stream instead [229, 238]. Others felt that litter needed to be tackled holistically [198].

A.7.2 Response

It is acknowledged that plastic bags make up only a small percentage of all litter and that further information is needed to demonstrate the impacts of this particular item. Additional research has been commissioned into the occurrence and trends in plastic bag litter compared to other littered material. This will be incorporated into the final RIS.

Confirmation of locations where plastic bag litter occurs and additional data sources is acknowledged and welcomed. However, there is a need to be careful of the potential for unsubstantiated conclusions when expanding out data from local area specific surveys, to a national scale.

In terms of current action, most jurisdictions have litter strategies already in place. All litter strategies require three elements: infrastructure, education and enforcement. Priority littered sites and litter types will differ between States and Territories, however, when it is possible to do so, national consistency in litter messages and regulation is desirable.

General litter prevention measures are too blunt to impact on specific items such as plastic bags. While they may achieve some reductions they do not specifically target consumer behaviour regarding plastic bag disposal. They also do not pass the cost of litter clean up back onto those who litter. A charge on plastic bags could go some of the way by placing the cost burden onto those who consume plastic bags.

A report from Friends of the Earth Scotland 2005, notes that the Ireland levy led to 1 billion less plastic bags being consumed, a reduction of over 90%. Consumers switched to reusable bags. According to the Irish Department of the Environment, shoppers used around 1.2 billion plastic bags per year before the tax was imposed in March 2002. Since then, the use has dropped by around 95%. In a recent statement, Minister of State Pat Gallagher noted data showing that plastic bags now comprise about 0.3 per cent of the nation's litter, compared with five per cent before the levy.

Targeted education and awareness of plastic bag consumption and litter issues are likely to be more effective than general litter messages in tackling plastic bags because they can highlight the issues associated with that particular item. Litter fines on their own will not solve the problem of plastic bag litter. Education and awareness of the litter impacts of plastic bag is also an important component.

It is agreed that consumers reuse plastic bags in a variety of ways but because the consumer perception is that they are provided 'free', there is no incentive to limit either their consumption or reuse. The introduction of further action to phase out bags may increase the use of purpose designed bin liner plastic bags. Even with this increased consumption of bin liner bags, they are generally used within a home, they are unlikely to become litter therefore there would be on perverse outcome in terms of littering.

A.8. OTHER ISSUES

A.8.1 Issues

There were a number of other comments provided in the submissions. Some commented on the frequency that the chosen measure should be reviewed [10, 79, 191, 200, 202, 230, 237, 238] while others proposed that the measure not have a sunset clause [Campaign]. Overseas models were also discussed. The Irish Plastax was a commonly cited example [9, 140, 229 and Campaign] but not all submissions supported the adoption of this model [198]. The Scottish Parliament's decision not to adopt the Irish model [6] was also raised.

A.8.2 Response

Being a national measure coordinated between jurisdictions, the minimum interval between reviews is likely to be two years. However, suggestions for intervals of five years have also have been noted.

The approaches used by other countries have been examined. While they provide useful insights into implementation challenges, care would be needed in adapting these to suit Australian conditions, give that they policy, regulation and economic framework is different here.

List of Submissions

Submission no.	Submitter
1	Rosolyn Martin
2	A D Morris
3	M J Donaghoe
4	P Conely, PCC & Associates
5	R Elliot Waste services for the City of Wanneroo
6	National Association of Retail Grocers of Australia Pty Ltd (NARGA)
7	C Bell, National Coordinator Enterprise in the Community
8	M Nugent
9	Shop Distributive and Allied Employees Union, SA
10	BioStarch Technology Australia Pty Ltd
11	Keep South Australia Beautiful (KESAB) Environmental Solutions
12 to 76	Environment Victoria campaign submissions
77	Environment Victoria campaign submission
78	Andrew Kohn Pty Ltd
79	Marrickville City Council Waste Officer
80	Environment Victoria campaign submission
89	Michael and Juanita Schofield
90	Don White & Co
91 to 128	Environment Victoria campaign submission
129 to 139	Environment Victoria campaign submission
140	Stan Moore, Issues Management

141 to 189	Environment Victoria campaign submission
190	Queensland Retail Traders & Shopkeepers Association (QRTSA) Industrial Organization of Employers
191	Peta Colebatch, Consultant
192	Lyndall McCormack, Zero Waste Action group formerly Waste Crisis Network
193	Rev Johnathan Keren-Black
194	Environment Victoria submission
195	Detmark
196	Keep Australia Beautiful – NSW
197	Local Government Association of the Northern Territory
198	Omnipac
199	Planet Ark
200	Keep Australia Beautiful WA
201	National Council of Women
202	Gecko - Gold Coast & Hinterland Environment Council Assoc Inc
203	Western Australian Local Government Association
204 to 216	Environment Victoria campaign submissions
217	Lee O'Mahoney
218 to 227	Environment Victoria campaign submissions
228	Clean Up Australia
229	Australian Retailers Association (ARA)
230	Total Environment Centre NSW
231	Patrice Howland, EPI
232 to 236	Environment Victoria campaign submissions
237	Environmental Defender's Office NSW
238	Plastics and Chemicals Industries Association (PACIA)
239	Steve Howlett
240	Australian National Retailers Association (ANRA)
241 to 251	Environment Victoria campaign submissions

APPENDIX B: BUSINESS COST CALCULATOR (SUMMARY) *

Note: Descriptions and objectives of each option are provided in Chapter 5 of this RIS. This summary table is drawn from more detailed analysis available in Allens 2008.
I= Internal O= Outsourced

Option	Number of businesses affected	Staff training (BCC: Education)		Equip. mod. (BCC: Enforcement)		Theft (BCC: Other)		Admin. (BCC: Record keeping)		Increased transaction times (BCC: Enforcement/Other)		In-store education and promotion (BCC: Enforcement)	
		I or O	COST	I or O	COST	I or O	COST	I or O	COST	I or O	COST	I or O	COST
Ban													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	n.a.	n.a.	I	$17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	$1620000	n.a.	$15600000	n.a.	n.a.	I	$3433421	O	$4834500
Large retailers	211	I	$32966640	O	$90000	n.a.	$63600000	n.a.	n.a.	I	$8871362	O	0
			$65702736		$1710000		$120000000		n.a.		$29452491		$29023875

Option	Number of businesses affected	Staff training (BCC: Education)		Equip. mod. (BCC: Enforcement)		Theft (BCC: Other)		Admin. (BCC: Record keeping)		Increased transaction times (BCC: Enforcement/Other)		In-store education and promotion (BCC: Enforcement)	
		I or O	COST	I or O	COST	I or O	COST	I or O	COST	I or O	COST	I or O	COST
Levy - 10c													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	I	$51604000	I	$17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	$1620000	n.a.	$15600000	I	$3867600	I	$3433421	O	$4834500
Large retailers	211	I	$32966640	O	$90000	n.a.	$63600000	I	$506400	I	$8871362	O	0
			$65702736		$1710000		$120000000		$55978000		$29452491		$29023875
Levy - 20c													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	I	$51604000	I	$17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	$1620000	n.a.	$15600000	I	$3867600	I	$3433421	O	$4834500
Large retailers	211	I	$32966640	O	$90000	n.a.	$63600000	I	$506400	I	$8871362	O	0
			$65702736		$1710000		$120000000		$55978000		$29452491		$29023875
Levy – 25c													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	I	$51604000	I	$17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	$1620000	n.a.	$15600000	I	$3867600	I	$3433421	O	$4834500
Large retailers	211	I	$32966640	O	$90000	n.a.	$63600000	I	$506400	I	$8871362	O	0
			$65702736		$1710000		$120000000		$55978000		$29452491		$29023875

Option	Number of businesses affected	Staff training (BCC: Education)		Equip. mod. (BCC: Enforcement)		Theft (BCC: Other)		Admin. (BCC: Record keeping)		Increased transaction times (BCC: Enforcement/Other)		In-store education and promotion (BCC: Enforcement)	
		I or O	COST	I or O	COST	I or O	COST	I or O	COST	I or O	COST	I or O	COST
Retailer charge - 10c													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	n.a.	n.a.	I	$17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	$1620000	n.a.	$15600000	n.a.	n.a.	I	$3433421	O	$4834500
Large retailers	211	I	$32966640	O	$90000	n.a.	$63600000	n.a.	n.a.	I	$8871362	O	0
			$65702736		$1710000		$120000000		n.a.		$29452491		$29023875
Retailer charge - 20c													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	n.a.	n.a.	I	17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	1620000	n.a.	$15600000	n.a.	n.a.	I	3433421	O	$4834500
Large retailers	211	I	$32966640	O	90000	n.a.	$63600000	n.a.	n.a.	I	8871362	O	0
			$65702736		1710000		$120000000		n.a.		29452491.4		$29023875
Retailer charge - 25c													
Small retailers	64505	I	$23221800	O	0	n.a.	$40800000	n.a.	n.a.	I	17147707	O	$24189375
Medium retailers	3223	I	$9514296	O	1620000	n.a.	$15600000	n.a.	n.a.	I	3433421	O	$4834500
Large retailers	211	I	$32966640	O	90000	n.a.	$63600000	n.a.	n.a.	I	8871362	O	0
			$65702736		1710000		$120000000		n.a.		29452491		$29023875

Descriptions and objectives of each option are provided in Chapter 5 of this RIS. This summary table is drawn from more detailed analysis provided in Allens 2008.

The Allen Consulting Group

Phasing out lightweight plastic bags

Supplementary Analysis

February 2008

Report to the Environment Protection and Heritage Council

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Contents

Chapter 1

Module one — sensitivity analysis

In order to provide an enhanced understanding of the modelling work previously undertaken, ACG is asked to elaborate on the thinking underpinning a number of the assumptions/estimates used in that modelling. Information is specifically requested in relation to:

- the manner in which the costs of government enforcement of the plastic bag phase out were derived;
- the rationale for the high estimates of trolley theft and other theft;
- how the existing substantial take-up of reusable bags was taken into account; and
- how the estimate of 15 cents for the price of an alternative paper bag was derived (this price helped to ensure that a 25 cent fee for a plastic bag would be almost 100% successful in reducing plastic bag use) and what proportion of the assumed reduction in bag usage is attributable to the existence of the cheaper paper bag.

1.1 Changes to the initial analysis

The estimates generated in the initial analysis were based on publicly available data and reports, data and reports provided to ACG by the EPHC and the Department, and a number of assumptions. EPHC has requested further information about and clarification of some of the assumptions used in the initial analysis, particularly with regards to:

- the manner in which the costs of government enforcement of the plastic bag phase out were derived;
- the rationale for the high estimates of trolley and other theft;
- how the existing take-up of reusable bags was taken into account; and
- how the estimate of $0.15 for the price of an alternative paper bag — and its subsequent impact on the demand for LWPBs — was derived.

Cost of government enforcement

For the initial analysis, ACG requested that EPHC and the Department consult the jurisdictions on the estimated costs of implementing and enforcing the different LWPB reduction strategies. The advice provided by EPHC and the Department was that each jurisdiction would incur a cost of around $11 000 a year, calculated as 10 per cent of a full-time equivalent salary of the individual undertaking the implementation and enforcement. For the nine jurisdictions (states, territories and the Australian Government), this comes to annual cost of $99 000 — an amount that can be changed to some extent without having a significant impact on the overall net impact. For example, if monitoring and enforcement costs were **increased by roughly a factor of ten**, so that annual costs came to $1 million a year, the overall net cost of the scenarios are unlikely to vary by more than **one per cent** in (see Table 1.1)

Table 1.1

SENSITIVITY ANALYSIS — INCREASED MONITORING AND ENFORCEMENT COSTS

	Benefits (PV, $m)	Costs (PV, $m)	Net — NEW (PV, $m)	Net — INITIAL (PV, $m)
Scenario 1	$218	-$1061	-$843	***-$839***
Scenario 3	$156	-$651	-$495	***-$490***
Scenario 4	$266	-$1298	-$1032	***-$1027***
Scenario 5	$271	-$1099	-$828	***-$823***
Scenario 7	$181	-$771	-$590	***-$586***
Scenario 8	$218	-1039	-$821	***-$817***
Scenario 9	$189	-$903	-$714	***-$711***

'Net — NEW' reflects the changes to the assumptions. 'Net — INITIAL' is taken from the initial analysis.

Theft

The rationale for including an estimate associated with the cost of increased theft was based on evidence from Ireland. Following the introduction of a modest tax on sales of plastic bags, Irish retailers reported an increase in theft. Theft is treated as a one-off cost, since Irish retailers reported that increased theft was noted only in the first year of the tax, and that theft returned to normal levels in subsequent years. As noted in the original ACG report:

> In Ireland a survey of retailers indicated that the incidence of theft was higher after the introduction of a €0.15 'PlasTax' levy on LWPBs, but eventually returned to pre-PlasTax proportions.[1] As noted by one observer: 'In the first few months after the bag tax was introduced in Ireland, shoppers were seen carrying their groceries out in their jumpers, a lot of wire baskets went missing, and it is safe to assume that the fate of the turtles was a very long way from everyone's minds'.[2]

The value of the cost associated with increased theft was taken from a preliminary cost-benefit analysis that was done by Nolan-ITU in 2003, titled *Plastic bag mandatory options — Cost and benefits analysis*. This report was not referenced in ACG's initial analysis at the request of the steering committee — this was because the 2003 Nolan-ITU report has not been publicly released.

[1] J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005b, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 2: Appendices*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh, p. 8.

[2] *Guardian* 2002, 'Plastic planet', 17 October, http://www.guardian.co.uk/waste/story/0,12188,813364,00.html.

Reusable bags

The increased take-up of reusable bags was based on the fact that a reusable bag is more economically attractive than an LWPB, on condition that consumers be required to pay at least $0.03 for an LWPB. The discussion presented in the initial ACG report demonstrates that consumers who 'invest' in reusable bags enjoy a rate of return on that investment of 130 per cent a year.[3] Required rates of return are normally considerably lower than this, which demonstrates the economic superiority of a reusable bag. Consumers with a required rate of return of 10 per cent would invest in reusable bags up to a price of $4.00 per reusable bag. It is assumed that when consumers are required to pay for LWPBs, reusable bags will become a more attractive prospect than they currently are, and that consumers will make the switch from LWPBs to reusable bags.

In spite of the economic and environmental superiority of reusable bags, however, it is also assumed that reusable bags will not replace 100 per cent of LWPBs. This is because consumers, in spite of their good intentions, may not always have their reusable bags with them when they go shopping. It was therefore assumed that reusable bags would make up around 95 per cent of LWPB substitutes. On the occasion that a consumer forgets their reusable bags — around one time for every twenty trips, or 5 per cent of the time — it was assumed that they would purchase a single-use, paper bag. This was because historically, supermarket retailers had offered consumers a choice of calico bags, green reusable bags and paper bags that were explicitly charged for, as well as 'free' LWPBS.

In order to test the impact of changes to this assumption, it would be necessary to remodel some of the scenarios. This is because changes to this assumption have implications for trade (reusable bags are imported, so a change in demand for reusables would lead to a reduction in imports), and for industry structure (reduced demand for reusables would lead to increased demand for paper bags or other LWPB substitutes, some of which are produced domestically). It is therefore not meaningful to scale the overall economic cost in each of the scenarios by the initial shocks.

Paper bags

The steering committee has requested further clarification with regards to how the estimate of $0.15 for the price of an alternative paper bag — and its subsequent impact on the demand for LWPBs — was derived. The price of paper bags was assumed to be $0.15, based on the case study presented in the Nolan-ITU report, where a Byron Bay supermarket purchased paper bags at $0.15 per bag, and provided them to consumers. In the same case study, the supermarket introduced a $0.10 price for LWPBs and biodegradable bags, and reported a reduction in demand for LWPBs of 83 per cent.[4]

[3] If reusable bags are priced at $1.00, consumers enjoy a rate of return of 192 per cent. If reusable bags are priced at $1.80, consumers enjoy a rate of return of 96 per cent.

[4] Nolan ITU 2002, *Plastic Shopping Bags — Analysis of Levies and Environmental Impacts*, Melbourne, p. 50.

The steering committee's request for clarification implies that it is demand for paper bags that affects demand for LWPBs. In the initial analysis, it was assumed that it was changes in the demand for LWPBs that drove changes in the demand for paper bags. Changes to demand for LWPBs were based on the price charged for LWPBs, and the availability of substitutes such as reusables and paper bags. As discussed above, 95 per cent of the demand for LWPB substitutes was assumed to be met by reusables, with the remaining 5 per cent met by paper bags.

For example, assume that at a zero price, 100 LWPBs are demanded. Following the introduction of a $0.10 price for LWPBs, demand for LWPBs falls to 20. Consumers need to purchase substitutes to make up the remaining 80 bags. It is assumed that 95 per cent of these 80 bags are replaced by reusables. The other 5 per cent — the other 4 bags — are replaced by paper bags. Demand for paper bags is based on demand for LWPBs, and not the other way around.

1.2 Time difference of LWPB alternatives

ACG is asked to provide advice regarding the impacts of the issues raised above on the modelling outcomes previously reported. Advice should include, but not necessarily be limited to:

- whether or not different checkout times for lightweight plastic bags and reusable bags would result in significant changes to the earlier economic modelling outcomes.

In the initial analysis, it was assumed that it would take staff longer to facilitate transactions if consumers used LWPB alternatives. This was due to an assumption that supermarkets were set up to offer and pack LWPBs, and that supermarket check-out counters were not set up to efficiently handle more than one sort of LWPB alternative. For example, rather than pulling or tearing out and packing an LWPB that was set up in an accessible place on the counter, checkout staff would need to take LWPB substitutes from consumers, and set them up so that they could be packed. Additionally, reusable bags carry more than LWPBs and are therefore heavier when full, which would add to the time taken to move a full bag off the counter. In the initial analysis, it was assumed that supermarkets would become more efficient over time, and that a standard LWPB substitute would be established, which would also reduce the time taken to process transactions.

It can also be assumed that supermarkets start out with a standard LWPB substitute, which can be secured to the counter and packed in the same way that LWPBs are. It can also be assumed that there is no significant time difference associated with packing, lifting or moving a reusable bag. Taking these assumptions into account, there would be no time differences for transactions involving LWPB substitutes, and therefore, this cost component could be dropped. If this is done, there could be a significant reduction in the overall costs of the different scenarios. A rough estimate of the likely impact of removing the costs associated with transaction times indicates that the net costs may fall by 10 to 35 per cent (see Table 1.2).

Table 1.2

SENSITIVITY ANALYSIS — NO INCREASE IN TRANSACTION TIMES

	Benefits (PV, $m)	Costs (PV, $m)	Net — NEW (PV, $m)	Net — INITIAL (PV, $m)
Scenario 1	$218	-$796	-$578	***-$839***
Scenario 3	$156	-$588	-$432	***-$490***
Scenario 4	$266	-$1,066	-$800	***-$1027***
Scenario 5	$271	-$817	-$547	***-$823***
Scenario 7	$181	-$678	-$497	***-$586***
Scenario 8	$218	-$852	-$634	***-$817***
Scenario 9	$189	-$777	-$588	***-$711***

'Net — NEW' reflects the changes to the assumptions. 'Net — INITIAL' is taken from the initial analysis.

1.3 The price of reusable bags

ACG is asked to provide advice regarding the impacts of the issues raised above on the modelling outcomes previously reported. Advice should include, but not necessarily be limited to:

- whether or not the lower price of a 'green bag' is likely to lead to a significant difference in the overall costs to the economy previously modelled.

In the initial analysis, it was assumed that consumers would be able to purchase reusable bags at a price of $1.40. This was because the price of reusable bags varied between different stores, and $1.40 seemed a reasonable indication of an average price. If it is assumed that the average price of reusable bags is $1.00 per bag, there is likely to be a reduction in the overall net costs of the scenarios. Compared to the initial analysis, this reduction is in the order of around 5 to 10 per cent (see Table 1.3).

Table 1.3

SENSITIVITY ANALYSIS — INCREASED MONITORING AND ENFORCEMENT COSTS

	Benefits (PV, $m)	Costs (PV, $m)	Net — NEW (PV, $m)	Net — INITIAL (PV, $m)
Scenario 1	$218	-$989	-$771	***-$839***
Scenario 3	$156	-$602	-$445	***-$490***
Scenario 4	$266	-$1,216	-$950	***-$1,027***
Scenario 5	$271	-$1,022	-$751	***-$823***
Scenario 7	$181	-$740	-$559	***-$586***
Scenario 8	$218	-$969	-$751	***-$817***
Scenario 9	$189	-$862	-$673	***-$711***

'Net — NEW' reflects the changes to the assumptions. 'Net — INITIAL' is taken from the initial analysis.

1.4 Alternative base case

ACG is asked to provide advice regarding the impacts of the issues raised above on the modelling outcomes previously reported. Advice should include, but not necessarily be limited to:

- whether or not use of a lower figure with respect to shopping bags currently used annually is likely to lead to a significant difference in the overall costs to the economy previously modelled.

Roughly two years have passed since the initial analysis on scenarios for phasing out light-weight plastic bags was completed. In that time, retailers have continued voluntary efforts to encourage consumers to use alternatives to light-weight plastic bags. As a result, the number of light-weight plastic bags that have been consumed in the absence of any government regulation differs from the numbers that were forecast in the initial analysis. Adjusting the analysis to take account of the actual number of light-weight plastic bags consumed in the intervening years will have an impact on the net cost of the different scenarios.

At the same time, however, it is necessary to adjust the base case to take account of the costs associated with retailers' actions. Therefore, a key 'baseline' assumption is that the investment that has already been made by government and retailers in terms of staff training, advertising and other infrastructure provides a base for future policy to build on. Rather than considering the wind-down of these training and monitoring costs as an economic 'saving' (e.g., under a presumption of 'no further action' as in scenario two of the initial analysis), these are assumed to be a 'given'. This means that the costs and benefits for the scenarios are *additional* to established levels of effort.

Estimates of the number of bags consumed in 2007 are taken from the latest survey of light-weight plastic bag production and consumption, undertaken by Hyder Consulting.[5] This reduces the estimated number of bags consumed in 2007 from an estimated 4.5 billion (original base case) down to around 4.2 billion bags (revised base case) — a reduction of about 7 per cent. Estimates of the costs incurred by retailers in the promotion of bag alternatives are harder to come by, because efforts are voluntary, and retailers do not separate out and report the costs of implementing their initiatives on a systematic basis. Consequently, the estimates of the costs associated with achieving the reduced consumption of light-weight plastic bags are taken from the supplementary analysis on phasing out light-weight plastic bags that was done for the (then) Department of the Environment and Heritage in June 2006.[6] The estimates in the June 2006 analysis specifically aimed to measure the costs associated with retailers sustaining the efforts they'd initiated under the ARA Code of Practice.

Overall littering behaviour has not changed significantly since the preliminary analysis was undertaken. The latest numbers from Hyder Consulting show that the number of bags littered, as a proportion of the number of bags consumed, is not materially different to estimates of bag litter in 2002. As a result, while the consumption of LWPBs has decreased since 2002, the environmental problem associated with LWPBs —litter and there adverse impact on the environment — has not been directly affected by the voluntary actions taken so far.

[5] Hyder Consulting 2007, *Plastic Retail Carry Bag Use*, Melbourne.

[6] The Allen Consulting Group 2006, *The ANRA proposal on plastic bag management*, Canberra.

When considering changing the base case, it is important to note that changes to the underlying assumptions can only be applied to the economic costs calculated by the MMRF-Green model with consideration of the following caveats:

- The MMRF-Green modelling is based on the assumption that one third of LWPBs are domestically produced, while the rest are imported. The latest information from Hyder Consulting suggests that the proportion of LWPBs produced domestically is less than one-fifth of LWPBs consumed. This means that as LWPB consumption is phased out, there is a lower economic cost associated with reduced activity in the plastic products manufacturing industry. Changes at this structural level cannot be reflected in this aggregate, high-level analysis.
- The earlier MMRF-Green modelling assumes either a gradual decline in the consumption of LWPBs over time, or a target that is achieved and sustained over time. The latest information from Hyder Consulting shows that LWPB consumption reached a minimum in 2006, and then increased in 2007 to a level of consumption that was higher even than in 2005. Non-linearities of this type are difficult to incorporate in this aggregate, high-level analysis.
- Voluntary measures on the part of retailers and changes in the shopping habits of consumers have meant that there are fewer LWPBs in 2007 than they were in 2002. Consumption of LWPBs has fallen from around 6 billion to around 4.2. In light. Changing the base case to reflect efforts undertaken so far will mean that the number of LWPBs that is the focus of policy efforts, and commensurately the number of discarded and littered bags, is much smaller.

Changing the base case to take account of these changes over time will lead to lower costs *and* lower benefits, for the reasons discussed above. While the precise value of these costs and benefits cannot be easily quantified, some indicative estimates are provided in Table 1.4, for comparison with the original costs and benefits estimated for the same scenarios. In general, these revisions tend to reduce the net cost of the program, because fewer bags are involved. The size of this reduction is about 30-50 per cent across scenarios.

Table 1.4

SENSITIVITY ANALYSIS — ALTERNATIVE BASE CASE

	Benefits (PV, $m)	Costs (PV, $m)	Net — NEW (PV, $m)	Net — INITIAL (PV, $m)
Scenario 1	204	-782	-578	***-839***
Scenario 3	144	-376	-232	***-490***
Scenario 4	250	-1009	-759	***-1027***
Scenario 5	249	-800	-551	***-823***
Scenario 7	170	-502	-332	***-586***
Scenario 8	204	-761	-557	***-817***
Scenario 9	177	-626	-449	***-711***

'Net — NEW' reflects the changes to the assumptions. 'Net — INITIAL' is taken from the initial analysis.

1.5 'More developed' policy scenario

Since the ACG May 2006 report, jurisdictions have refined the parameters in relation to a mandatory retailer charge on all lightweight plastic bags supplied to the consumer. A description of this option is contained in Attachment A. ACG is also asked to review this 'more developed' outline of what such an option might contain, and to provide advice on whether or not it is significantly different to the relevant option modelled earlier and, if so, to provide advice on the work required (and cost involved) to appropriately remodel this option.

The main feature of the 'more developed' policy scenario is that it will entail a price — either a mandatory charge kept by retailers, or a levy collected by government — on LWPBs. Other features include:

- a targeted reduction of 80 to 90 per cent, achieved using a bag price of 10, 20 or 25 cents;
- focus on LWPBs only — thicker, department store type plastic bags are permitted, as are bags on a roll/produce bags and bait bags (light weight, but no handles);
- focus on LWPBs from all sources — big, medium and small retailers, take-away and restaurant bags; and
- include degradable bags that appear similar to LWPBs, due to lack of a standard, suitable degradable product.

Effectively, this 'more developed' policy scenario is very similar in nature to scenarios eight and nine from the preliminary analysis. Differences in the value of the estimated costs and benefits of the 'more developed' policy are due to the following things:

- A range of prices for LWPBs are tested for each scenario — 10, 20 and 25 cents, for both the government levy and the retailer charge.
- Costs and benefits are calculated in comparison to the alternative base case described above (which reflects fewer LWPBs and less Australian content), rather than the base case used in the original analysis.

It is assumed that a price of 10 cents will reduce LWPB demand by 80 per cent, that a price of 20 cents will reduce LWPB demand by 90 per cent, and that a price of 25 cents will effectively eliminate LWPB demand, due to the availability of cheaper, single use alternatives. This is done to maintain consistency with the assumptions used in the first ACG report. While LWPBs sold at 20 cents a bag are more expensive than the single-use alternative sold at an assumed 15 cents a bag, it is assumed that consumers are willing to pay an extra 5 cents for a plastic bag when it comes to transporting meat and frozen, wet or chilled goods, or food from takeaway restaurants. When the price difference between LWPBs and the alternative climbs to 10 cents, it is assumed that only a very small, insignificant proportion of consumers would still elect to purchase LWPBs over the substitute.

In each case, the policy is assumed to come into effect on 1 January 2009, with full compliance. To facilitate comparison with the estimates in the preliminary analysis, the net present value is calculated over ten years, beginning with 2006. Since no action is taken until 2009, effectively there are no costs or benefits in comparison to the base case for the first two years of the policies. This is consistent with the initial analysis, when many of the scenarios did not begin until 2007 or 2009. Fast tracking the new program would magnify the quoted NPV values by bringing the impacts forward.

In the initial analysis, it was assumed that retailers would incur administrative costs associated with recording and reporting the charge, and reporting the sale of bags. Under the 'more developed' retailer charge policy scenario, these costs are not included as businesses would not be required to keep records and report to jurisdictions. For the 'more developed' government charge, however, it is assumed that retailers would incur some administrative costs related to accounting for and reporting the amount of the levy collected. This is because while the price is a government levy, it is assumed that it charged by retailers as a transparent, point-of-sale price. There will therefore be some costs associated with account keeping and reporting — these costs are assumed to be of the same magnitude as the administrative costs incurred by retailers in the initial analysis.

In addition, retailers also incur costs associated with advertising and promotion, training, theft and increased transaction times. These costs are of the same magnitude as were used in the initial analysis for scenarios eight and nine. The assumptions for costs to consumers and government, as well as the rates of substitution between LWPB and LWPB alternatives are also the same as what was used for the initial analysis.

Table 1.5 presents estimates of the costs and benefits associated with the different prices. As with all of the cost estimates in this analysis, it is important to note that these estimates are indicative only, and are presented so that different scenarios can be compared against one another.[7] The following key findings can be drawn from the analysis:

- The environmental benefit for a given price is the same whether a retailer charge or a government levy applies. This is unsurprising, as the environmental benefit is derived entirely from reduced litter, which is linked with reduced LWPB consumption, which in turn is driven by the price of LWPBs. Also unsurprising is the fact that the value of the environmental benefit increases along with the price of the LWPBs, up to 25 cents. At the 25 cent price, the maximum benefit is reached, as this is the point at which it is assumed that LWPB consumption is driven to (approximately) zero.
- At the 20 cent price, LWPB consumption drops to 10 per cent of current levels. At a 10 cent price, LWPB drops to 20 per cent of current levels. Both prices raise the same amount of revenue and impose the same cost on consumers for LWPB consumption. The 20 cent price has a greater overall economic impact than the 10 cent price because:

[7] For example, it is reasonable to say that a retailer charge of 25 cents has a lower net cost than a retailer charge of 20 cents. It would be unreasonable to say that a retailer charge of 25 cents would entail a net cost of precisely $436 million over ten years. To be able to do the latter, it would be necessary to remodel the options using the MMRF-Green model proper, rather than highly aggregated spreadsheet analysis used for these estimates.

  - consumers will need to purchase more reusable bags, which must be imported, and represent an economic cost; and
  - the greater reduction in LWPB consumption leads to diminished activity in the plastic products manufacturing industry, which also represents and economic cost.

- Both under a retailer charge and under a government levy, the net cost associated with a 25 cent price is less than the net costs associated with the 10 and 20 cent prices. While this initially appears counterintuitive, the lower net cost is due to the fact that at 25 cents per LWPB, demand for LWPBs drops to zero. Cost is a function of both price and quantum consumed (given the availability of close substitutes for LWPBs).
  - For every price, the net cost of the government levy is less than the net cost of the retailer charge. This is due to the depiction (within MMRF-Green) of the retailer charge as a de-facto subsidy — which enables retailers to charge considerably more than the actual cost of plastic bags, and keep the proceeds. This 'subsidy' erodes competition and efficiency in the economy. In contrast, the 'balanced budget' assumptions inherent in the modelling see the revenue raised from a government levy returned to the community in the most benign way possible (generally entered as a lump sum transfer to the household sector).
  - Some of the revenue raised by retailers could be allocated to litter clean up, Landcare or meeting other environmental goals. This would effectively reduce the size of the implied subsidy given to retailers, which would in turn reduce the overall economic cost associated with the retailer charge. At the same time, it would also enhance the environmental benefits.

Table 1.5

MORE DEVELOPED POLICY SCENARIO

	Benefits (PV, $m)	Costs (PV, $m)	Net — NEW (PV, $m)
Retailer charge			
10 cent charge	177	-822	-645
20 cent charge	191	-936	-745
25 cent charge	204	-640	-436
Government levy			
10 cent levy	177	-626	-449
20 cent levy	191	-711	-521
25 cent levy	204	-480	-276

Table 6.2, in module six, shows the economic costs of these scenarios per person and per littered LWPB. It also shows the estimated, average annual net cost of the both the scenarios shown above, as well as the scenarios discussed in subsequent modules.

Chapter 2

Module two — LWPB demand

Box 3.2 in the May 2006 ACG report illustrates a consumer demand curve for lightweight plastic bags, which indicates that a 25 cent fee will result in a reduction in bag use close to 100%, while a 10 cent fee will result in an 80% reduction. ACG is requested to review this demand curve without the assumption that a paper bag will be available for purchase at 15 cents (thus allowing the analysis to focus on the optimal price of a plastic bag rather than the effect of cheaper alternatives).

In the light of this review, ACG is then requested to provide advice on the benefits and/or limitations of a range of fees (10 cents, 20 cents and 25 cents) with a view to recommending the optimal fee to achieve an 80% to 90% reduction in bag use after two years.

2.1 Initial analysis

The initial analysis on the demand for LWPBs, estimated across a range of prices, was based on anecdotal evidence from a number of sources (see Box 2.1). These data points were indicative only. The first two were derived from the Nolan ITU report, and changes in LWPB consumption observed in a number of case studies drawn from the Irish experience, and local bag pricing initiatives from a range of retail outlets including Bunnings, Byron Bay supermarket, etc. A near 100 per cent reduction in consumption at a price of $0.25 was assumed, as consumers reduce bag consumption and re-direct their demand for 'bag services' to less costly substitutes. This assumption depended strongly on the availability of substitutes to LWPBs.

2.2 Reliance on substitutes

For the purposes of the modelling, the assumption was that if LWPBs were not available, consumers would choose a least cost and closely substitutable alternative. In the study, the simplifying assumption was that when a bag is in high demand, and an LWPB is no longer available at the checkout, the least cost 'fallback' solution is the purchase of a single use paper bag. This had the effect of limiting the maximum price that consumers must pay for LWPB services.

This assumption was based on the following reasoning:

- consumers would switch to reusable bags in response to the phase-out initiatives; but
- on the occasions where consumers forgot their reusable bags, they would purchase single use bags; and
- supermarkets had at one stage offered paper bags as an alternative to LWPBs, which would have given consumers the choice of paper bags or LWPBs as their single-use fallback, depending on the policy scenario.

While there may still be some demand for LWPBs at prices of $0.25, this demand was assumed not to be significant. Since the initial analysis, it is clear that retailers make a number of single use alternatives available to consumers. These include:

- paper bags;

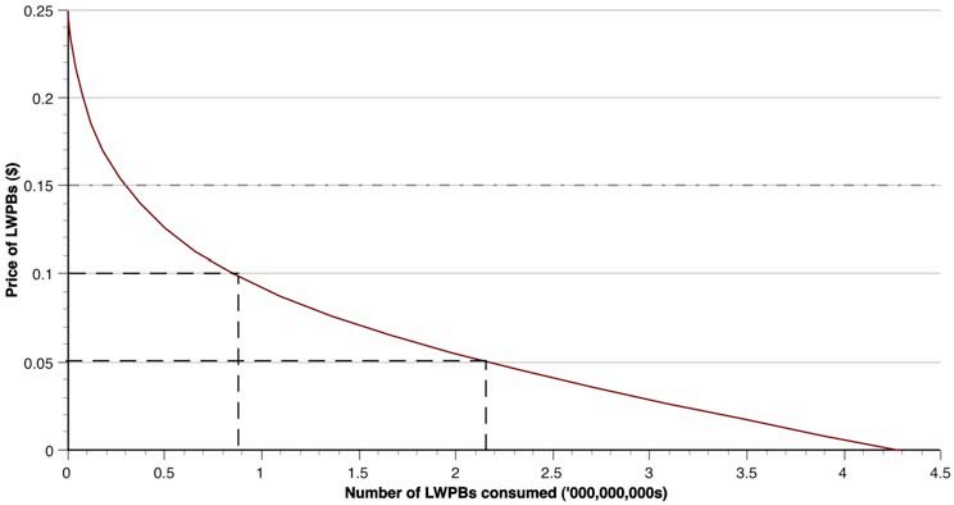
- thicker plastic bags; and
- biodegradable bags.

The demand for LWPBs at different prices would therefore depend on the prices of these alternatives, and demonstrated demand for these substitutes across a range of prices. Given that there is no retail market for LWPBs, it is necessary to make assumptions about levels of demand at different prices. Even for products where retail markets exist, it is necessary to undertake consumer surveys or close monitoring of sales in response to changes in price, in order to meaningfully comment on the impact that changes in price will have to demand for that product. At the very least, a more detailed demand analysis for LWPBs and their substitutes would require case studies similar in nature to the Byron Bay supermarket case study that was referenced in Nolan-ITU's 2002 report.

Box 2.1

ESTIMATED CONSUMER DEMAND FOR LIGHT-WEIGHT PLASTIC BAGS, 2005

Establishing a consumer demand curve for plastic bags is a fundamental requirement of the policy assessment exercise. It is a key determinant of the revenues associated with bag sales and the costs that would be imposed on consumers through a ban. The following demand curve has been estimated for modelling purposes.



Its construction relies on the following data estimates:

- 4.3 billion bags at $0.00[8];
- a reduction in consumption of around 80 per cent at $0.10[9]; and
- a reduction of close to 100 per cent at $0.25[10].

While not shown as a point on the demand curve, for the purposes of this supplementary analysis, it has been assumed that a 20 cent price will result in a conservative 90 per cent reduction in demand for LWPBs, rather than the 98 per cent reduction implied in the above diagram.

Source: J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005a, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 1: Main Report*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh; Nolan ITU 2002 *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts, Final Report*, Dept of the Environment and Heritage, Canberra.

[8] Nolan-ITU 2005, op. cit., p. 6.

[9] Nolan-ITU 2002, op. cit. p. 50.

[10] Based on the availability of cheaper substitutes. While LWPBs may still be purchased at the $0.25 price, the amount consumed is assumed to be insignificant, and close to zero for modelling purposes.

2.3 Implications for the analysis

It is extremely likely that retailers will offer a single-use alternative to LWPBs as LWPBs are phased out (or priced out of heavy use). As discussed above, this is because while most people will take advantage of the economic and environmental superiority of reusable bags, consumers may not always have their reusable bags with them when they shop. Rather than requiring consumers to purchase more reusable bags, retailers are likely to offer a cheaper, single use alternative. The initial analysis assumed that this alternative would be paper bags, given that some supermarkets offered paper bags for sale, as well as 'free' LWPBs and reusable bags. While paper bags may not be the 'stand by' alternative that supermarkets are likely to offer consumers, the other possibilities — biodegradable bags, or slightly thicker plastic bags — come at a similar price to paper bags. This means that there will not be much of a change to the LWPB demand curve.

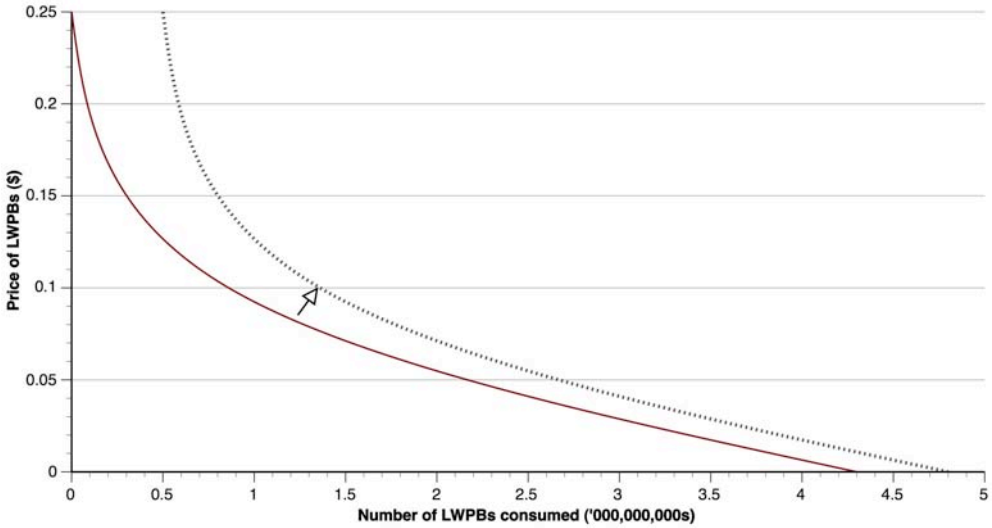
In terms of the overall economic cost, the scenarios would need to be remodelled if the assumptions around the take up of substitutes bags were altered. This is because the economic costs are partly driven by a reduction in the economic activity associated with the domestic production of LWPBs, and their being replaced with imported reusables. These costs are off-set to some extent by an assumed increase in the demand for paper bags — which are domestically produced. The initial analysis breaks down the changes in economic activity at the industry level, and shows increases in the paper products industry coming at the expense of decreases in the plastic product industry.

There are a number of other factors to take into consideration when using the LWPB demand curve:

- As the economy grows, consumers will be willing to pay a higher price for LWPBs. This will lead to the demand curve shifting to the right — effectively, for every point on the demand curve, consumers will consume a larger number of LWPBs for the same price (see Figure 2.1). The original analysis used price impacts that were observed in or before 2005. Given subsequent strong economic growth, these same prices are unlikely to have the same impact in 2009. Ireland, for example, has had to increase the value of the PlasTax since it was originally introduced in order to maintain the reduced demand for LWPBs.
- The demand curve is based on consumer reactions to prices that were introduced 'out of the blue'. In Ireland, the PlasTax was introduced without a history of information and awareness campaigns to drive down LWPB consumption. In Australia, LWPB demand has already reduced considerably following the voluntary efforts of retailers and consumers. The consumers who have not as yet switched over to reusables are the same consumers who value LWPB services, and will therefore be willing to pay a higher price for LWPBs than the average consumer. If an LWPB price is brought in — following a voluntary reduction in LWPB demand on the part of consumers — it will need to be higher than a price that was introduced with no history of persuasive or voluntary action in order to have the same impact on LWPB consumption.
- The charge will need to be high enough that it shocks consumers into using fewer LWPBs. At the same time, a charge that is too high may lead to community resentment — particularly if consumers see that retailers keep the revenue from the charge.

Figure 2.1

GROWTH IN DEMAND FOR LIGHT-WEIGHT PLASTIC BAGS



Note: This diagram is provided for illustrative purposes only. It is not intended to forecast changes to LWPB demand following economic growth.

In order to meaningfully account for alternative assumptions around consumer demand for LWPBs, it would be necessary to obtain information, or to develop reasonable assumptions, about:

- the types of bags offered by retailers, the share of the market that these different types of bags have, and whether they are produced domestically or imported; and
- consumer demand for LWPBs and LWPB substitutes for different prices for each type of bag.

Chapter 3

Module three — direct litter campaign

Governments have been asked by the Office of Best Practice Regulation to adequately consider litter reduction/management options in addition to options focused on bag consumption. It is also desirable that the Decision RIS include an option that is assessed as having a net benefit.

A draft menu of measures including litter clean up, grants to community groups and targeted litter enforcement addressing plastic bag litter has been prepared by the Australian, state and territory governments. This is described in Attachment B. The aim of a litter option would be to reduce litter by half at a cost which is less than the derived benefit.

ACG is requested to select, from the menu of options described in attachment A, the most cost effective package that will reduce litter by 50%, and provide a cost benefit analysis of this package, ensuring consistency with the analyses of the other options focusing on bag consumption.

3.1 Targeting litter

Targeting littered LWPBs narrows the focus of the regulatory scenario from all LWPBs to that less than one per cent of LWPBs from which an environmental benefit can potentially be derived. The maximum environmental benefit comes from eliminating all littered LWPBs — both inadvertent and deliberate litter. Inadvertent litter refers to LWPBs that were intended to be taken to landfills, but escaped either on the journey to the landfill, or from the landfill itself. Deliberate litter refers to LWPs that are discarded by consumers once the LWPB has served its purpose.

It is estimated that around 40 to 60 million LWPBs are littered annually. In 2002, 20 to 30 million — or one half — could be attributed to inadvertent litter.[11] If one half of littered LWPBs could be attributed to inadvertent litter in *all* years, then the 50 per cent target could be achieved by focussing entirely on improvements to public rubbish bins, and improved fencing for landfill. However, it is not known whether inadvertent litter continues to make up half of littered LWPBs. In addition, improvements to rubbish collection, transportation and landfill fencing are unlikely to have an impact on LWPB consumption behaviour. By focusing entirely on initiatives that operate outside of the view of consumers, LWPB consumption — and with it, LWPB litter — may start to increase. In addition, initiatives that take place out of the view of consumers will not have a social impact on consumption decisions, and consumer awareness of waste. Instead, the targeted litter strategy needs to target litter in a way that can be seen and noted by consumers.

[11] The Allen Consulting Group 2006, *Phasing out light-weight plastic bags*, Canberra, p. 5.

The value of the environmental benefit associated with reducing littered LWPBs by 50 per cent is $102 million, when the benefit is calculated in comparison to the alternative base case.[12] In order to break even, the present value of the economic costs cannot be greater than $102 million. This figure of $102 million, however, is the size of the maximum allowable economic cost that is generated using the MMRF-Green model, on a general equilibrium basis. For example, the present value cost of the 'initial shocks' under scenario one of the original analysis is $304 million. Once these shocks are applied to the CGE-model, the final economic cost is $839 million, which is more than double the value of the preliminary shock. For scenario nine, on the other hand, the initial shocks of $761 million are less than the general equilibrium economic cost of $711 million.

As a direct litter targeting strategy was not one of the scenarios modelled using the MMRF-Green model, it is not possible to tell whether the spending activity that addresses the litter problem should be greater than or less than the break even $102 million. Nevertheless, it is possible to develop a range of estimates. On average, for the scenarios modelled in the original analysis, the yearly initial shocks across the modelled scenarios were around 1.2 times greater than the general equilibrium cost. While the factor of 1.2 is the average ratio of initial shocks to final overall costs, it would also be prudent to take into account the maximum and minimum factors. This is shown in Table 3.1. On average, the ratio of the initial shocks to the final CGE cost is 1.2, which means that to achieve a break even target of $102 million in economic costs, initiatives that reduce littered LWPBs by 50 per cent can be funded by up to a present value up to $124 million over ten years, or around $25.5 million a year.[13]

Table 3.1

BREAK EVEN LITTER TARGETING STRATEGY

	Ratio of initial shock to CGE cost	Present value ($ million)	Annual maximum ($ million)
Average	1.2	$124.0	$25.5
Maximum	2.0	$202.6	$41.5
Minimum	0.4	$37.0	$7.5

The 50 per cent LWPB litter reduction target can reasonably be achieved through a combination of the initiatives put forward by the Steering Committee. At an estimated annual cost of $9.6 million, the following policies can be implemented:

- $4.4 million — target unintentional litter, through:
  - a national survey to identify causes of litter problems and gauge the adequacy of existing infrastructure;

[12] The alternative base case incorporates the latest data on LWPB consumption and litter. More information on the alternative base case is available in Chapter 2.

[13] Net present value is calculated over ten years, with 2006 as year one, but with the policy only coming into effect on 1 January 2009. This is to facilitate comparability with the scenarios in the original analysis.

  - enhanced enforcement of landfill regulations, including enforcement blitzes;
  - requiring the provision of adequate numbers of properly designed rubbish receptacles in public places; and
  - requiring that these public rubbish receptacles be checked regularly, particularly in sensitive areas and at peak times;
- $1.5 million — improve education and awareness and change consumer behaviour, through:
  - media and public event promotion of new enforcement requirements;
  - advisory campaigns on how to minimise inadvertent litter;
  - sponsoring a National Day of Action, focussing on both deliberate and inadvertent litter; and
  - grant programme to support local initiatives;
- $0.7 million — direct litter clean up, through:
  - grants to community organisations and local groups to clean up sensitive sites (for example, coastal, near landfills, urban areas, Indigenous and remote communities, and so on) — some overlap with the above initiative;
- $3.1 million — improvements to infrastructure, through:
  - grants to support better placement and design of public rubbish receptacles (some overlap with targeting unintentional litter);
  - grants to LGAs to ensure bins are cleared regularly (some overlap with targeting unintentional litter); and
  - commissioning a national study to investigate the design of rubbish bins and garbage collection trucks.

In effect, the annual costs are likely to be less than $9.6 million, since some of the initiatives have components that overlap. In addition, the benefits are likely to be higher than calculated, because not only will LWPB litter be reduced, but so will the litter of other items, such as cigarette butts, plastic bottles, wrappers and cans. It is likely that implementation of this scenario could even result in a small net benefit. However, such an approach would do little to address social anxiety (and associated social costs) over LWPB consumption and resource use.

Chapter 4

Module four — valuation of environmental benefits

Submissions received on the Consultation RIS have questioned the basis for the $1 value ascribed by ACG to the environmental benefit of a bag removed from the litter stream, arguing that it is too high. ACG is asked to provide additional explanatory information that can be used to further explain and justify the $1 value. This additional rationale should expand on but not be limited to the points made by ACG in this regard in its May 2006 report including:

- the dominance of economic costs over environmental benefits is likely to be insensitive to changes in the estimate of environmental damages arising from discarded lightweight plastic bags;
- the decision to base the environmental benefit on an estimate of the value of the voluntary effort invested in "Clean Up Australia" and a significant scaling factor; and
- there is reason to believe that this is a generous treatment.

ACG is also requested to revise the value of the environmental benefits calculated previously based on an updated litter estimate (to be provided by another consultant).

4.1 Initial analysis

Submissions received on the Consultation RIS have questioned the basis for the $1 value ascribed by ACG to the environmental benefit of a bag removed from the litter stream, arguing that it is too high. ACG is asked to provide additional explanatory information that can be used to further explain and justify the $1 value.

The $1 value associated with the removal of an LWPB from the litter stream was used as a starting point for discussion. In the absence of detailed consumer choice modelling, it is not possible to accurately state what the value to society is of a reduction in the number of littered LWPBs. Rather, assigning a $1 value to each littered LWPB was a way of marking a line in the sand, and obtaining feedback along the following lines: *Was $1 too high? Was $1 not enough? Was $1 a reasonable value? If not, what is a reasonable value? 50 cents? $2? $5?* The value of $1 for each littered LWPB therefore cannot be justified. Where data are lacking, a more reasonable approach is to present a range of values, which was done in the initial analysis. Littered LWPBs were valued at $0.50, $1 and $5.

Rather than ascribing a value to the environmental benefits of the options, an alternative presentation is to consider a break-even analysis. For example, the present value of the economic cost associated with scenario one in the initial analysis was $1057 million. At the same time, this scenario reduced the number of bags littered by 360 million over ten years. If the timing of the costs and benefits were disregarded, then each littered bag would effectively need to be valued at around $3 for this scenario to break even. The RIS could then present this value to stakeholders and seek comments on whether $3 was reasonable — if $3 is too low, then scenario one comes at a net benefit and if $3 is too high, then scenario one comes at a net cost. The same could be done for each of the scenarios, and take the timing of the costs and benefits into account. When this was done in the initial analysis, it was found that scenario one needed littered LWPBs to be valued at around $5 each in order for the costs to off-set the benefits.

This additional rationale should expand on but not be limited to the points made by ACG in this regard in its May 2006 report including:

- the dominance of economic costs over environmental benefits is likely to be insensitive to changes in the estimate of environmental damages arising from discarded lightweight plastic bags;
- the decision to base the environmental benefit on an estimate of the value of the voluntary effort invested in "Clean Up Australia" and a significant scaling factor; and
- there is reason to believe that this is a generous treatment.

The dominance of the economic costs over the environmental benefits is due to the fact that the policy scenarios are aimed at reducing the *consumption* of LWPBs, whereas the benefits arise only from the littered LWPBs. Strategies targeted at 100 per cent of LWPBs represent too great an effort when the potential environmental benefits can only be realised from the less than one per cent of the LWPBs that are littered (since concern over the sustainability of resource consumption and alignment with social and ethical values are considered as part of the 'social' pay-off). For this reason, economic costs are several orders of magnitude greater than the environmental benefits. If the number of LWPBs that were littered was to be doubled, or even tripled, the economic costs would still be greater than the environmental benefits associated with eliminating this increased number of littered LWPBs. In addition, the value of each littered LWPB would need to be increased to around $5 to bring the environmental benefits to a similar order of magnitude to the economic costs.

The value of the environmental benefit was in part based on the voluntary effort invested in 'Clean Up Australia'. This was because there are no publicly available data on how much people value reduced litter. With the Clean Up Australia volunteers, the information provided demonstrated that some people valued reduced litter sufficiently to volunteer their time to picking up litter. Given that they had given up their free time to pick up litter, it is reasonable to argue that the volunteers value time spent reducing litter *at least if not more than* the value they place on their free time. However, using only this data resulted in an environmental benefit of $0.02 for each LWPB, which was felt to be too low. The $1 per LWPB was proposed as a 'test value'.

4.2 Alternative litter estimate

ACG is also requested to revise the value of the environmental benefits calculated previously based on an updated litter estimate (to be provided by another consultant).

The latest data from Hyder Consulting indicate that levels of LWPB litter have not changed significantly since 2002. Estimated LWPB consumption for 2007 was 4.24 billion, of which 40 million LWPBs — or roughly one per cent — were estimated to have entered the litter stream. As this proportion is not significantly different to the proportion of littered bags that was used in the preliminary analysis, no further estimates have been developed.

The fact that the proportion has not changed may have implications for strategies targeting inadvertent litter, as opposed to deliberate litter. The Hyder Consulting report notes that the increase in the number of LWPBs consumed in 2007 compared to 2006 and even 2005 can be attributed to the failure of the non-supermarket retailers to curtail LWPB consumption. In 2002, the overwhelming majority of LWPBs sourced from supermarkets ended up at people's homes.[14] All deliberate litter, however, was sourced from LWPBs that did not make it into people's homes. A significant share of LWPBs that end up 'away from home' are LWPBs sourced from fast food and other food outlets.

It is possible that the ratio of deliberately littered LWPBs to inadvertently littered LWPBs has increased, given that:

- consumption of LWPBs sourced from supermarkets has fallen, while consumption of LWPBs sourced from other retailers has risen;
- the proportion of LWPBs littered has not changed significantly; and
- the vast majority of supermarket LWPBs end up in the home, and are not *deliberately* littered.

In addition, the latest numbers from Hyder Consulting indicate that the number of LWPBs that escape from landfills amount to around 210 000 plastic bags (includes non-light weight plastic bags) currently, compared with 20 to 30 million, as estimated in 2002. This would significantly reduce the proportion of LWPBs littered inadvertently from around 50 per cent to around 0.5 per cent. It would therefore be prudent not to focus litter reduction strategies on *only* one or the other of deliberate or inadvertent litter, since it is possible that the composition of LWPBs arising from the two different sources may be changing.

[14] Nolan-ITU 2002, *Plastic shopping bags — Analysis of levies and environmental impacts*, Melbourne.

Chapter 5

Module five — responses to public submissions

5.1 Cost benefit estimates

Retailers

The ACG cost benefit analysis is flawed:

- *probable overestimates of retailer future marketing costs, training, theft and administrative costs and does not cost the environmental benefits (194)* [15]*;*
- *assumption transaction times will rise with reusable bags (194).*

We believe these costs [administration, infrastructure, training, theft etc] are grossly over estimated. There would be significant economic benefit to the retailers to be seen as doing good for the community and the environment (230).

In order to assess the costs and benefits of a policy scenario, it is necessary to establish a base case against which scenarios can be compared. Ordinarily, this establishes the costs and benefits of taking action as opposed to doing nothing. In the case of phasing out LWPBs, it was not clear as to whether 'doing nothing' meant that retailers would voluntarily continue the initiatives that they undertook through their Code of Practise, or whether all activities would lapse. It was assumed that all actions would lapse, and that consumer behaviour would return to the consumption pattern exhibited prior to retailer action.

Effectively, the costs that were estimated for the retail industry consist of the costs of undertaking further action *as well as* the costs of actions already taken. This was done to ensure that all of the scenarios could be meaningfully compared against one another. As a result, the costs to the retail sector appear high. At the same time, the economic benefits include the value of the benefits already achieved by the voluntary actions of retailers. While it can be argued that retailers that are seen to be doing good for the community and the environment would benefit economically from increased sales or increased patronage, there is no quantitative evidence to support this.

The benefits from reduced extraction of resources and energy consumption in reusing bags are considered in the economic analysis. The economic analysis accounts for reduced economic activity in the plastic products manufacturing industry. Estimates of CO2 equivalent emissions are also provided in the initial analysis.

Have the profits from sale of 'green bags been included in this economic analysis, as well as a reduction in expenditure on plastic bags (228).

The reduction in the expenditure of plastic bags was one of the inputs to the economic modelling. The *profits* from the sale of green bags were not one of the inputs to the economic modelling. Estimates of total sales of reusable bags were input into the modelling, and a profit margin for green bags was imputed in the MMRF-Green model.

[15] Bracketed numbers eg (194) refer to the submission number.

Environmental benefits

The ACG cost benefit analysis is flawed:

- *environmental benefits from reduced extraction of resources and energy consumption in reusing bags not considered (194).*

Environmental restoration costs not included in the economic evaluations; these are difficult to cost (11).

The modelling assumes that the extraction of resources and energy are economically efficient. The extent to which society dislikes the fact that resources and energy are allocated towards the production and distribution of a product that is mainly for single use and for limited subsequent use is a *social* consideration, rather than an economic consideration.

The ACG figures have an artificially high value assigned to each bag removed from litter (6).

There is a range of environmental benefits that apply to the reduced use of LWPBs. These benefits are associated with a number of aspects, including but not limited to:

- reduced choking hazard for marine animals and livestock;
- reduction in the clogging of plant or machinery situated near or on waterways; and
- aesthetic improvements due to reduction in litter.

Given the difficulties of placing a value on the environmental benefits, the initial analysis used a way of converting the time donated by clean up volunteers into monetary values. The initial analysis argued that volunteers give up their time to clean up litter for a number of reasons, which align with the environmental benefits of reduced LWPB litter. While these reasons may not be clearly articulated, it can be argued that volunteers clean up LWPB litter for the simple reason that LWPB litter is 'undesirable', and the reasons why LWPB litter is undesirable are covered by some of the aspects described above. As a result, the valuation of the environmental benefits effectively covers every *type* of environmental benefit that can be associated with a reduction in LWPB litter.

It is difficult to assign a monetary value to the benefits described above, using information that is available publicly. Given this, the initial analysis proposed a value of $1 per LWPB for the body of the report, and used a number of values — ranging from $0.50 to $5 — in an appendix to test for reasonableness.

The RIS "does not address the environmental consequences of 'doing nothing' or maintaining current efforts" (228).

'Doing nothing' is the assumed base case, against which all of the other scenarios are compared. In order to estimate the value of the environmental consequences of doing nothing, it is necessary to compare it with an alternative action. This can be done by comparing the base case against the action scenarios, and reversing the sign on the environmental benefits. For example, under scenario one, which is a mandatory ban on LWPBs, the **environmental benefits** are $218 million over ten years. *Compared to scenario one,* the environmental **cost** of doing nothing is $218 million over ten years.

5.2 Demand for bags

A price for zero LWPB demand

The key assumptions in the MMRF-Green model suggest that imposing a levy would ultimately get plastic bag use to zero, which is simply not realistic (228).

As discussed in module 2, it is not possible to establish a price that completely eliminates LWPB demand. The initial analysis does not state that imposing a levy would get LWPB use to zero — it states that at a $0.25 price, demand for LWPBs would not be **significantly** greater than zero due to the availability of a cheaper substitute.

Calico bags

The analysis underestimated the longevity of calico bags, two and not one year (194).

The longevity of calico bags has no impact on the cost-benefit estimates, as calico bags were not included as possible LWPB substitutes.

5.3 Litter estimates

Discrepancy from Nolan-ITU litter estimates

The baseline (litter) data from 2002 is not correct (6). [ACG is requested to comment on how the estimate of 40-60m bags was derived in comparison to the Hyder figure of 50-80 million bags, and whether or not the modelling outcomes are sensitive to use of either estimate].

The Nolan flow chart (on page 9 of their 2002 report) has 5 levels. In the first level, it shows the distribution of the 6900 million bags by where they come from (produced or imported) and what type of bag they are (HDPE or LDPE). In the second level, it shows bag consumption by type of retailer (supermarket, fast food, etc).

In the third level, it shows the bags' destinations (home or away). In this level, the sum of bags adds to 6910 billion, rather than the 6900 million starting figure (6140 bags at home + 770 bags consumed away = 6910 bags in total).

In the fourth and fifth levels, it shows the how the bags are disposed of.

In the fourth level, the sum of bags is 6900 million (same as the starting figure) if litter is 30 million bags, or 6920 million if litter is 50 million bags.

In the fifth level, the sum of bags is 6880 million (less than the starting figure) is litter is 50 million bags, or 6910 if litter is 80 million bags.

There are three problems with these numbers. The first is fairly trivial, in that there is a rounding error causing the difference in the third level of the diagram (6910 versus 6900 million bags). The second problem is that there is a range given for the number of bags littered, however, the numbers for recycling and landfill are fixed and not provided as ranges.

The third problem is to do with the flow (in the fifth level of the diagram) between bags in landfill and bags in litter. In a 'worst case' scenario, 30 million bags are inadvertently littered while only 10 million are cleaned up — a net result of 20 million bags adding to landfill. In a 'best case' scenario, 20 million bags are inadvertently littered *and* 20 million bags are cleaned up — a net result of 0 bags moving from litter to landfill or vice versa. The numbers (in the fifth level of the diagram) for litter and landfill do not appear to reflect this movement.

If the number of bags littered in the fourth level is 30 million, then the litter range in the fifth level of the diagram should be 30 million to 50 million. If the number of bags littered in the fourth level is 50 million, then the litter range in the fifth level should be 50 million to 70 million.

ACG has gone for the midpoint in the fourth level — choosing 40 million bags littered, giving a range in the fifth level of 40 million to 60 million bags littered. Additionally, ACG has sought to keep the total number of bags the same at all levels of the flow chart in the ACG diagram.

Changing the number of bags littered to the upper limit of 80 million will alter the environmental benefits, without affecting the economic costs. Doing so will provide the following net impacts under the scenarios:

Table 5.1

SENSITIVITY ANALYSIS — INCREASING LITTERED BAGS FROM 60 TO 80 MILLION

	Benefits (PV, $m)	Costs (PV, $m)	Net — NEW (PV, $m)	Net — INITIAL (PV, $m)
Scenario 1	$290	-$1,057	-$767	***-$839***
Scenario 3	$208	-$646	-$438	***-$490***
Scenario 4	$361	-$1,293	-$932	***-$1,027***
Scenario 5	$361	-$1,093	-$733	***-$823***
Scenario 7	$254	-$768	-$514	***-$586***
Scenario 8	$290	-$1,035	-$745	***-$817***
Scenario 9	$261	-$900	-$639	***-$711***

'Net — NEW' reflects the changes to the assumptions. 'Net — INITIAL' is taken from the initial analysis.

5.4 Other comments

Social impact analysis

The regulation needs to address the inequity of how the costs are currently borne between consumers and retailers (194).

This is neither an economic cost nor an environmental benefit. It is a social impact, and requires a value judgement. It is addressed in module 6.

Chapter 6

Module six — social impact analysis

Rather than providing estimates of the cost of social impacts of options, ACG has for other projects ranked the social impacts of options in order to provide qualitative input to policy makers. ACG is asked to provide advice as to whether it feels able to meaningfully undertake this task in relation to plastic bags, and should this be the case provide a quote for this work.

6.1 Multi-Criteria Decision Analysis

The policy scenarios that are being compared, and their monetised economic costs and environmental benefits are shown in Table 6.1. The estimates shown in Table 6.1 do not reflect the sensitivity analysis around the price of reusable bags, the impact of changes to transaction times or the changes to costs associated with government monitoring and enforcement. If these changes were also to be introduced, then the net cost of the scenarios would be lower than shown.

Table 6.1

COST BENEFIT ANALYSIS — SUMMARY OF NPVS

Scen.	Description	Enviro. Benefit ($m, PV)	Econ. Cost ($m, PV)	Net ($m, PV)
A	Base case	0	0	0
B	Scenario one from original analysis — LWPB ban from 2009	204	-782	-578
C	Scenario seven from original analysis — advanced clean-up fee	170	-502	-332
D	Scenario eight from original analysis — mandatory retailer charge ($0.25)	204	-761	-557
E	Scenario nine from original analysis — government levy ($0.10)	177	-626	-449
F	'More developed' scenario — government levy ($0.20)	191	-711	-521
G	'More developed' scenario — government levy ($0.25)	204	-480	-276
H	'More developed' scenario — retailer charge ($0.10)	177	-822	-645
I	'More developed' scenario — retailer charge ($0.20)	191	-936	-745
J	'More developed' scenario — retailer charge ($0.25)	204	-640	-436
K	Targeted litter strategy	102	-102	0

Note: All costs and benefits are calculated in comparison to the alternative base case (see for more information). Action scenarios that were scheduled to have been implemented prior to 1 January 2009 are not included in this comparison.

Additionally, it is important to note that the net cost of the scenarios is spread over a number of years, with action commencing in 2009 and continuing to 2016. The average cost for each year is shown in Table 6.2.

Table 6.2

COST BENEFIT ANALYSIS — ALTERNATIVE BREAK DOWN

Scen.	Description	Total cost per littered LWPB ($)	Total cost per person ($)	Annual net cost ($)
A	Base case	$0	$0	$0 m
B	Scenario one from original analysis — LWPB ban from 2009	$3	$5	$78 m
C	Scenario seven from original analysis — advanced clean-up fee	$2	$4	$44 m
D	Scenario eight from original analysis — mandatory retailer charge ($0.25)	$3	$6	$84 m
E	Scenario nine from original analysis — government levy ($0.10)	$3	$5	$68 m
F	'More developed' scenario — government levy ($0.20)	$3	$6	$82 m
G	'More developed' scenario — government levy ($0.25)	$2	$4	$31 m
H	'More developed' scenario — retailer charge ($0.10)	$4	$7	$104 m
I	'More developed' scenario — retailer charge ($0.20)	$4	$8	$125 m
J	'More developed' scenario — retailer charge ($0.25)	$3	$5	$60 m
K	Targeted litter strategy	< $1	< $1	$0 m

Note: As costs and benefits vary from year to year, the estimates presented are approximate averages calculated over the period 2010 to 2016. The year 2009 is excluded, because this is the implementation year for all of the scenarios, and there will be significant one-off start-up costs that are not representative of the on-going costs of the scenarios.

While this provides another perspective on the same problem, it still does not take into account the social aspect of the LWPB problem. In order to do so, it is necessary to develop criteria against which the scenarios can be scored. This is because competing scenarios might deliver similar observable or objective outcomes, but differ substantially in the way they are perceived by the community. They may have a different 'feel' from a community perspective, and offer a different mix of pros and cons when rated against broader ethical and societal objectives. At the same time, it is necessary to incorporate the cost-benefit analysis so that the full gamut of impacts can be considered and compared. Two scenarios may provide the same social and environmental pay-off, but one may do so at a considerably lower economic cost. If the economic analysis is omitted from the MCDA framework, it will not be possible to identify these sorts of opportunities.

Economics has long recognised the importance of ethical, social and environmental criteria in identifying policies that enhance community wellbeing. While some elements of these are easier to measure than others, all contribute to the degree of satisfaction achieved within a society. Economics' key role is a tool for highlighting least-cost pathways to achieving desired outcomes, and for comparing the costs and benefits of alternatives. However, where social and environmental valuations are important (and difficult to estimate), economics is ill equipped to determine the superiority of one policy outcome over another. The information 'gap' that sometimes confronts economic analysis (eg. valuation of environmental and social impacts) and the need to reflect social preferences (eg. attitudes to waste or animal welfare) both require the use of informed judgement by policymakers to determine the mix of measures that is likely to deliver the best all round outcome.

A tool known as multi-criteria decision analysis (MCDA) can be employed to highlight the multi-dimensional nature and consequences of policy decisions, and support a transparent process of weighing and scoring scenarios within this framework as an aid to decision-making. The main strength of MCDA is that it brings a degree of structure and openness to the evaluation of scenarios in circumstances where the scenarios generate impacts that cannot be easily quantified or valued, but that are important to the assessment, and that can be compared. An overview of the MCDA process is provided in Box 6.1.

Box 6.1

SETTING UP MULTI-CRITERIA DECISION ANALYSIS (MCA)

MCA is an aid to decision-making. Three key steps are involved in conducting multi-criteria decision analysis:

- First — a range of criteria are chosen to assess each option. The criteria must reflect performance dimensions in proposal under consideration, and must be measurable, in the sense that it must be possible to assess, at least in a qualitative sense, how well a particular option is expected to perform in relation to the criterion.
- Second — each option is given a score that depends on its expected performance against each of the criteria selected. A five or seven point scale is typically used to assess whether the performance of an option against a criterion is 'good', 'moderate' or 'bad'. This immediately raises the issue of what is meant by a 'good', 'moderate', or 'bad' outcome. There is really no way of objectively answering this question — it is inevitably a matter of judgment. However, the advantage of multi-criteria decision analysis is that such judgments would be transparent.
- Third — each criterion would be assigned a weight, depending on its relative importance in making an overall choice. Again, the assignment of weights would involve a good deal of subjective judgment. While the choice of weights could never be proven 'correct', such a method has the advantage of transparency and consistency. Moreover, the robustness of the methodology could be easily checked by changing the weights for each variable, or indeed changing the criteria for judging whether a change to a variable caused by a particular option was 'significant' or not.

The weighting process forces decision makers to explicitly rank those criteria that are most significant. This makes the final assessment of the options more transparent and less prone to criticism than an assessment made with less of an analytical foundation.

For the evaluation of plastic bag policies a full set of environmental, economic and social criteria are relevant. As highlighted below, plastic bag reduction policies appear to have a strong social resonance, in addition to the environmental benefits that are commonly highlighted as a key rationale. A range of consumer surveys point to the importance of waste and sustainability issues in relation to plastic bags. These issues include, but extend beyond, concerns about plastic bags entering the litter stream and harming visual amenity and wildlife. A strong theme from the surveys is a concern about unnecessary consumption of plastic bags and the extent to which they have become a lighting rod for concerns about a profligate and 'throw way' society chewing through its resources at an increasing rate.

6.2 Community perceptions

The pervasiveness of plastic bags has led them to acquire a high profile in the public psyche, and has seen them strongly targeted by environmental and anti-litter groups. There is significant evidence that the public considers that there are 'too many' plastic bags being consumed and a consequent 'excessive' use of resources that is spilling over into wildlife concerns and a reduction in social and environmental amenity.

This is highlighted in an Australia-wide Newspoll survey of 1200 adults conducted in 2005 on behalf of the Clean Up Australia campaign. This survey found that, despite a high level of bag usage, about 58 per cent of respondents were in favour of a ban on plastic bags. Further, 81 per cent of respondents considered themselves 'likely' to use plastic bag alternatives. Of those shoppers that regularly use plastic bags, 46 per cent say it is because they are always given one by retailers.[16] A 2003 survey conducted by PlanetArk reported 8 out of 10 respondents were in favour of levy on plastic bags as a mechanism for discouraging their use.

A more recent survey conducted by OmniAccess Wolcott on behalf of the NSW Department of Environment and Conservation echoes these results, and provides further insight to the linkage of plastic bags to a suite of broad environmental concerns in the mind of consumers. The survey was carried out nationally between 21 and 23 April 2006, and represents a sample of 1000 consumers (over the age of 16) drawn from a random telephone poll.

Key results include:

- 812 of the 1000 respondents were conscious of reducing their use of plastic bags;
- 4 per cent of all respondents gave 'plastic bag reduction' as their first answer when asked what they had done in the past year to help the environment (compared to 30 per cent who nominated 'recycling', 11 per cent who nominated water conservation, and 21 per cent who said they couldn't recall any contribution)
- 95 per cent of these avoided bags if they had few items to carry, while 88 per cent said they now used re-usable bags 'often'; and
- of the 155 respondents not currently reducing their plastic bag consumption:

[16] Clean Up Australia 2005, *Community Favours Plastic Bag Ban in Retail Outlets*, Media release, 29 May 2005.

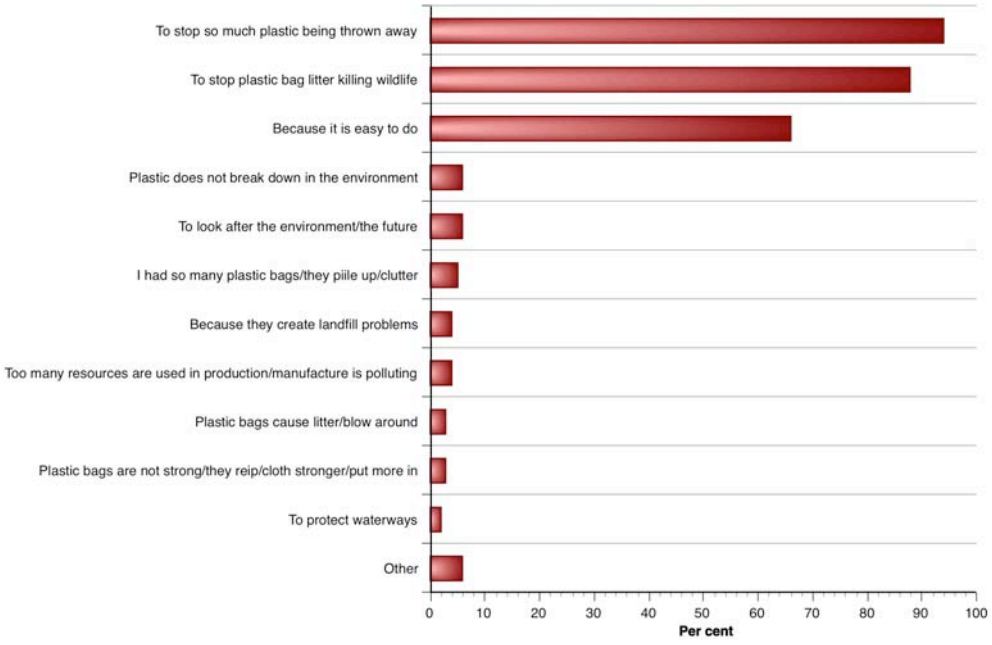
- 4 per cent stated that this was because they rejected the objective (i.e. they considered it to be 'hype');
- 36 per cent of non-reducers highlighted the value of bags as bin liners, etc; and
- 23 per cent suggested that apathy on their part was the main reason.

The perceived 'environmental' contribution of reduced levels of plastic bag consumption is also important. Consumer views on the environmental benefits from cutting plastic bag consumption extend beyond litter (eg. adverse aesthetic and wildlife) impacts. This is illustrated in Figure 6.1.

Results at the national level show that over 90 per cent of respondents were concerned about the amount of plastic being thrown away, 85 per cent were concerned about wildlife impacts and 63 per cent favoured action on plastic bags '… because it's easy to do'. The survey also suggests the existence of a flow-on effect from action around plastic bags. In response to the question 'Did reducing your use of plastic bags for shopping make it easier to make other changes that help the environment?' 48 per cent of respondents asserted that it did.

Figure 6.1

REASONS FOR REDUCING PLASTIC BAG USE (PERCENTAGE OF RESPONDENTS WHO ARE CURRENTLY REDUCING BAG CONSUMPTION (812 IN TOTAL))



Source: OmniAccess Woolcott Research 2006, *Plastic Bags Tabulation prepared for the Department of Environment and Conservation,* Sydney.

The form that this flow-on takes is not clear. It may be linked to awareness raising, or increased motivation to build on environmental efforts. The extent to which higher levels of spin-off or environmental benefit might be associated with other environmental policy objectives is also unclear.

What does emerge from the survey and the review of the litter problem is that while plastic bags can often represent a small share of the litter problem in a strict numerical sense, they tend to have a high profile in the public consciousness. For whatever reason, plastic bags have assumed a degree of public importance and generate a level of community concern that appears to exceed their importance in the litter stream on an 'item' or volume basis.

6.3 Scoring the scenarios

These elements point to the following criteria for use in a comparative assessment of the full range benefits of alternative LWPB policy scenarios. The MCDA framework used for this analysis has three broad criteria, each of which is made up of three sub-criteria. These criteria are:

- socio-environment impacts, which contain the following sub-criteria:
  - reduce consumption of lightweight plastic bags and associated non-renewable resources;
  - support behaviour change in other environmental resource and waste minimisation aims; and
  - support community empowerment and facilitate consumer choice;
- directly attributable environmental and amenity impacts, which consist of the following sub-criteria:
  - reduction in deliberate LWPB litter output (and associated environmental impacts);
  - reduction in non-deliberate litter output (eg. animals and windblown);
  - reduction in upstream (production related) environmental impact;
- economic impacts, which consist of the following sub-criteria:
  - minimise economic impact on retailers;
  - minimise economic impact on consumers; and
  - minimise other economic costs/ inefficiencies/ adverse incentives.

The first broad criterion is socio-environment impacts, which contains the following sub-criteria:

- reduce consumption of light weight plastic bags and associated non-renewable resources;
- support other environmental resource and waste minimisation aims; and
- supporting community empowerment and facilitating consumer choice.

The first criterion focuses on reducing the consumption of LWPBs. As this is not directly linked to the number of LWPBs littered, it is included as a criterion because reducing the consumption of LWPBs is a socially desired outcome in its own right. Reduced consumption of LWPBs represents a lessening reliance on a 'throw-away' product. For this criterion, the scenarios that eliminate LWPB consumption — scenarios B, D, G and J — score highest (5 out of a possible 5). Scenarios that do not target reductions in LWPB consumption — effectively or at all — score relatively poorly (1 or 2 out of a possible 5). These are scenarios A and K — the base case, and the targeted litter strategy. All of the other scenarios — which involve charges or levies — are scored in between — LWPB consumption is reduced, but not *completely* reduced. Scenarios that achieve an 80 per cent reduction are scored with a 3, while scenarios that achieve a 90 per cent reduction are scored with a 4.

The second criterion — *support behaviour change in other environmental resource and waste minimisation aims* — aims to account for the extent to which the scenario's action on LWPB consumption has spillover benefits to other wasteful activities. As discussed earlier in this chapter, a significant proportion of consumers feel that reducing their use of LWPBs made it easier for them to make other changes that helped the environment. Scenario B — the LWPB ban — scored lowest (1 out of a possible 5) on this criterion. This is because it is thought that once LWPBs are banned, they will be 'out of sight, out of mind' for consumers, and the flow-on benefits to other wasteful activities will not result. The base case scored 2, since the evidence from the aforementioned survey suggests that the voluntary initiatives of retailers are already having an impact on household consumption patterns. The advanced fee for litter clean-up scenario (C) scored highest (4 out of a possible 5), with all of the other scenarios scoring 3.

The third criterion — *supporting community empowerment and facilitating consumer choice* — accounts for the impact the various scenarios have on consumers' ability to make decisions for themselves. Once again, the LWPB ban scenario (B) scored lowest on this criterion (2 out of 5). By using regulation to eliminate LWPBs, consumers are deprived of one of their options for carrying their shopping home. While the retailer charge and government levy scenarios involving a 25 cent price also drive LWPB consumption close to zero, this is in response to consumers *choosing* to consumer fewer LWPBs. Scenario A, the base case, scored 3 on this criterion. While consumers are able to choose from a range of LWPB alternatives under this scenario, the fact that there is no transparent and direct charge for the LWPBs means that consumers are paying for LWPBs (through the mark-up on retail items) regardless of whether or not they actually use LWPBs. Scenario K was scored 3 out of 5 for the same reason. All of the remaining scenarios score 5 out of 5, because consumers are given the opportunity to choose from the full range of LWPB alternatives.

The second broad criterion accounts for directly attributable environmental and amenity impacts, and consists of the following sub-criteria:

- reduction in deliberate LWPB litter output (and associated environmental impacts);
- reduction in non-deliberate litter output (eg. animals and windblown); and
- reduction in upstream (production related) environmental impact.

The directly attributable environmental and amenity impacts reflect the extent to which littered LWPBs are a problem, and the production of LWPBs is a waste of limited resources. While the socio-environment criteria are directly related to social ideals and consumer choice, the directly-attributable environmental and amenity impacts are focussed on the perceived desirability of LWPBs. The first sub-criterion reflects the impact of the scenario in deliberate litter, while the second focuses on inadvertent litter. Both criteria are applied, because some scenarios address each type of litter in different ways, and with varying success. The third criterion taps into the idea that a reduction in the consumption of LWPBs will lead to a reduction in the production of LWPBs and that the resources that go into producing and distributing LWPBs — time, effort, raw materials and so on — can be allocated to something more worthwhile.

For the first sub-criterion, all of the scenarios that result in the elimination of LWPB consumption score highest — scenarios B, D, G and J. The base case scores lowest (1 out of 5), as the latest information from Hyder Consulting demonstrates that the voluntary initiatives of retailers have not had a significant impact on the number of LWPBs entering the litter stream annually. All of the other scenarios score 4 out of 5. For most of these scenarios, this is due to expected significant decreases in LWPB consumption. Scenario C uses the revenue from the LWPB-levy to address LWPB litter — either through clean up, or through information and awareness campaigns. Scenario K also directly addresses LWPB litter, however, it has a targeted 50 per cent reduction. Nevertheless, scenario K also scores 4 out of 5, since the initiatives implemented under scenario K will lead to reduced rates of deliberate litter for waste products other than simply LWPBs.

The scores for the scenarios against the second sub-criterion — *reduction in non-deliberate litter output (eg. animals and windblown)* — are essentially the same as they were for the first sub-criterion. This is because most of the scenarios address deliberate and inadvertent litter in the same way — through reduced LWPB consumption. The scores are different for scenarios C and K for this sub-criterion than for the earlier one because both of these scenarios specifically address the cleanup of littered LWPBs. As a result, both of these scenarios score 5 out of 5 for this sub-criterion.

The third sub-criterion addresses the extent to which the scenario reduces the production of LWPBs — effectively, the time and energy devoted to manufacturing and distributing a product that only has a single use. Once again, scenarios that eliminate demand for LWPBs score highest against this criterion — scenarios B, D, G and J. The scenarios that entail a charge or a levy — scenarios C, E, F, H and I — score 4 out of 5, since all of these scenarios reduce LWPB demand. The other scenarios score poorly — 1 or 2 out of 5. The targeted litter strategy (K) scores 1, while the base case scores 2. This is because in the base case, retailers encourage consumers to use fewer LWPBs and promote reusables, and these activities have had some success, as supported by the latest information from Hyder Consulting, which shows that manufacturers in Australia have significantly reduced their production of LWPBs. Under scenario K, these activities may cease, with consumers demanding LWPBs unchecked and production of LWPBs increasing to meet demand.

Finally, the last broad criterion accounts for the economic impacts of the scenarios. It consists of the following sub-criterion:

- minimise economic impact on retailers;
- minimise economic impact on consumers;
- minimise other economic costs/ inefficiencies/ adverse incentives.

The economic impacts can be scored objectively to directly reflect the cost-benefit analysis. The MCDA framework is therefore used to apportion weights to different stakeholder groups. For example, the retailer charge is likely to increase costs to consumers while benefiting retailers to some extent. The MCDA framework allows policy makers consider whether or not they value the impacts to retailers as much as they value the impact to consumers. Finally, the third criterion reflects the extent to which the different scenarios give rise to economic inefficiencies — that is, the overall economic cost estimated using the CGE modelling.

Scenario K — the targeted litter strategy — scores highest on the first sub-criterion, because it has no direct economic impact on retailers. Scenarios H and I score second highest (4 out of 5), since while retailers do incur costs, they also benefit from the revenue collected from the mandatory charge. Scenario A also scores 4 out of 5, since retailers have chosen to undertake voluntary measures to reduce LWPB consumption. Scenario J scores 3 out of 5, since retailers charge for LWPBs, however, since there is very limited demand for them at the 25 cent price, retailers do not actually raise any revenue from selling them. Scenario D is scored 2 out of 5. Scenario D is identical to scenario J, except that under scenario D, retailers incur administrative costs associated with the charge, whereas under scenario J, they do not. Retailers are therefore worse off under scenario D than they are under scenario J. All of the other scenarios are scored 1 out of 5.

For the second sub-criterion — *minimise economic impact on consumers* — scenarios F and I score lowest (1 out of 5). This is because both of these scenarios entail a 20 cent price for LWPBs, and consumers must pay a high price for something they currently receive for 3 cents. Scenarios with a 25 cent levy or charge — D, G and J — score 3 out of 5, since consumers do not actually pay the levy/charge due to consuming fewer LWPBs. Nevertheless, the costs of training, equipment modification and increased transaction times incurred by retailers will be passed on to consumers in the form of higher prices for retail goods. The LWPB ban receives 2 out of 5 for the same reason — consumers no longer have a cheap LWPB alternative, and must purchase either a reusable bag or a single use alternative bag, both of which cost significantly more than 3 cents. Scenarios with a 10 cent levy or charge are scored at 3 out of 5 as they still give consumers a relatively cheap bag product. In addition, the overall costs passed onto consumers by retailers are less under these scenarios than in the scenarios where the levy/charge is 20 cents. Scenarios A and K score highest — 5 out of 5 — because consumers are not directly charged more than 3 cents for their LWPBs.

For the final sub-criterion — *minimise other economic costs/ inefficiencies/ adverse incentives* — the scores are allocated based on the overall economic costs presented in Table 6.1. This is because the CGE-modelled results measure the cost of the chosen scenario to the economy as a whole. This criterion also seeks to reflect the extent to which the different scenarios present stakeholders with options to exploit loopholes in the regulations. For example, a charge on LWPBs may lead to retailers introducing slightly thicker plastic bags that are provided for free, leading to an adverse outcome. The original analysis assumed that, given the voluntary actions taken by retailers to date, retailers would follow the spirit as well as the letter of any regulations. To maintain consistency with the original analysis, it is assumed that retailers will not seek to game the regulations under the different scenarios. Since the base case (A) does not cause any changes to economic activity, it scores highest (5 out of 5). Scenario K, which has the lowest economic cost, scores next highest (4 out of 5), with all of the scenarios scoring lower to some extent.

Sensitivity analysis

The unweighted scores for each of the criteria, and the total scores for each scenario, are shown in Table 6.3. Scenario J, the 'more developed' retailer charge with the 25 cent price emerges as the superior policy scenario (36 points), closely followed by the mandatory retailer charge of 25 cents from the initial analysis (D, 35 points) and the 25 cent government levy (G, 34 points). This result assumes that each criterion is equally important. Given that the problem that the policy scenarios are aiming to address is the wastefulness represented by LWPBs, and the overall community dislike of LWPBs, the socio-environmental impacts could be given a higher weighting than the environmental and economic impacts.

Table 6.4 presents a weighted MCDA framework, with socio-environmental impacts having a higher weight (40 per cent) than the others (30 per cent each). These weighted scores do not change the outcome — scenario J remains the superior policy, once again followed by scenarios D and G. Nevertheless, changing the weights — and changing the scores — can alter the ranking of the options. Subjective interpretations of what the scores for different scenarios ought to be can also vary depending on how the scenarios are to be implemented. For example:

- The current scoring is based on the assumption that retailers can keep all of the revenue that is raised by the retailer charge — if a significant proportion of the retailer charge revenue is allocated to an environmental trust or fund, then the scores for the retailer charge scenarios will need to revised downwards accordingly. At the same time, the scores for these scenarios against environmental outcomes and overall economic performance will improve. To the extent that this is the case, scenarios D, H, I and J will need to be re-scored.
- Stakeholders may seek to game the regulations by offering free LWPB-substitutes in place of LWPBs. If the LWPB-substitutes are not environmentally sound (for example, slightly thicker plastic bags), this gives rise to an adverse outcome. This will mean that all of the scenarios — except for scenario A and scenario K — will need to be re-scored.

- There is evidence to suggest that retailers are seeking exemptions to the LWPB ban, on the basis that for occupational health and safety reasons, it is necessary to pack certain items (frozen products, fresh meat and fish, raw vegetables and fruit, packaged raw meats, chemicals, etc) to isolate them from other goods. There is a possibility that if this exemption is allowed, a price on LWPBs may actually reduce LWPB consumption to a greater extent than a partial ban. If this is the case, then scenario B will need to be re-scored.

Table 6.3

PROPOSED MULTI-CRITERIA DECISION ANALYSIS FRAMEWORK FOR LWPB POLICY SCENARIOS — UNWEIGHTED

Criteria	A	B	C	D	E	F	G	H	I	J	K
Socio-environmental impacts											
1. Reduce consumption of light weight plastic bags and associated non-renewable resources	1	5	3	5	3	4	5	3	4	5	2
2. Support behaviour change in other environmental resource and waste minimisation aims	2	1	4	3	3	3	3	3	3	3	3
3. Supporting community empowerment and facilitating consumer choice	3	2	5	5	5	5	5	5	5	5	3
Directly attributable environmental and amenity impacts											
4. Reduction in deliberate LWPB litter output (and associated environmental impacts)	1	5	4	5	4	4	5	4	4	5	4
5. Reduction in non-deliberate litter output (eg. animals and windblown)	1	5	5	5	4	4	5	4	4	5	5
6. Reduce upstream (production related) environmental impact	2	5	4	5	4	4	5	4	4	5	1
Economic impacts											
7. Minimise economic impact on retailers	4	1	1	2	1	1	1	4	4	3	5
8. Minimise economic impact on consumers	5	2	3	3	3	2	3	3	2	3	5
9. Minimise other economic costs/ inefficiencies/ adverse incentives	5	1	3	2	1	1	2	1	1	2	4
TOTAL	**24**	**27**	**32**	**35**	**28**	**28**	**34**	**31**	**31**	**36**	**32**

Scale: 1-5 — 1 for poor performance through to 5 for high performance

Table 6.4

PROPOSED MULTI-CRITERIA DECISION ANALYSIS FRAMEWORK FOR LWPB POLICY SCENARIOS — WEIGHTED

Criteria		A	B	C	D	E	F	G	H	I	J	K
Socio-environmental impacts	***40.0***											
1. Reduce consumption of light weight plastic bags and associated non-renewable resources	**13.3**	13	67	40	67	40	53	67	40	53	67	27
2. Support behaviour change in other environmental resource and waste minimisation aims	**13.3**	27	13	53	40	40	40	40	40	40	40	40
3. Supporting community empowerment and facilitating consumer choice	**13.3**	40	27	67	67	67	67	67	67	67	67	40
Directly attributable environmental and amenity impacts	***30.0***											
4. Reduction in deliberate LWPB litter output (and associated environmental impacts)	**11.0**	11	55	44	55	44	44	55	44	44	55	44
5. Reduction in non-deliberate litter output (eg. animals and windblown)	**11.0**	11	55	55	55	44	44	55	44	44	55	55
6. Reduce upstream (production related) environmental impact	**8.0**	16	40	32	40	32	32	40	32	32	40	8
Economic impacts	***30.0***											
7. Minimise economic impact on retailers	**11.0**	44	11	11	22	11	11	11	44	44	33	55
8. Minimise economic impact on consumers	**11.0**	55	22	33	33	33	22	33	33	22	33	55
9. Minimise other economic costs/ inefficiencies/ adverse incentives	**8.0**	40	8	24	16	8	8	16	8	8	16	32
TOTAL	***100.0***	**257**	**298**	**359**	**394**	**319**	**321**	**383**	**352**	**354**	**405**	**356**

Scale: 1-5 — 1 for poor performance through to 5 for high performance. The score is then multiplied by the weight. E.g., a score of 5 with an 11 per cent weight results in a weighted score of 55.

Appendix A

Summary of scenarios

The 'preliminary analysis' scenarios refers to the scenarios that were evaluated in the first ACG report on options for phasing out light-weight plastic bags, which was submitted to the EPHC in final form in May 2006.

The 'supplementary analysis' scenarios refers to the scenarios that were evaluated in the latest ACG report on options for phasing out light-weight plastic bags, which was submitted to the EPHC in draft form in January 2008.

Preliminary analysis — scenarios

Table A.1

SUMMARY TABLE OF FORECAST INITIAL ECONOMIC AND ENVIRONMENTAL COSTS AND BENEFITS, IN COMPARISON TO 'NO FURTHER ACTION'

Scen.	Timing	Description	Key sectors affected by scenarios identified by the Environment Protection Heritage Council			
			Retail industry	Households	Government	Environment
1	Eliminate LWPBs by 2009	Comprehensive ban effective from 1 January 2009	• implementation costs (equipment modification, staff training, increased theft) • reduced revenue due to longer transaction times • increased cost due to in-store education and promotion • net cost ($432.9m)	• reduced consumption of LWPBs, increased consumption of alternatives • net benefit ($109.8m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($19.0m)	• reduction in litter • 360.6m fewer bags littered
2	**No further action** (ARA Code expires)	Code expired on 31 December 2005, then no further action.	• no impact	• trend toward pre-2002 purchase behaviour	• no impact	• no further policy impact • (expect litter increase)
3	**Extend Code**	**Continuation of 50 per cent reduction on 2002 bag ratio to 2016**	• **50 per cent of 2002 bag/sales ratio maintained over the period 2005-2020 for all large retailers, and half of all medium and small retailers** • **implementation costs and on-going costs (similar to Scenario 1)** • **net cost ($329.6m)**	• **50 per cent reduction of LWPB consumption, increased consumption of alternatives** • **net benefit ($82.9m)**	• **increased administrative expenses** • **reduced litter clean-up expenses** • **net benefit ($12.7m)**	• **reduction in litter** • **245.3m fewer bags littered**
4	Escalating charge (kept by retailers)	LWPB charge from 1 January 2007 at $0.05 per bag, $0.15 from 2008,	• increased implementation costs and on-going costs (similar to Scenario 1) • increased administrative costs • increased revenues (from LWPB	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net benefit ($1.6m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($23.1m)	• reduction in litter • 418.4m fewer bags

Scen.	Timing	Description	Key sectors affected by scenarios identified by the Environment Protection Heritage Council			
			Retail industry	Households	Government	Environment
		$0.25 from 2009	sales) • net cost ($663.4m)			littered
5	Voluntary phase out to 2009, mandatory beyond	Linear phase out to zero between 2006 and 2009	• increased implementation costs and on-going costs (similar to Scenario 1) • net cost ($563.9m)	• reduced consumption of LWPBs, increased consumption of alternatives • net benefit ($136.5m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($23.9m)	• reduction in litter • 422.4m fewer bags littered
6	Earlier ban on LWPBs	Timing variations on Scenario 1	• see chapter 5	• see chapter 5	• see chapter 5	• see chapter 5
7	Disposal fee (cost recovery)	Fee charged to consumers ($0.05) to recover cost of effective LWPB disposal initiative from 1 January 2009	• increased implementation, on-going and administrative costs (similar to Scenario 4) • net cost ($433.9m)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net cost ($195.5m)	• increased administrative expenses (general) • increased administrative expenses (levy collection) • reduced litter clean-up expenses • net cost ($10.8m)	• reduction in litter • 300.5m fewer bags littered
8	Regulated price (kept by retailers)	Fee charged to consumers ($0.25), and applied by retailers from 1 January 2009	• increased implementation, on-going and administrative costs (similar to Scenario 4) • net cost ($620.8m) • (bag consumption & revenue approx zero @ price of $0.25 per bag)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net benefit ($152.1m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($19.5m)	• reduction in litter • 360.6m fewer bags littered
9	Levy on LWPBs	LWPB levy ($0.10) applied at point of sale from 1	• increased implementation, on-going and administrative costs (similar to Scenario 4) • net cost ($511.2m)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net cost ($262.8m)	• increased administrative expenses (similar to Scenario 7) • reduced litter clean-up expenses • net cost ($12.9m)	• reduction in litter • 312.5m fewer bags littered

Scen.	Timing	Description	Key sectors affected by scenarios identified by the Environment Protection Heritage Council			
			Retail industry	Households	Government	Environment
		January 2009				

Supplementary analysis — scenarios

Scenario A

Scenario A is the base case, against which all other scenarios are compared. This scenario assumes:

- a continuation of voluntary effort on the part of retailers, maintained at current levels (promotion of reusables, making alternatives available, 'say no to plastic bags', etc); and
- LWPB consumption levels updated to reflect the latest data from Hyder Consulting, with 4.2 billion LWPBs consumed in 2007 and an estimated rate of growth for LWPB consumption of 2.5 per cent.

Scenario B

Scenario B is similar to scenario one from the May 2006 analysis. This scenario assumes:

- a legislated or regulated ban on LWPBs from 1 January 2009;
- retailer costs associated with training, equipment changes, theft, and increased transaction times;
- government costs associated with monitoring and enforcement; and
- elimination of LWPB demand and LWPB litter (does not include existing LWPB litter).

Scenario C

Scenario C is similar to scenario seven from the May 2006 analysis. This scenario assumes:

- a legislated or regulated 5 cent levy on LWPBs from 1 January 2009;
- levy revenue is allocated to LWPB litter clean up or other LWPB litter initiatives;
- retailer costs associated with training, equipment changes, theft, administration, and increased transaction times; and
- government costs associated with monitoring and enforcement, and collection of the levy;
- government benefits associated with levy revenue;
- 50 per cent reduction in LWPB demand and roughly 80 per cent reduction in LWPB litter (may include existing LWPB litter).

Scenario D

Scenario D is similar to scenario eight from the May 2006 analysis. This scenario assumes:

- a retailer charge of 25 cents for LWPBs from 1 January 2009;

- retailers get to keep the revenue, but there is very little revenue because demand for LWPBs at this price is assumed to fall to close to zero;
- retailer costs associated with training, equipment changes, theft, administration, and increased transaction times; and
- government costs associated with monitoring and enforcement;
- effective elimination of LWPB demand and LWPB litter (does not include existing LWPB litter).

Scenario E

Scenario E is similar to scenario nine from the May 2006 analysis. It is also the 10 cent 'more developed' government levy option. This scenario assumes:

- a legislated or regulated 10 cent levy on LWPBs from 1 January 2009;
- retailer costs associated with training, equipment changes, theft, administration, and increased transaction times; and
- government costs associated with monitoring and enforcement, and collection of the levy;
- government benefits associated with levy revenue;
- 80 per cent reduction in LWPB demand and roughly 86 per cent reduction in LWPB litter (does not include existing LWPB litter).

Scenario F

Scenario F is the same as scenario E, but with a 20 cent levy. This scenario assumes:

- a legislated or regulated 20 cent levy on LWPBs from 1 January 2009;
- retailer costs associated with training, equipment changes, theft, administration, and increased transaction times; and
- government costs associated with monitoring and enforcement, and collection of the levy;
- government benefits associated with levy revenue;
- 90 per cent reduction in LWPB demand and roughly 93 per cent reduction in LWPB litter (does not include existing LWPB litter).

Scenario G

Scenario G is the same as scenario E, but with a 25 cent levy. This scenario assumes:

- a legislated or regulated 25 cent levy on LWPBs from 1 January 2009;
- retailer costs associated with training, equipment changes, theft, administration, and increased transaction times; and
- government costs associated with monitoring and enforcement, and collection of the levy;

- no government benefits associated with levy revenue, since LWPB demand is driven effectively to zero at this price;
- effective elimination of LWPB demand and LWPB litter (does not include existing LWPB litter).

Scenario H

Scenario H is the same as scenario J, but with a 10 cent retailer charge. This scenario assumes:

- a retailer charge of 10 cents for LWPBs from 1 January 2009;
- retailer benefits associated with LWPB-charge revenue;
- retailer costs associated with training, equipment changes, theft, and increased transaction times, **but no additional administrative costs**; and
- government costs associated with monitoring and enforcement;
- 80 per cent reduction in LWPB demand and roughly 86 per cent reduction in LWPB litter (does not include existing LWPB litter).

Scenario I

Scenario I is the same as scenario J, but with a 20 cent retailer charge. This scenario assumes:

- a retailer charge of 20 cents for LWPBs from 1 January 2009;
- retailer benefits associated with LWPB-charge revenue;
- retailer costs associated with training, equipment changes, theft, and increased transaction times, **but no additional administrative costs**; and
- government costs associated with monitoring and enforcement;
- 90 per cent reduction in LWPB demand and roughly 93 per cent reduction in LWPB litter (does not include existing LWPB litter).

Scenario J

Scenario J is similar to scenario eight from the May 2006 analysis. . It is also the 25 cent 'more developed' retailer charge option. This scenario assumes:

- a retailer charge of 25 cents for LWPBs from 1 January 2009;
- retailers get to keep the revenue, but there is very little revenue because demand for LWPBs at this price is assumed to fall to close to zero;
- retailer costs associated with training, equipment changes, theft, and increased transaction times, **but no additional administrative costs**; and
- government costs associated with monitoring and enforcement;
- effective elimination of LWPB demand and LWPB litter (does not include existing LWPB litter).

Scenario K

The targeted litter strategy. Reduces LWPB litter by 50 per cent, using a combination of initiatives targeting community behaviour, deliberate and inadvertent litter, and providing assistance with litter clean up.

Appendix B

Business Cost Calculator

Table B.1 and Table B.2 provide the inputs necessary for the Business Cost Calculator. These estimates are based on the estimates used in the earlier Allen Consulting Group report, which were in turn based on previous work by Nolan-ITU. The major changes to the costs to businesses shown in these tables, and the costs to businesses in the previous analysis are:

- lower estimates associated with increased transaction times, to acknowledge that some retailers are already incurring costs associated with increased transaction times in the alternative base case; and
- lower estimates associated with in-store education and promotion, to acknowledge that some retailers are already incurring costs associated with increased transaction times in the alternative base case.

Table B.1

INPUTS FOR BUSINESS COST CALCULATOR — INTERNAL COSTS, SCENARIOS B TO J

	One-off or On-going	No. of businesses	Times performed	Time to complete (hours)	Cost of labour (per hour)
Staff training (BCC: Education)					
Small retailers	One-off	64 505	5	4	$18.00
Medium retailers	One-off	3 223	41	4	$18.00
Large retailers	One-off	211	2170	4	$18.00
Administration (BCC: Record keeping)*					
Small retailers	On-going	64 505	1	16	$50.00
Medium retailers	On-going	3 223	1	40	$30.00
Large retailers	On-going	211	1	80	$30.00
Increased transaction times (BCC: Enforcement/Other)					
Small retailers	On-going	64 505	10 633	0.0014	$18.00
Medium retailers	On-going	1 612	85 223	0.0014	$18.00
Large retailers	On-going	53	6 727 099	0.0014	$18.00

Notes: *Administration costs do not apply under scenarios H, I and J — the 'more developed' retailer charge scenarios.

Table B.2

INPUTS FOR BUSINESS COST CALCULATOR — OUTSOURCED COSTS, SCENARIOS B TO J

	One-off or On-going	No. of businesses	Times performed	Purchase cost
In-store education and promotion (BCC: Enforcement)				
Small retailers	On-going	48 379	1	$500.00
Medium retailers	On-going	1 612	1	$3 000.00
Large retailers	On-going	0	1	$5 000.00
Equipment modification (BCC: Enforcement)				
Small retailers	One-off	0	1	n.a.
Medium retailers	One-off	540	1	$3 000.00
Large retailers	One-off	30	1	$3 000.00
Theft (BCC: Other)				
Small retailers	One-off	64 505	1	$632.51
Medium retailers	One-off	3 223	1	$4 840.21
Large retailers	One-off	211	1	$301 421.80

The Allen Consulting Group

Phasing Out Light-Weight Plastic Bags

Costs and Benefits of Alternative Approaches

May 2006

Report to the Environment Protection and Heritage Council

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Contents

Executive summary

This report has been commissioned on behalf of the Environment Protection and Heritage Council to provide a cost-benefit analysis of policy options that could be used to phase out light-weight plastic bag (LWPB) use in Australia.

Reducing LWPB use is a significant and iconic policy issue — momentum has been building for some time to see a tangible reduction. In October 2003, the Environment Protection and Heritage Council, comprising Environment Ministers from the Commonwealth, and State and Territory governments, instructed officials to commence negotiations with retailers to phase out LWPBs within five years. Action to reduce plastic bag consumption was driven by the Australian Retailers Association *Code of Practice for the Management of Plastic Bags* (the ARA Code — which was appended to the National Packaging Covenant), which has recently expired.

The National Packaging Covenant (NPC) requires brand owners over a certain size to adopt take-back and reporting provisions or to become a signatory to the NPC and develop an action plan for managing their use of packaging. For LWPBs, the 'brand owner' is considered to be the importer or manufacturer of the plastic bag or the retailer who provides the plastic bag to the customer at point of sale.

Covenant signatories who provided bags to customers were also subject to the ARA Code. This applied target obligations on major retailers that would see LWPB consumption reduced to 50 per cent of 2002 levels by the end of 2005. Other obligations applied to smaller retailers. Following the expiration of the ARA Code, it is not yet certain whether retailers will continue the initiatives that were in place to reduce LWPB consumption.

The broad pattern of LWPB use (classified and traded as high density polyethylene (HDPE) bags) for 2002 is depicted in Figure E.1. This shows LWPB consumption in Australia at that time of around 6 billion bags per year. Low-density polyethylene (LDPE) bags — the heavier carry bags typically provided by major retailers — represented a further 900 million bags consumed by shoppers.

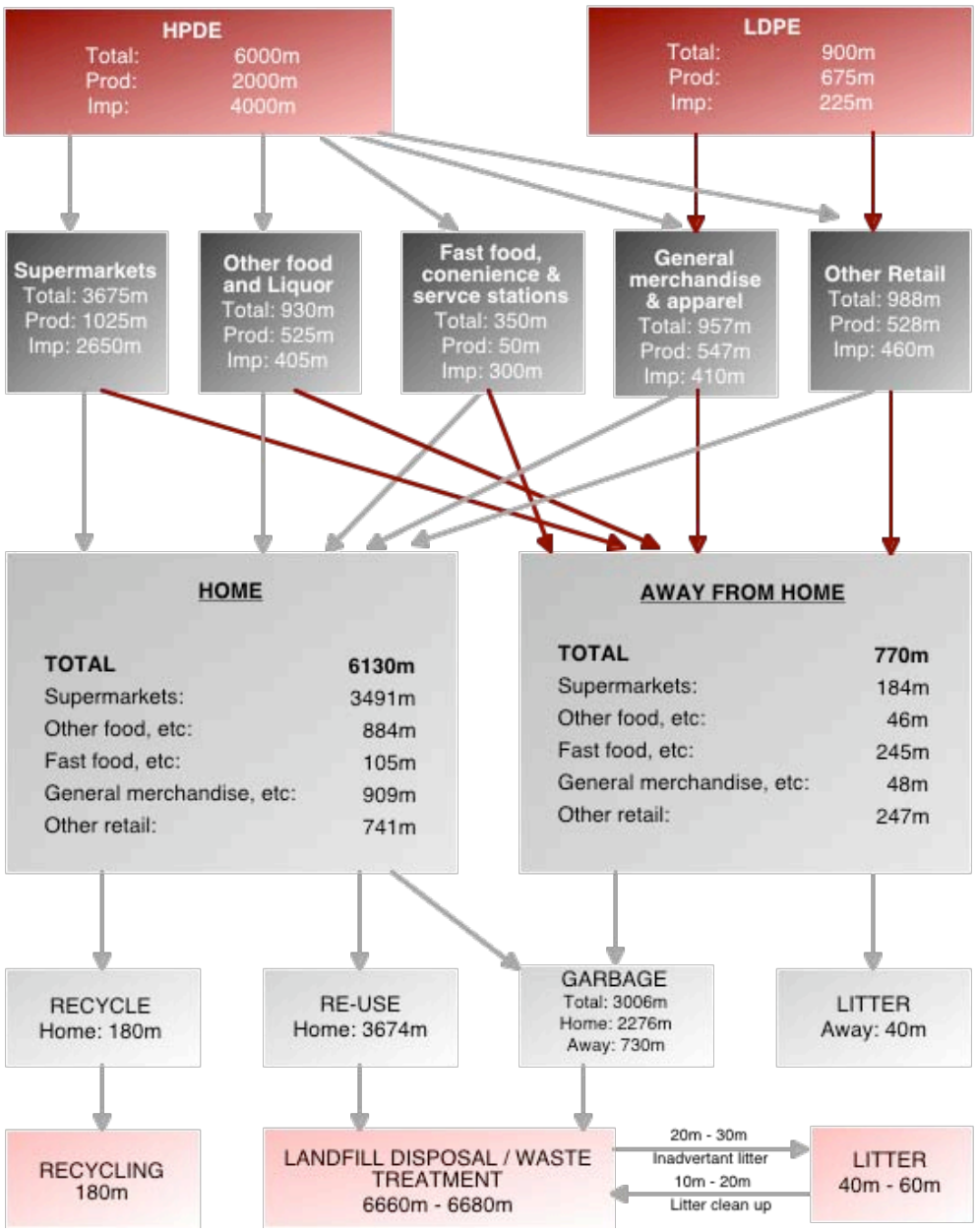
Action under the ARA Code to reduce LWPB consumption saw a range of initiatives introduced such as consumer awareness campaigns, greater availability and promotion of re-usable bags, and staff training, with a focus on point of sale communication with the customer. Obligations under the ARA Code for ongoing actions in this area expired on 31 December 2005. On current estimates, these initiatives are expected to have reduced LWPB consumption to around 4.3 billion bags per year[1] — final estimates of the reduction in LWPB use over the 2002 to 2005 period have yet to be developed.

In parallel with the 'code of practice' approach, the Environment Protection and Heritage Council also asked officials to develop advice on legislative options for achieving a phase-out objective. These options are to represent a mandatory pathway toward achieving LWPB reductions if the approach negotiated with industry did not deliver an adequate outcome.

[1] Nolan-ITU 2005, *Plastic Retail Carry Bag Use: 2002-2005 Consumption*, Melbourne, p. 7.

Figure E.1

PLASTIC BAG PRODUCTION, CONSUMPTION AND DISPOSAL, 2002



Based on: Nolan-ITU 2002, Plastic Shopping Bags — Analysis of Levies and Environmental Impacts, Melbourne, p. 9.[2]

Options for further action to achieve a phase-out of LWPBs are to be examined in the context of a subsequent regulatory impact statement.

[2] Calculating the number of bags that end up in the litter stream is complex and depends on the definitions and methodologies used. The economic modelling used here is based on a derived estimate of 40-60m littered bags. This differs from the Nolan-ITU 2002 estimate of 50-80m bags due to an alternative method used to aggregate Nolan-ITU's original inputs. The difference between these two estimates does not have a significant effect on the outcomes of the modelling.

Examination of policy options

Cost-benefit analysis of a range of LWPB phase-out policy options is presented in this study. Economic implications are examined at a national and industry level using the MMRF-Green computable general equilibrium model of the Australian economy. Economy-wide impacts of phase-out options were supplemented with analysis of flow on environmental effects.

The policy options evaluated are:

- Scenario 1 — elimination of LWPBs on 1 January 2009 (that is, an outright ban);
- Scenario 2 — no further government action;
- Scenario 3 — extension of the Australian Retailers Association *Code of Practice for the Management of Plastic Bags* (the ARA Code — which has been appended to the National Packaging Covenant);
- Scenario 4 — industry agreement to impose a gradually escalated charge, supported by co-regulatory measures;
- Scenario 5 — industry agreement to phase out LWPBs, followed by government regulation to restrict their supply;
- Scenario 6 — an outright ban on LWPBs prior to 2009;
- Scenario 7 — an advance disposal fee for LWPBs;
- Scenario 8 — retailers will be obliged (by regulation) to impose a minimum charge on every LWPB; and
- Scenario 9 — a government imposed levy on LWPBs.

In comparison to the scenario under which no further action is taken (that is, Scenario 2), all change options identified by the Environment Protection and Heritage Council produce outcomes in which the estimated economic and environmental costs exceed the benefits by substantial margins (see Table E.1).

Table E.1

SUMMARY TABLE OF ECONOMIC AND ENVIRONMENTAL COSTS AND BENEFITS IN RELATION TO SCENARIO 2

Scenario	Benefits (NPV*, $m)	Costs (NPV*, $m)	Net impact (NPV*, $m)
1. Eliminate LWPBs by 2009	$217.78	-$1057.08	-$839.30
3. Extend ARA Code	$156.34	-$646.01	-$489.67
4. Escalated charge	$266.28	-$1293.08	-$1026.80
5. Voluntary phase out to 2009, mandatory beyond	$270.61	-$1093.48	-$822.87
7. Disposal fee (cost recovery)	$181.48	-$767.95	-$586.47
8. Regulated price (kept by retailers)	$217.78	-$1035.12	-$817.34
9. Levy on LWPBs	$188.74	-$900.03	-$711.29

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum. Further detail about the methodology is provided in Appendix B and Appendix C.

This consistently negative outcome — ranging from $45 million to $85 million a year (consistently less than 0.02 per cent of gross domestic product, and equivalent to a net cost of around $5.80 to $11.00 per household per year) across the different scenarios — is:

- due to the fact that the environmental benefits of the different options are driven by reductions in the less than one per cent of LWPBs that are littered annually, and not by the overall consumption of LWPBs;
- driven by the adjustment costs faced by retailers, including increased transaction times, staff training and expenditure on in-store education and promotion, in relation to the situation in which there is no further action, and the ARA Code is no longer adhered to; and;
- relatively insensitive to alternative implementation dates and alternative discount rates.

The three lowest cost options are:

- Scenario 2 (which is not explicitly shown in Table E.1) — this scenario represents a baseline or 'inaction' scenario in which the ARA Code is no longer followed and no further government action is taken. Modest administrative savings are associated with this outcome, but LWPB usage and associated environmental damage costs grow unabated (that is, in the period from 2005 to 2016 an estimated 59.3 billion LWPBs will enter the waste stream and an additional 515.8 million will persist as litter).
- Scenario 3 — under this scenario LWPBs are not fully eliminated, because retailers are subject to ongoing suasive pressure through continuation of the ARA Code, and it is assumed that LWPB consumption will remain constant as a proportion of retail sales. Commensurate growth in the number of LWPBs in the waste stream, and consequential environmental damage effects, explain the lower net environmental benefits associated with this approach. It is less costly, but it also achieves less.

- Scenario 7 — this is also a lower cost option, and also does not eliminate all plastic bags. However, this option depicts a bag levy designed to recoup the cost of a litter elimination campaign in which LWPBs are successfully removed. A litter campaign funded to a level of over $300 million (and rising through time) focussing exclusively on the collection of LWPB's is assumed to achieve this purpose. This represents an effective 'bounty' of about $0.50 per littered LWPB, and an expenditure level about 50 per cent higher than the total amount currently spent on all public litter collection in Australia.

The other scenarios depicted achieve elimination of LWPBs, but at higher levels of economic cost and with only a moderate additional environmental benefit. This reflects the fact that less than one per cent of LWPBs arise as litter[3], the rest are disposed of in landfill. The calculations represented here reflect the costs of eliminating ninety-nine LWPBs to get at the one that is the principal cause of environmental damage.

The dominance of economic costs over environmental benefits is likely to be insensitive to changes in the estimate of environmental damages arising from discarded LWPB. In this study, an environmental benefit of $1.00 per LWPB removed from the national litter stream was assumed — based on the value of voluntary effort invested in the 'Clean Up Australia' campaign and a significant scaling factor. There is reason to believe that this is a generous treatment.

Setting the social impact aside, the environmental damage attributable to an LWPB would need to be around $2.50 (in net present value (NPV) terms) for each of the LWPB elimination policy options to break even. Inclusion of net greenhouse reduction benefits does not significantly alter this result.

Based on the environmental estimates calculated in this report, the additional 'social' benefit (needed to fill the NPV 'gap') per bag eliminated from the litter stream as a result of these policy options would need to be around $2.00, or be in excess of $0.02 for each of the tens of billions of bags expected to be consumed — but forgone as a result of these measures — over the next decade.

Reflecting the tradeoffs between the economic costs and the environmental benefits, Figure E.2 shows the impacts modelled for the various scenarios, with the clear implication that the efficiency frontier (that is, the options that represent the most efficient tradeoffs) is made up of Scenarios 3, 7 and 5.

The approximately 4182[4] supermarkets in Australia in 2004-05 would need to meet their obligations under the policy options at a cost of less than around $12 000 a year in order to break even with the maximum possible environmental benefit of $50 million a year — to say nothing of the administrative and regulatory costs incurred by jurisdictions, or the costs faced by the plastic products manufacturing industry.

[3] Nolan ITU 2002, *Plastic Shopping Bags — Analysis of Levies and Environmental Impacts*, Melbourne, p. 9.

[4] IBIS World 2005, G5111 — *Supermarkets and other grocery (except convenience) stores in Australia*, http://www.ibisworld.com.au/industry/keystatistics.asp?industry_id=1834, accessed on 15 February 2006.

Despite the estimated net costs associated with the abolition of LWPBs, a change in social behaviour can be achieved by imposing a relatively modest fee on LWPBs, allowing consumers to benefit from investing in a re-usable bag, and reducing the incidence of transactions in which a consumer accepts an LWPB without thought, and subsequently discarded without thought. This report also highlights that in a situation where a consumer can reduce their grocery bill by rejecting a LWPB, re-usable carry bags represent a remarkably cost effective investment.

Clearly, there is merit in pursuing policies that reduce waste and profligate use of scarce resources within our society. There appears to be widespread recognition of an over-consumption problem associated with LWPBs, and support for policies that reduce their use. However, it remains an open question as to whether the non-quantified social benefits associated with the elimination of LWPBs would be sufficient to justify the significant net costs identified in this study.

Given this uncertainty, and the government and industry commitment to phase out single use LWPBs, Table E.2 shows a ranking of the identified *change* scenarios (that is, not including the 'no further action' scenario) against a number of alternative criteria. The scenarios are ranked — with 1 as the strongest ranking and 7 as the weakest — based on the extent to which they minimise costs, the extent to which they maximise benefits, and the extent to which they maximise the benefit per dollar of cost incurred.

Figure E.2

THE RELATIONSHIP BETWEEN ECONOMIC AND ENVIRONMENTAL COSTS UNDER VARIOUS SCENARIOS

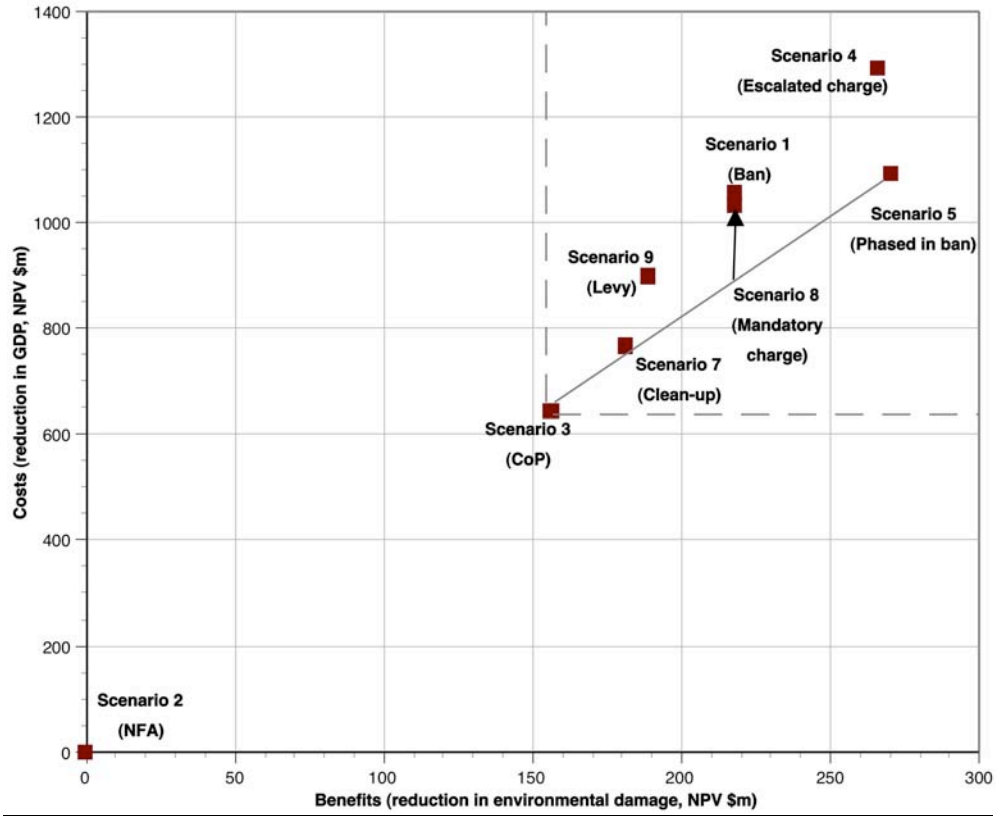


Table E.2

SUMMARY TABLE OF ECONOMIC AND ENVIRONMENTAL COSTS AND BENEFITS

Scenario	Costs (PV, $m)	Benefits (PV, $m)	Litter reduction (millions)	Maximise Benefits	Minimise Costs	Maximise benefit: cost ratio
1. Eliminate LWPBs by 2009	-$1057.1	$217.8	360.6	3	5	6
3. Extend ARA Code	**-$646.0**	$156.3	233.2	**7**	***1***	**2**
4. Voluntary charge	-$1293.1	$266.3	418.4	2	7	7
5. Voluntary phase out to 2009, mandatory beyond	-$1093.5	$270.6	422.4	***1***	6	***1***
7. Disposal fee (cost recovery)	-$767.9	$181.5	300.5	6	2	3
8. Regulated price (kept by retailers)	-$1035.1	$217.8	360.6	3	4	4
9. Levy on LWPBs	-$900.0	$188.7	312.5	5	3	5

As there is no single identified policy scenario that is clearly superior, it is useful to highlight some key characteristics that can act as navigation points for the development of an efficient and effective policy for reducing the environmentally adverse and socially undesirable implications of LWPBs. These are:

- the implied 'free' status of LWPBs generates no incentive for consumers to reduce their use of these items;
- consumption of LWPBs falls off significantly at modest prices;
- re-usable bags are a highly cost effective alternative to LWPBs, but consumers cannot pocket this benefit if the cost of LWPBs continues to be spread across the cost of groceries and other goods;
- consumers will continue to face circumstances where a LWPB is an efficient option for their carrying needs (for example, to carry refrigerated products, for impulse purchases, etc); and
- environmental benefits flow from reductions in littered bags.

These findings, supported by the comparison of the identified scenarios, suggest that a price-based approach is likely to be considerably more cost-effective than a ban in circumstances where it allows for residual bag use. That is, when a price is used to drive a significant reduction in bag consumption but allows those consumers who put a high value on LWPBs to continue to access them.

Chapter 1

Introduction

Light-weight plastic bags (LWPBs) have become ubiquitous in Australian society. They are a convenient means of bundling and carrying a miscellany of food, hardware and grocery items, and are provided at no charge to customers by thousands of supermarkets, smallgoods and fast food outlets. They have been designed as a single use item, and perform that function well. Around 60 per cent of LWPBs are re-used as bin-liners or waste bags, but ultimately, more than 95 per cent of all LWPBs end up in landfill.[5] Another 2 to 3 per cent are recycled, while the others decorate the landscape as litter or find their way into waterways and other ecosystems.

In 2002, Australians are estimated to have consumed around 6 billion LWPBs,[6] however, concerted efforts by governments and retailers to discourage LWPB consumption have seen current demand drop to about 4.3 billion units in 2005[7] — equivalent to about 24 425 tonnes of material and tens of millions of dollars worth of resources and production.

For many, single-use plastic bags have become symbolic of our 'disposable' society, flagrantly chewing through Earth's finite resources. Yet, few would deny the service they perform and the need for this function to be maintained, but in a way that is more sustainable and cost effective.

1.1 The ongoing policy context

The issue of reducing LWPB use is important to policymakers, and momentum has been building for some time to see a tangible reduction. In October 2003, the Environment Protection and Heritage Council, comprising Environment Ministers from the Commonwealth, and State and Territory governments, instructed officials to commence negotiations with retailers to phase out LWPBs within five years. The Council also asked officials to develop advice on legislative options for achieving this objective. These options are to represent a mandatory pathway toward achieving LWPB reductions if the approach negotiated with industry did not deliver an adequate outcome.

Action to reduce plastic bag consumption was driven by the Australian Retailers Association *Code of Practice for the Management of Plastic Bags* (the ARA Code — which was appended to the National Packaging Covenant), and expired at the end of 2005.

The National Packaging Covenant (NPC) requires brand owners over a certain size to adopt take-back and reporting provisions or to become a signatory to the NPC and develop an action plan for managing their use of packaging. For LWPBs, the 'brand owner' is considered to be the importer or manufacturer of the plastic bag or the retailer who provides the plastic bag to the customer at point of sale.

[5] Nolan-ITU 2002, *Plastic Shopping Bags — Analysis of Levies and Environmental Impacts*, Melbourne, p. 6.

[6] Nolan-ITU 2005, op. cit. , p. 7.

[7] Ibid.

Covenant signatories who provided bags to customers were also subject to the ARA Code. This applied target obligations on major retailers that would see LWPB consumption reduced to 50 per cent of 2002 levels by the end of 2005. Other obligations applied to smaller retailers. Following the expiration of the ARA Code, it is not as yet certain whether retailers will continue the initiatives that were in place to reduce LWPB consumption.

To date, action under the ARA Code to reduce LWPB consumption has seen a range of initiatives introduced such as consumer awareness campaigns, greater availability and promotion of re-usable bags and staff training, with a focus on point of sale communication with the customer. Obligations under the ARA Code for ongoing actions in this area expired on 31 December 2005.

Government officials and key industry stakeholders are developing a draft agreement to further phase out LWPBs between 2006 and 2008. Ministers noted the draft agreement and the advice on legislative options at their 1 July 2005 meetings and that the draft agreement would be finalised during August and September 2005. Options for further action to achieve a phase-out of LWPBs are to be examined in the context of a subsequent regulatory impact statement.

1.2 This report

This report has been commissioned by the Environment Protection Heritage Council to provide a cost-benefit analysis of the following nine key policy options for the post-2008 period:

- Scenario 1 — elimination of LWPBs from 2009;
- Scenario 2 — no further government action (used as the 'base case' in this study);
- Scenario 3 — extension of the ARA Code;
- Scenario 4 — industry agreement to impose a gradually escalated charge, supported by co-regulatory measures;
- Scenario 5 — industry agreement to phase out LWPBs, followed by government regulation to restrict their supply;
- Scenario 6 — a stand-alone ban on LWPBs;
- Scenario 7 — an advance disposal fee for LWPBs;
- Scenario 8 — retailers will be obliged (by regulation) to impose a minimum charge on every LWPB; and
- Scenario 9 — a government imposed levy on LWPBs.

Assessment of the costs and benefits associated with these scenarios has been undertaken in a 'triple bottom line' context. That is, giving explicit recognition to economic, environmental and social impacts.

Conceptually, triple bottom line analysis allows direct comparison between scenarios based on their economic, social and environmental implications. This increases transparency, but complexity also increases, there can be disagreement about the relative importance of some indicators (and even whether their contribution to the bottom line is positive or negative). Social effects can be particularly prone to these problems.

To ensure comparability within the triple bottom line framework, outcomes have been quantified and valued where this has been considered feasible:

- for economic and environmental impacts, enough is known about the production, use and disposal of LWPBs in Australia to develop modelling tools for the analysis of economic income, welfare and environmental effects; but
- the social implications of different policy scenarios are more problematic from a valuation perspective and so are considered separately in section 5.3. These represent an 'x-factor' that, while difficult to quantify, should nevertheless enter the decision framework of policy makers. The implicit or judged values attributed to these factors by policy makers, weighed alongside empirical results, can help identify an appropriate ranking for policies — or at least the value that would need to be attributed to 'social' impacts for one policy option to come to dominate another on the basis of relative costs and benefits.

Analysis of the costs and benefits of alternative approaches to phasing LWPBs in Australia is presented in the following chapters:

- Chapter 2 provides an overview of current LWPB usage patterns in Australia and their significance in output and consumption patterns for various stakeholders. Production, use and disposal of plastic bags are significant issues for households and industry, and the implications of an induced bag reduction will depend on the nature and extent of activities stimulated by this change.
- Chapter 3 outlines how various key stakeholder groups — that is, manufacturers, retailers, government, consumers and the environment — are likely to be affected by a reduction in LWPB consumption.
- In Chapter 4 the nine policy scenarios are outlined, along with the assumptions used for broader consideration of the initial impacts on industry, households, government and the environment. Using a general equilibrium model of the economy, the flow-on impacts associated with these first-round impacts are identified, as well as the benefits of the various scenarios on litter reduction (that is, impacting on issues such as aesthetics and wildlife).
- Chapter 5 discusses wider implications and variations on these scenarios in the context of a sensitivity analysis. The likely impacts of changes in policy timing are examined, as are the implications of inducement and behavioural issues that can affect the practicality of policy approaches in an applied environment.
- Conclusions are presented in chapter 6.

This report examines the costs and benefits of alternative approaches to reducing the consumption of LWPBs in Australia. This cost-benefit analysis will form part of a regulatory impact statement for consideration by governments.

Chapter 2

Light-weight plastic bag usage

As background on the scale and nature of the challenge of phasing out LWPBs, this chapter provides an overview of current LWPB usage patterns in Australia and their significance in output and consumption patterns.

The most recent and comprehensive study of plastic bag consumption in Australia was conducted in 2002, finding that Australians consumed approximately 6.9 billion plastic bags, 6.0 billion of which were single use, LWPBs — see Figure 2.1.[8]

The use of single use LWPBs was reduced by nearly one third between 2002 and 2005, falling from 6.0 billion to 4.3 billion bags.[9] This reduction can be attributed in part to the introduction and up-take of the ARA Code. There is little data on the number of plastic bags consumed in Australia prior to the introduction of the ARA Code but it is generally thought that the number of plastic bags was steadily increasing.

Of the different sorts of retailers, supermarkets were by far the greatest users of LWPBs made from high-density polyethylene (HDPE), accounting for 3.5 billion in 2002. Of the other types of retailers that used only the HDPE plastic bags, 'other food and liquor' retailers had the next greatest usage (930 million) followed by fast food outlets, convenience stores and service stations (350 million). The thicker, printed and more easily recycled low-density polyethylene plastic bags were restricted in use among 'general merchandise and apparel' retailers and miscellaneous 'other retailers'. These two sectors used 957 million and 988 million plastic bags respectively — a combination of HDPE and low-density polyethylene (LDPE) plastic bags.

Of the HDPE and LDPE plastic bags consumed in 2002, 6.1 billion were used to carry items home from the shops, while the remaining 770 million were used to carry items to locations away from home. Bags that were carried home were more likely to be re-used or recycled than bags that were used away from home that tended to end up:

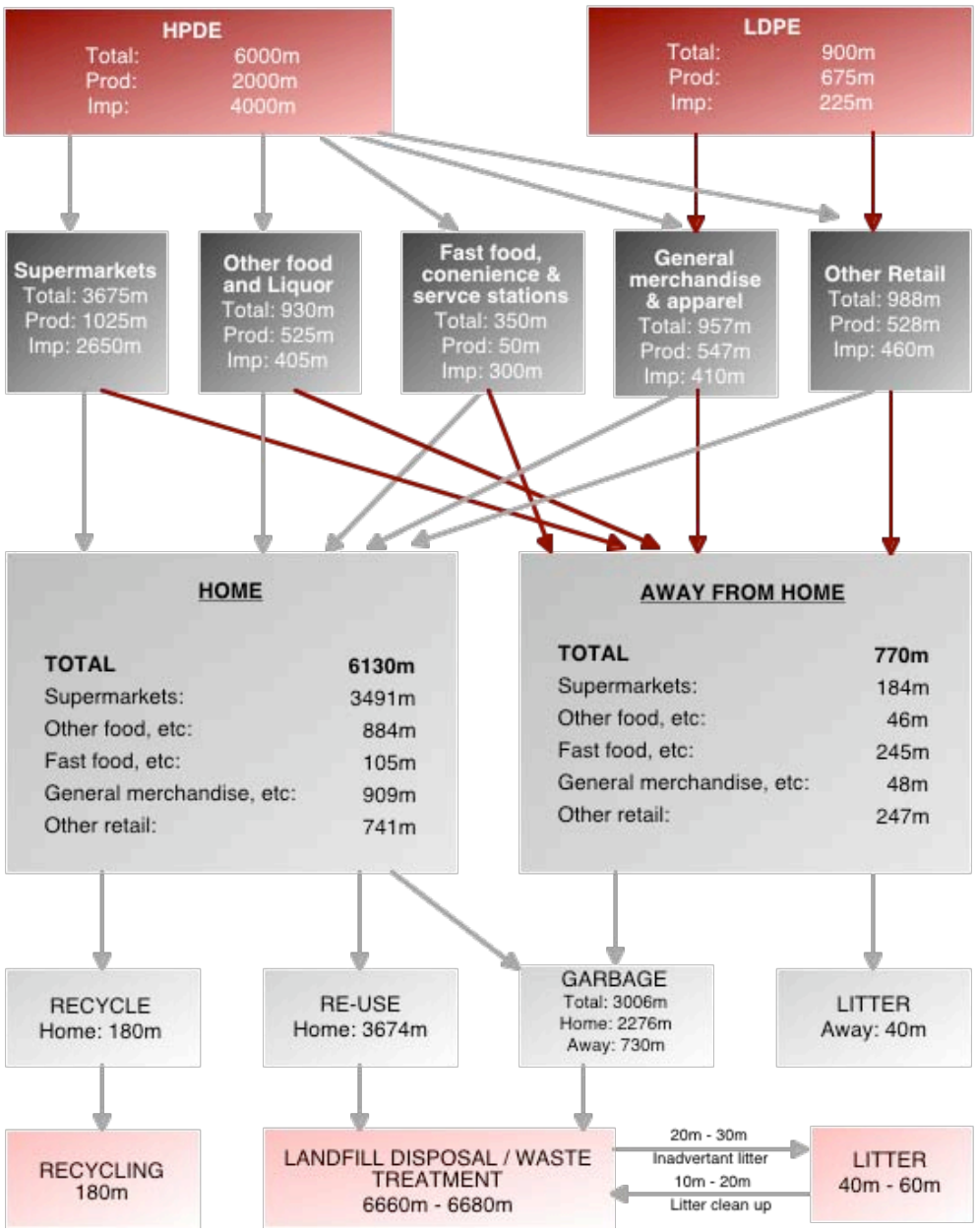
- in the garbage, and subsequently the landfill; or
- in the litter stream.

[8] Nolan-ITU 2002, *Plastic Shopping Bags — Analysis of Levies and Environmental Impacts*, Melbourne, p. 9.

[9] Nolan-ITU 2005, op.cit., p. 7.

Figure 2.1

PLASTIC BAG PRODUCTION, CONSUMPTION AND DISPOSAL, 2002



Based on: Nolan-ITU 2002, *Plastic Shopping Bags — Analysis of Levies and Environmental Impacts,* Melbourne, p. 9.[10]

[10] Calculating the number of bags that end up in the litter stream is complex and depends on the definitions and methodologies used. The economic modelling used here is based on a derived estimate of 40-60m littered bags. This differs from the Nolan-ITU 2002 estimate of 50-80m bags due to an alternative method used to aggregate Nolan-ITU's original inputs. The difference between these two estimates does not have a significant effect on the outcomes of the modelling.

Some of the major supermarket chains have established a plastic bag 'return recycling' scheme, where drop-off bins are provided for shoppers to return used, unwanted bags. The scheme relies on HDPE bags being collected separately to all other recyclables. It is estimated that in 2002, 1000 tonnes (approximately 180 million bags) were recycled through these drop-off bins, achieving a recycling rate of approximately 2.7 per cent. The majority of bags are exported for reprocessing, whilst about 50 tonnes were reprocessed in Australia, with the reprocessed material used in pipe manufacture. LWPB recycling via kerbside collection is limited to only a few council areas in South Australia. In all other areas, any plastic bags placed in the kerbside recycling stream are disposed to landfill.

The overwhelming majority of plastic bags ended in landfill (97.1 per cent) — including those that were re-used. Around 180 million bags were returned for recycling, with the remaining 40 million bags ending in the litter stream. It was estimated that volunteers and other litter collectors were able to retrieve between 10 and 20 million bags that were initially littered and send them to landfill. Conversely, due to the lightness of the plastic bags, between 20 and 30 million of the plastic bags that were destined for landfill are estimated to have blown away — on the way to, or from — the landfill sites. These bags enter the litter stream once more, meaning that the number of bags released into the litter stream — whether it is due to thoughtless disposal, or inadvertent litter — ranges from 40 to 60 million bags.[11]

[11] This estimate based on analysis of plastic bag 'flows' represented in the Nolan ITU (2002) report. That report provides an aggregate litter estimate of 50-80 million bags — apparently based on an assumption of a constant number of bags retained in landfill.

Chapter 3

Stakeholder perspectives on carry bags

This chapter provides an overview of responses likely to be triggered by government action to put further pressure on LWPB use. Identifying the responses and 'fall back' positions of these stakeholders as they respond to policy action on LWPBs is fundamental to estimating the likely costs and benefits associated with particular scenarios.

3.1 Manufacturers

The single-use LWPBs provided by retailers in Australia are predominantly imported. Approximately one third of LWPBs are produced domestically, and around 90 per cent of this production is concentrated in Victoria. In line with the reduction in the consumption of LWPBs, there has also been a reduction in both the production and import of LWPBs in Australia.[12]

There are a number of alternatives to LWPBs, with substitutes made out of paper, cloth and thicker plastic coming onto the market in recent years. In addition to the alternatives available to substitute for the primary purpose of LWPBs (to carry good home from the shops), households also re-use the LWPBs to collect rubbish, or as a liner for their rubbish bins. A reduction in the demand for LWPBs would not only see an increase in the demand for different types of bag, but also for bin-liners. The estimated rate of substitution is equivalent to one bin-liner demanded for every seven plastic bags foregone.[13]

Official data on economic activity in Australia's manufacturing industry do not recognise a 'bag' (or 'bin-liner') industry, and as such the impact of a decrease in the consumption of plastic bags would register in the plastic product manufacturing, paper products manufacturing, and textiles industry. As a result, reduction in demand for LWPBs would lead to a reduction in the output of the 'plastic and rubber products manufacturing' industry, offset to some extent by the increase in demand for plastic bin-liners.

Reduced demand for LWPBs could have a mixed impact on Australia's balance of trade:

- The re-usable bags are currently fully imported from manufacturers in Asia. In spite of demand for re-usable bags increasing, it is anticipated that domestic manufacturers would not be able to meet the prices of overseas suppliers for re-usable bags. While there may be a niche market for a specialty or boutique re-usable bag that could be met by Australian domestic manufacturers, it is anticipated that in the main, domestic producers will not manufacture enough re-usable bags to have a significant impact on the composition of supply.

[12] Nolan ITU 2005, op.cit., p. 3.

[13] J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005b, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 2: Appendices*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh, p. 21.

- With respect to paper bags, the simple, low-cost paper alternative to an LWPB is currently produced domestically, and it is anticipated that an increase in the demand for this paper substitute can be fully met by domestic producers.

Aside from manufacturers, there are also importers — organisations that purchase the re-usable bags from off-shore and then sell them to retailers. Following the introduction of the ARA Code, Australian consumers have replaced around 2 billion LWPBs with an estimated 10 million re-usable bags[14], mostly imported from China. Each re-usable bag has an estimated value of $0.65[15], which would have generated around $6.5 million worth of turnover for re-usable bag importers.

3.2 Retailers

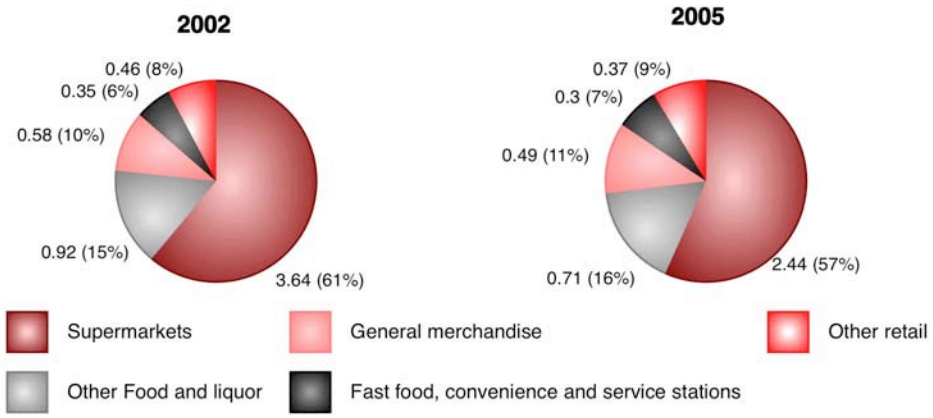
There are a number of plastic bag substitutes readily available to consumers at a range of different types of stores:

- major supermarkets have made available substitutes to LWPBs such as heavier weight plastic bags that are easier to recycle, and the green polypropylene re-usable bags. Some supermarkets have calico and paper substitutes for plastic bags, but these are more rare; and
- department stores, and smaller, specialised retailers tend not to use the LWPBs, preferring instead the thicker, printed plastic bags. Department stores are starting to offer re-usable bags as a plastic bag alternative, and several of the smaller, specialised retailers offer paper or cloth bags — in some cases as an alternative, and in others as their bag of choice.

Figure 3.1 shows the reduction in the use of plastic bags by retailers between 2002 and 2005. The supermarket sector has not only reduced its overall use of LWPBs by 33 per cent, but has also reduced its usage as a proportion of total LWPBs provided by retailers. This supports the assertion that it is the larger supermarket chains that are making the greatest effort to comply with the ARA Code.

Figure 3.1

RETAIL SERVICES INDUSTRY USE OF PLASTIC BAGS, 2002 AND 2005



Source: Nolan ITU 2005, *Plastic Retail Carry Bag Use: 2002-2005 Consumption*, Melbourne, p. 7.

[14] C. Long 2005, 'Who is making money out of Enviro carry bags?', *The Age (Money)*, 4 August, p. 13.

[15] Ibid.

Manufacturers are the first sector when considering the supply chain for LWPBs, but it is the retail sector that is the first to incur costs with respect to implementing the policy options, and — in passing on these costs — the sector that drives the impacts to the other stakeholders. There are a number of costs that are almost always associated with a change in regulatory arrangements. These include:

- initial set-up costs, such as modifying the equipment at the check-out to cater for different types of bags, and providing training for all employees to ensure that they understand and comply with the regulation;
- on-going administrative costs associated with reporting or auditing; and
- expenditure on in-store education and promotion aimed at encouraging consumers to consider alternatives to plastic bags.

In addition to these costs, the retail sector is also likely to incur indirect costs related to:

- an increase in the average time taken to complete a transaction at the check-out, due to the introduction of less efficient alternatives to LWPBs; and
- a one-off increase in the incidence of theft. In Ireland a survey of retailers indicated that the incidence of theft was higher after the introduction of a €0.15 'PlasTax' levy on LWPBs, but eventually returned to pre-PlasTax proportions.[16] As noted by one observer: 'In the first few months after the bag tax was introduced in Ireland, shoppers were seen carrying their groceries out in their jumpers, a lot of wire baskets went missing, and it is safe to assume that the fate of the turtles was a very long way from everyone's minds'.[17]

Retailers spend an estimated $173 million a year on plastic bags that are provided to consumers 'for free'.[18] While customers are not directly charged for plastic bags, the cost of providing the bags is worked into the retail mark-up on goods sold. Subsequently, there is no benefit to the retail services sector from no longer having the option of providing plastic bags, as it is the household sector that ultimately pays for them.

Presently, there is a range of alternatives to plastic bags, and an even greater variety of prices associated with them:

- the price of the re-usable, non-woven polypropylene bags ranges from $1.80 for a bag to nothing — where bags are given away with purchases or as part of promotional activity; and
- there is also little clarity on what the mark-up on re-usable bags might be. Once more, there is a range of estimates; 'green' re-usable bags retail for $0.99 each, and it is estimated that they cost retailers approximately $0.65. However,

[16] J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005b, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 2: Appendices*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh, p. 8.

[17] *Guardian* 2002, 'Plastic planet', 17 October, http://www.guardian.co.uk/waste/story/0,12188,813364,00.html.

[18] Planet Ark Environmental Foundation 2005, Plastic check-out bag use in non-supermarket retail outlets, http://www.deh.gov.au/settlements/publications/waste/plastic-bags/planet-ark/key-results3.html, Accessed 25 November 2005.

several stores donate $0.10 from each bag sold to charities or environmental initiatives such as Planet Ark, Clean Up Australia or Landcare.[19]

It is quite likely that retailers could profit from the sale of re-usable bags, particularly if they are one of the only alternatives available to consumers. However, it is equally likely that current retailer policy on bags reflects a set decision designed to service customer needs and maximise retailer profits. The extent to which this is the case depends on the knowledge that retailers have of the costs and benefits of LWPBs and their alternatives. As shown in Box 3.1, individual views vary considerably.

3.3 Government

Designing, introducing and implementing a regulatory intervention introduces costs to governments, as well as to the stakeholders whose behaviour the regulation is intended to affect. All of these costs can be controlled or minimised to some extent, but there is a trade-off against the effectiveness of the regulation. A policy to reduce the demand for LWPBs will be ineffective in achieving its objective if it is not properly enforced, or if no appropriate penalties exist for failure to comply. Much like the retail services industry, the government sector likely faces a one-off, initial set-up cost, followed by a stream of implementation costs.

These costs need to be justified not only within the context of the net benefit they are expected to achieve, but also within the context of whether it is necessary for the government to intervene. So far, government has relied on the retail services industry to self-regulate, with mixed results:

- of signatories to the ARA Code:
  - self-regulation has been relatively successful among the larger retailers. Compliance with the ARA Code required that major retailers that are signatories to the Code halved their supply of LWPBs between 2002 and 2005. Only supermarkets — categorised as 'Group One' retailers under the ARA Code — were committed to this target, and their reporting suggests that they will have achieved a reduction of at least 38 per cent by December 2005;[20]
  - Group Two signatories were from the non-supermarket segment of the retail services sector. Signatories to the ARA Code from Group Two made up a very small percentage of the non-supermarket sector, which in total, is responsible for up to 47 per cent of the LWPBs supplied. Additionally, many of these signatories were not able to report accurately on their use of bags;
- the ARA Code only addressed the conduct of a small percentage of the total number of retailers. Indeed, it is estimated that tens of thousands of the 200 000 non-supermarket retailers in Australia are not members of *any* industry association. For example, a recent survey commissioned by the Commonwealth Department of the Environment and Heritage found that:

[19] C. Long 2005, 'Who is making money out of Enviro carry bags?', *The Age (Money)*, 4 August, p. 13.

[20] Nolan-ITU 2005, op. cit., p. 8.

62 per cent of the retailers who took part in our survey could not confirm whether they were members of an industry association or not. Additionally, some of the industry associations we spoke to don't represent all of the retailers in their category. One industry body confidentially told Planet Ark that they do not even have the resources or the means to contact most of their members. This could explain the lack of retailer awareness about the ARA agreement to reduce HDPE plastic bag use by 50 per cent by the end of 2005. Despite extensive publicity about the agreement, 47 per cent of the retailers we questioned did not know about it.[21]

Box 3.1

COSTS ASSOCIATED WITH ALTERNATIVE BAGS — DIFFERENCES IN PERCEPTION BETWEEN RETAILERS AND SUPPLIERS

In March 2005, Planet Ark conducted a survey of retailers and of distributors of plastic bag alternatives. The survey identified that there are several information asymmetries (that is, differing levels of understanding/information) between retailers and LWPB distributors.

For example, of the retailers surveyed:

- Thirty-five of the 129 retailers questioned (27 per cent) do not currently provide any plastic bag alternatives for customers. 21 of these 35 retailers (60 per cent) are now thinking of offering plastic bag alternatives in their outlets.
- Cost was the major obstruction factor stated by 40 per cent of these 35 retailers, for holding their company back from using re-usable bags.
- Fourteen per cent of the 35 retailers stated that having to order a minimum quantity of re-usable bags was a reason for not stocking re-usable bags. A similar number said their not knowing any re-usable bag suppliers was another reason.
- From the 35 retailers that do not provide any plastic bag alternatives for their customers, 51 per cent of them stated that cost was the main reason for primarily using plastic bags, 46 per cent said it was habit (that is, "it's just the way we have always done things") and 43% said convenience was a reason why they currently primarily use plastic bags.

Of the distributors surveyed, it was found that:

- All distributors surveyed stated that all plastic bag alternatives, such as degradable, paper, calico and non-woven polypropylene bags, have minimum order numbers that are well within the reach of small retail outlets.
- When it came to non-woven polypropylene bags, one distributor had no minimum order, three only required ten bags to be ordered and one required a 50 bag order.
- When it came to calico bags, two distributors had no minimum order and another only required an order of ten bags.
- When it came to paper bags, two distributors stated that 10 was the minimum order and another said it was 500.
- When it came to degradable bags, one distributor didn't have a minimum number of bags that needed to be ordered. Two out of the 7 distributors said that 1000 degradable bags were the minimum order. Only 1 out of the 7 distributors surveyed stated that 2000 degradable bags was the minimum order for their business.

Examples like this, made it all too apparent that the job of buying plastic bag alternatives and implementing a plastic bag policy was often done by executives who had no prior experience of carrying out such a strategy. Indeed, our research showed that 83 per cent of retailers we spoke to did not have an Environment Manager — an ideal person to oversee a plastic bag reduction strategy.

Retailers also need to be educated in the types of plastic bag alternatives that are available to them. The fact that degradable bags are the most popular option that retailers would think about stocking in their outlets (above all other plastic bag alternative options), indicates that retailers want the cheapest and most convenient alternative to single-use plastic bags.

Source: Planet Ark Environmental Foundation 2005, Plastic check-out bag use in non-supermarket retail outlets, http://www.deh.gov.au/settlements/publications/waste/plastic-bags/planet-ark/key-results3.html, Accessed 25 November 2005

[21] Planet Ark Environmental Foundation 2005, op. cit.

Given that take-up of the self-regulatory measures by retailers has not been complete, and that there is considerable incentive for small and medium retailers to free-ride off the efforts of the larger retailers, this could justify a role for government in providing information and mandating a co-ordinated approach to either phasing out or reducing the consumption of LWPBs.

The benefits to the government sector vary depending on the policy option chosen. If a levy or an 'advance clean-up fee' is implemented, the government receives increased revenue from this, net of monitoring and administration expenses, and the revenue can be allocated to litter clean-up, increased education and awareness about the impacts of litter, or improving infrastructure with respect to recycling and collecting LWPBs or their substitutes for recycling.

In cases where no revenue directly accrues to the government, the reduction in litter associated with the reduced use of LWPBs reduces the costs of LWPB litter collection or, to look at it from another angle, increases the relative proportion of already allocated funding for collecting non-LWPB litter.

Of course, 'government' in this section aggregates all 3 levels of government, and costs and effort can be attributed to all. State and local government contributions are particularly important to policy coordination and litter reduction efforts.

3.4 Consumer impacts

Prior to the introduction of the ARA Code in 2002, retailers only provided their consumers one or two types of bag with their purchases. As shown in Figure 2.1, this option was usually a LWPB. Since the ARA Code was introduced, the larger retailers not only started to provide consumers with a number of alternatives to the LWPB at the check-out (as discussed in section 3.2), but they trained check-out staff to ask customers if they require a bag with purchase before packing the goods.

This is not to say that consumers had no choice in the matter prior to 2002. Consumers have always had the option of:

- taking their own bags when shopping and asking that their goods be packed in these bags, rather than avail themselves of the bags provided by retailers; and
- advising check-out staff that they do not require a bag with purchase, without having to be asked directly.

Part of the reason that relatively few consumers exercised these options prior to the introduction of the ARA Code is because they are not directly charged for the cost of plastic bags. While consumers pay for plastic bags, the do so via a mark up in grocery prices rather than through an explicit price. As a result the cost of bags is not 'front-of-mind'. Perhaps more importantly, for those who *are* aware of the cost of plastic bags, there is no opportunity to 'opt out' of paying for plastic bags. Households are estimated to indirectly spend around $10 to $15 on LWPBs in a year,[22] yet customers who refuse plastic bags are not able to recoup this value.

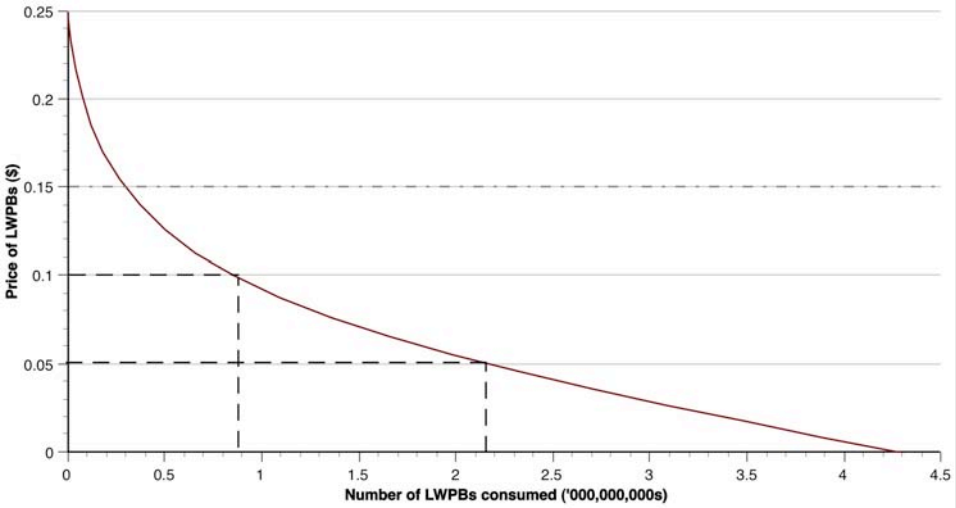
[22] Nolan-ITU 2002, op. cit., p. 4.

However, introducing a direct and transparent charge for LWPBs does not mean that consumption of LWPBs will vanish. Consumers demand the services provided by LWPBs, and these can take on a high value in certain circumstances. It is therefore necessary to determine how many LWPBs are likely to be consumed over a range of different prices — in effect, to derive a demand curve for LWPBs as is done in Box 3.2.

Box 3.2

ESTIMATED CONSUMER DEMAND FOR LIGHT-WEIGHT PLASTIC BAGS, 2002

Establishing a consumer demand curve for plastic bags is a fundamental requirement of the policy assessment exercise. It is a key determinant of the revenues associated with bag sales and the costs that would be imposed on consumers through a ban. The following demand curve has been estimated for modelling purposes.



Its construction relies on the following data estimates:

- 4.3 billion bags at $0.00[23];
- a reduction in consumption of around 80 per cent at $0.10[24]; and
- a reduction of close to 100 per cent at $0.25[25].

These data points are indicative only. The first two are derived from the Nolan ITU report, and changes in LWPB consumption observed in a number of case studies drawn from the Irish experience, and local bag pricing initiatives from a range of retail outlets including Bunnings, Byron Bay supermarket, etc. A near-100 per cent reduction in consumption at a price of $0.25 is assumed, as consumers reduce bag consumption and re-direct their demand for 'bag services' to less costly substitutes.

For the purposes of the modelling, the assumption is that if LWPBs are not available, consumers will choose a least cost and closely substitutable alternative. In this study, a simplifying assumption is that when a bag is in high demand, and an LWPB is no longer available at the checkout, the least cost 'fallback' solution is the purchase of a single-use paper bag. This has the effect of capping the maximum price that consumers must pay for LWPB services at $0.15 per bag.

Source: J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005a, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 1: Main Report*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh; Nolan ITU 2002 *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts, Final Report*, Dept of the Environment and Heritage, Canberra.

[23] Nolan-ITU 2005, op. cit., p. 6.

[24] Nolan-ITU 2002, op. cit. p. 50.

[25] Based on the availability of cheaper substitutes. While LWPBs may still be purchased at the $0.25 price, the amount consumed is assumed to be insignificant, and close to zero for modelling purposes.

The curve shown in Box 3.2 illustrates a relationship in which consumption of bags is characteristically sensitive to price (that is, highly elastic). This implies that close substitutes exist for LWPBs, such as re-usables (see Box 3.3) or paper bags.

In spite of the fact that a number of close substitutes exist for LWPBs, there is also a hard core of bag consumption that is relatively insensitive to price. In this region, consumers are willing to pay a high price for the services provided by the LWPBs. The level of demand in this region can be thought of as representing consumers who find currently available alternatives for LWPBs inadequate.

These are consumers who:

- find it inconvenient to carry a re-usable — they might be planning to do some other type of shopping before they go to the supermarket at the mall);
- prefer plastic for carrying certain types of products — for example, meat or other chilled items from the supermarket, or take-away foods; or
- find themselves in need of a bag but do not have a re-useable with them — they forgot, or are buying on impulse.

Planet Ark's survey for the Commonwealth Department of the Environment and Heritage suggested that:

> the non-supermarket retail sector is characterised by 'impulse buying'. Thus the likelihood of shoppers bringing a re-usable bag is not as high as it is for supermarkets. As a result, in some parts of the non-supermarket retail sector (such as the fast-food sector), major reductions in total bag usage may not be achievable. In this instance, a more sustainable single use alternative, such as paper or truly biodegradable/compostable bags, would be more suitable.[26]

There is a range of worst-case (and high cost) scenarios that might be applied to this eventuality and the costs that it can impose if LWPBs are not available. In thinking about the *likely* cost implications it is useful to think about the feasible fallback position for consumers in this situation. Shoppers that plan ahead can easily arrange their affairs and budgets to avoid the LWPB price impost. It is mainly the opportunistic and forgetful shoppers that will be faced with making a bag purchase at the point of sale in a situation where LWPBs are unavailable or have an explicit price attached.

This approach will have a different impact on different types of consumers, and this will have an impact on the proportion of LWPBs littered under the different policy options. As discussed earlier, consumers are not directly charged for the plastic bags they consume. By introducing an explicit charge or levy for a plastic bag, consumers are able to refuse the bag and enjoy the associated monetary saving.

By definition, consumers who continue to purchase LWPBs value the services provided by the bag at an amount greater than or equal to the price they are willing to pay. Those that are most sensitive to a LWPB price include those that put the lowest value on the availability of a bag. It is likely that a disproportionate share of deliberately littered ('throw away') bags emanate from this group.

[26] Planet Ark Environmental Foundation 2005, op. cit.

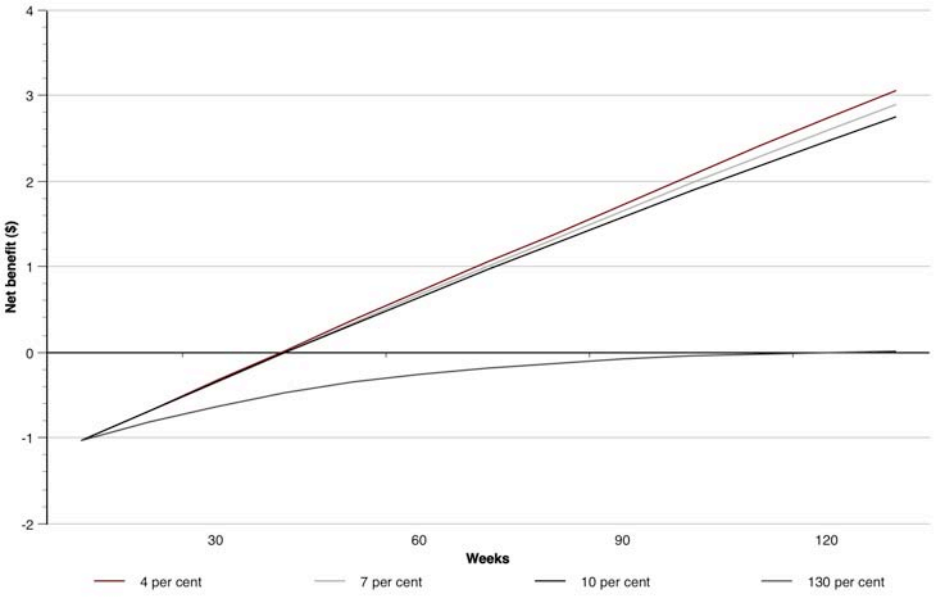
Box 3.3

ECONOMICS OF RE-USABLE BAGS

Re-usable bags are a close substitute for single-use LWPBs. They cost more, but are longer lived and therefore, in a world where consumers pay for the cost of LWPBs, represent a 'technology' with a high initial cost that generates a stream of savings into the future. The economics of this investment will depend on the relative cost of re-usable bags and LWPBs, the number of LWPBs that a re-usable bag replaces over time, and consumer time preferences (that is, the rate at which they discount future consumption relative to current).

The figure below illustrates the net economic cost or benefit of a re-usable bag 'investment' as a function of its economic life and a consumer's discount rate (rates of 4, 7 and 10 per cent per annum are examined). It is based on the following assumptions:

- price of re-usable bag = $1.40;[27]
- price of single use LWPB = $0.03 (explicitly charged to consumer); and
- re-usable bags replace 1.2 LWPBs per week.



The figure highlights that a re-usable bag is an attractive investment, with a positive net present value if it is used at least once a week for a year. If, as expected, it has a two-year life — and is used routinely as a LWPB replacement, a re-usable bag would deliver a rate of return on its upfront cost of close to 130 per cent per annum. The example shown assumed a price for re-usable bags of $1.40, an average of the prices observed in shops during the course of this study. For re-usable bag prices of $1.00 or $1.80, the same calculation shows that an investment in a re-usable is profitable at a maximum discount rate of 192 and 96 per cent respectively. At a 10 per cent discount rate, even spending $4.00 for a re-usable bag is a profitable investment.

Shoppers with this usage pattern would be financially advantaged by replacing LWPBs with a re-usable bag, but only if they can enjoy the cost savings associated with their lower LWPB consumption — something that will only happen if they face an explicit charge for LWPBs.

[27] Coles 2005, *Our Services*, http://www.coles.com.au/frame/build.asp?url=/services/, accessed on 25 November 2005.

This inversely links the proportion of bags littered to the price charged for bags — as the price increases, only those consumers who continue to value the services at or above the amount of the charge will purchase the bags. The number of consumers that fit into this category will decrease as the price increases — as represented by the demand curve. Additionally, of the plastic bags consumed, a lesser proportion are likely to be littered because, on balance, there is likely to be a higher proportion of 'throw away' bag consumption among those that value them least. Grocery shoppers with multiple items can be expected to take their bags home — as can purchasers of hot food for home consumption. But buyers of a small number of items (for which a plastic bag may be unnecessary or provide a short lived service) are most likely to be faced with the temptation to litter.

This is particularly the case with respect to plastic bags that are used to carry goods only a short distance, or are used away from home — for example, take-away food packaging. The services that the bags provide are no longer required after the bag's initial purpose is fulfilled, and the bag is subsequently discarded, either in the garbage or by littering. With a direct charge on plastic bags, these consumers who do not value the services that a bag provides beyond its initial use may choose not to purchase a bag. Reduced LWPB consumption by this group is likely to result in a disproportionate reduction in 'deliberate' littering.

However, of the 40 to 60 million LWPBs that find their way into the landscape annually, about half are estimated to have been littered inadvertently. This means that they were intended for garbage collection and landfill, but have blown off-course at some stage, or are blown off the landfill sites once they are dumped. Changes in household behaviour, with respect to how plastic bags are disposed of, cannot directly address this problem. Instead, the number of plastic bags that are inadvertently littered can only be contained or reduced by reducing the consumption of plastic bags (for example, by placing a charge on the bags so that people who choose to have a bag clearly value it and are less likely to dispose of it – see Table 3.1), and improving garbage collection, litter clean-up and landfill management practices.

Table 3.1

LWPB CONSUMPTION AND DISPOSAL — THE PRICE EFFECT

Price	Consumption (in relation to current consumption)	Proportion (of total bags consumed) littered
$0.00	100%	0.87%
$0.05	50%	0.72%
$0.10	20%	0.58%
$0.15	20%	0.58%
$0.25	≈ 0%	n.a.

Source: The change in the number of LWPBs consumed and littered is based on estimates of bag consumption and litter by Nolan-ITU 2002, op. cit. p. 9, p. 13, and pp. 49-51.

Many consumers re-use LWPBs as 'bin-liners' or receptacles for rubbish around the home. Policy options that affect the consumption of LWPBs will also affect the demand for and consumption of commercially produced plastic bin-liners, made out of a similar light-weight plastic. In Ireland, it was observed that sales of bin-liners increased by 75 per cent following the introduction of the PlasTax.[28] The rate of substitution between LWPBs and bin-liners was recently estimated at approximately one bin-liner consumed for every seven LWPBs foregone.[29] Table 3.2 summarises the assumptions made about the price and degree of substitutability of the LWPB alternatives.

Table 3.2

CHARACTERISTICS OF THE ALTERNATIVES TO LWPBS

Substitute	Price (assumed)	Rate of substitution (number of LWPBs)
Re-usable bags	$1.40	125.3
Paper bags	$0.15	1.0
Bin-liners	$0.05	7.0

Source: J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005a, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 1: Main Report*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh; Nolan ITU 2002 *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts, Final Report*, Department of the Environment and Heritage, Canberra.

3.5 Environmental impacts

Assigning a monetary value to the environmental impacts of the policy options under consideration is an inherently difficult proposition. Individual households are often unable to indicate a *reliable* 'willingness to pay' for a better environment, because one person's expenditure on clearing up litter in the neighbourhood benefits the entire neighbourhood. The service provided is a public good.[30] What's more, an expectation that government (not the householder) will pay for the provision of a benefit can lead to an exaggeration of willingness to pay, while an expectation that a payment may be required can result in an under-statement (particularly if there is an expectation by individuals that they may be able to 'free ride' on the contributions of others).

An initial value of $1.00 for each LWPB removed from the environment was used in the modelling. A discussion of how this estimate was derived — as well as some of the limitations of this approach — is provided in Box 3.4.

[28] *Guardian* 2005, 'Excess Baggage', 26 October, http://society.guardian.co.uk/societyguardian/story/0,7843,1600179,00.html.

[29] J. Cadman, S. Evans, M. Holland, R. Boyd and AEA Technology Environment 2005a, *Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, Volume 1: Main Report*, Environment Group Research Report 2005/06 for the Scottish Executive, Edinburgh; Nolan ITU 2002 *Plastic Shopping Bags – Analysis of Levies and Environmental Impacts, Final Report*, Department of the Environment and Heritage, Canberra.

[30] A public good is a good that exhibits two particular features: 'non-excludability', which means that people cannot be excluded from deriving a benefit from the good (or that the costs of doing so are prohibitive); and 'non-rivalry in consumption', which means that the consumption of the good by one individual does not limit consumption by others (that is, there is no scarcity). These properties significantly limit the incentive for private providers to supply a public good, resulting in an undersupply or no supply at all.

Box 3.4

VALUING ENVIRONMENTAL DAMAGE — WILLINGNESS TO PAY

Due to the 'public good' nature of litter clean-up, it is difficult for individuals to meaningfully articulate their willingness to pay for a cleaner environment. Indeed, this is the main reason that litter collection is undertaken either by the government, or by volunteers. To some extent, a value can be imputed from observed behaviour — people freely volunteer their time to improve their environment by removing litter from it. The value they attach to litter reduction can be estimated from these actions, rather than rely on survey responses.

A significant initiative in this regard is 'Clean Up Australia Day'. In 2005, 678 146 volunteers donated approximately 1.5 million hours of their time to Clean Up Australia.[31] At an average remuneration rate of $16.00 an hour (derived from an average weekly earning of $810.60,[32] and adjusted for income tax[33]) this represents a resource input of approximately $24 million (— valuing the input of all contributors including children, who are likely to make up a significant proportion of total hours, at this rate). Of this resource input, $480 000 can be attributed to the collection of LWPBs, as LWPBs account for 2 per cent of the stream of litter. With approximately 20 million LWPBs collected, this gives a value of just over $0.02 per LWPB.

This valuation takes into account the full range of environmental impacts — on the assumption that the volunteers who collect LWPB litter do so because they too are concerned about the full range of aesthetic, biological and economic damage that littered LWPBs can cause.

However, to obtain a community-wide value for LWPB litter reduction it is also necessary to scale this sampling result to account for factors such as:

- people are likely to care more about 'localised' litter occurring in their own vicinity or preferred locations than they do about litter in remote localities (- implying a need to scale down the imputed average value per bag);
- people may contribute un-counted hours to litter reduction (- implying a need to scale up the per bag value)
- Clean Up Australia volunteers make up only a small sample of the total Australian population (about 3.4 per cent), and therefore their values could be extended to a broader base (- implying a need to scale up the per bag value); and
- Clean Up Australia volunteers are not a representative sample, and are likely to place a higher than 'average' value on the environmental damage caused by LWPBs (- implying a need to scale down the per bag value).

It is a matter of judgement how these effects should be weighted. For this exercise, in order to take these effects into account in the valuation of the environmental damage caused by LWPBs, an estimate of $1.00 per LWPB was taken as a starting point. The sensitivity of results to this estimate will be an important factor in considering the policy insights from this exercise.

[31] Clean Up Australia 2005, *Australians Put Rubbish Away for Good*, http://www.cleanup.com.au/main.asp?RequestType=MediaReleaseIn&SubRequestType=Detail&MediaRelID=233, accessed on 9 January 2006.

[32] Australian Bureau of Statistics 2006, *Average Weekly Earnings Australia November 2005*, cat. no. 6302.0 AusInfo, Canberra.

[33] Income tax adjustment was conducted using the Australian Tax Office's 'simple tax calculator' (http://calculators.ato.gov.au/scripts/ASP/SimpleTaxCalc/main.asp, accessed on 24 March 2006), and applying the tax rates for 2004-05.

The value that people place on the clean up of LWPBs is not intended to reflect the cost of clean-up — rather it is intended to reflect what a reduction in environmental damage is worth, in dollar terms. If a person values a reduction in environmental damage at $20, this indicates that that person is indifferent between receiving $20 or observing a reduction in environmental damage — that is, the person in question values both equally. The $1.00 per bag starting value for the clean up of LWPBs currently in the litter stream is derived in Box 3.4 as being based on the amount of money volunteers were willing to forgo in order to remove LWPBs from the litter stream.

This estimation of the value placed on a reduction in the environmental damage attributable to LWPBs accounts for all of the potentially damaging aspects of a littered LWPB. It assumes that the people who voluntarily pick up littered LWPBs do so because of their concerns about an LWPB's potential to impact adversely on:

- marine biodiversity;
- other wildlife or livestock;
- drains and sewers (unsightly – and also delivering an adverse economic impact when blockages lead to flooding);
- the aesthetics of their neighbourhood or other valued locations.

These considerations may not be explicitly stated, and anybody being asked why they volunteer to pick up littered LWPBs may simply respond that it is because LWPBs are bad for the environment. The fact that they recognise this, however, means that they have an implicit concern for some of the impacts stated above. This methodology attempts to place a value on all of the environmental damage that can be attributed to LWPBs, however, it should be noted that this valuation is based on the extent to which people are willing to allocate their time to addressing the problem — that is, the value that *people* place on the damage caused by littered LWPBs.

The analysis does not attempt to estimate an inherent value for individual animals or habitats that might be adversely affected by LWPB litter in the landscape and waterways. It assumes that these valuations are inherent in the effort expended by community volunteers in removing littered LWPBs from our landscapes and waterways (and which were significantly scaled up in this analysis). Of course, it is also possible that attributing an environmental value $1.00 to all non-littered bags may be considered by some to be overly generous. The implications of non-linearity in the environmental damage function are considered in Appendix D.

Litter

LWPBs are perceived to be an environmentally unsustainable product, and seeing them being blown across the streets or the environment more generally detracts from the aesthetic of our surroundings. Indeed, the introduction of the plastic bag reduction policies in several countries was due to a consideration of aesthetics.[34] Littered LWPBs can also have a serious impact on wildlife — particularly marine life — in relation to entanglement, suffocation and ingestion.

[34] See Cadman, Evans, Holland, Boyd and AEA Technology Environment 2005b, op. cit.

As a response to this, in August 2003 the Federal Minister for the Environment and Heritage listed injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris as a key threatening process. Plastic bags are included in the definition of 'harmful marine debris'.

While LWPB litter on land does not appear to be a major problem for wildlife, it is unsightly and can block gutters and drains creating stormwater problems. Litter studies indicate that LWPBs are generally in the top twenty litter items counted, although not the top ten. LWPBs lend themselves to inadvertent litter due to their lightness and easy ability to 'balloon' with the wind. As plastic bags do not readily break down in the environment, the number of plastic bags in the environment is effectively cumulative (with the nation releasing between 40 to 80 million bags into the environment each year).

Degradable plastic bags are available, however, it is unlikely that they will address this particular aspect of the costs associated with LWPB consumption. Degradable plastic bags are predominantly made from starch-based polymers, polyesters manufactured from hydrocarbons, or starch-polyester blends. The different types of bags degrade over different time frames, which are dependent on the environmental conditions they experience (that is, anything from three months to ten years). An Australian performance standard for composting and biodegradability is expected to be finished soon, however, a similar standard for plastics that break down primarily by non-biological means has yet to be developed anywhere. Whether or not degradable bags are an environmentally viable alternative to LWPBs is debatable:

> While the two sides bicker over whether plastic is better or worse than paper for carrying our shopping, they do at least agree on one thing: biodegradable bags are not the answer. 'It may actually encourage wrong attitudes to litter prevention and does not contribute to environmental sustainability,' says a statement by the UK's Packaging and Industrial Films Association, based in Nottingham. 'Biodegradable bags make people feel better for doing something that is still unhelpful, and it's not actually tackling the bigger problem of wasting resources,' Wilton [Claire Wilton, senior waste campaigner for Friends of the Earth in London] says. And to your average turtle, a degradable bag looks just as much like a jellyfish as a non-degradable one.[35]

Greenhouse gas and other emissions

A change in Australia's production mix of different types of bags has an impact on the level of greenhouse gas emissions. Assuming 52 shopping trips a year,, and using the conversion factors discussed earlier for finding how many LWPBs each of the alternatives represent, Table 3.3 presents the emissions of each of the different bag alternatives into the:

- atmosphere as greenhouse gas emissions, measured as carbon dioxide equivalent — the measure of greenhouse gas emissions is primarily related to the carbon dioxide associated with energy consumption (electricity used in production and fuels consumed in transporting the bags), and methane emissions released by the degradation of the bag in landfill; and
- waterways as eutrophication — the release of nitrates and phosphates into the waterways, as well as nitrogen oxides emitted into the air as part of combustion processes. This latter effect makes up by far the greatest share of the eutrophication of each bag alternative.

[35] Williams 2004, op. cit.

Table 3.3

ANNUAL GREENHOUSE GAS EMISSIONS AND PHOSPHATE EUTROPHICATION ASSOCIATED WITH LWPBS AND ALTERNATIVES

Type of bag (annual consumption)	Greenhouse (kg CO_2 equivalent per annum)	Phosphate (grams PO_4 equivalent per annum)
Light-weight plastic bag	6.1	2.5
Paper bag	30.2	26.6
Re-usable bag	2.0	1.2
Calico bag	6.4	8.0
Biodegradable bag	2.5	2.7

Note: The type of degradable bag chosen for this comparison is a bag made of biodegradable polyester, which has the lowest greenhouse and eurotrophication emissions of all the varieties of biodegradable bags considered in the paper referenced below.
Source: K. James and T. Grant 2005, *Life Cycle Assessment of Degradable Plastic Bags,* Royal Melbourne Institute of Technology, Melbourne p. 10.

Of the various bags available to consumers, re-usable bags have by far the lowest emissions in both categories, and this is directly related to the fact that they have the greatest life span. The emissions associated with paper bags are the highest of all of the available options, due to the high usage of electricity and gas in the production of paper bags.[36] It is also true that while a reduction in LWPB use in favour of a re-usable bag will reduce national emission levels, at least part of this reduction will be associated with a shift in emissions to an offshore location. LWPB production (and associated emissions) in Australia declines, while offshore production of re-usable bags increases.

Landfill

Most of the waste in Australia is disposed of in landfills. Surveys indicate that 60 per cent of bags taken home are reused as bin-liners or waste bags, lunch bags and general carry bags. [37] Bags that are reused as bin liners end up in landfill, and it is likely that bags reused for other purposes also end in landfill. That annual plastic bag disposal to landfill was estimated at 6.67 billion bags — or 36 700 tonnes — in Australia in 2002.[38] This equates to roughly 0.2 per cent of total solid waste going to landfill each year in Australia.

LWPBs may take between 20 to 1000 years to break down in the environment. As a result, the environmental impact of plastic bags in landfill is likely to be low due to their inert nature. The major impact of plastic bags in disposal is not their effect on the actual landfill, but in litter emanating from the site. This is associated with unloading operations as well as the compaction and burial of waste.

[36] The impact of the different policy scenarios discussed in chapter 4 on Australia's greenhouse gas emissions is estimated in the modelling, and is linked to the impacts that the various policies have on the level of demand and output, and the composition of domestic production. These estimates are based on the assumptions of resource use and greenhouse gas emissions that are inherent in MMRF-Green (see appendix B), and are not based on the figures in Table 3.3.

[37] Nolan-ITU 2002, op. cit., p. 6.

[38] Nolan-ITU 2002, op. cit., p. 9.

Chapter 4

Assessing the policy options

Determining the relative costs and benefits of alternative policy options calls for an empirical approach. This report builds its cost benefit analysis on impact assessments and scaling factors drawn from relevant literature as well as economic impact analysis derived from a dynamic, computable general equilibrium (CGE) model of the Australian economy. The general equilibrium approach captures the interdependency of income and production relationships within the economy, and is therefore a powerful tool for examining the industry-level impact of policy-induced changes on an inter-temporal basis.

4.1 The policy scenarios and their initial impacts

The Environment Protection and Heritage Council identified nine regulatory approaches to address the problems associated with LWPBs. The key features of each of the regulatory approaches were estimated in terms of their impact on the stakeholders referred to in the previous chapter.

MMRF-Green is built on data supplied by the Australian Bureau of Statistics, and complemented by data from other sources further detailing the inter-industry and production relationships within the Australian economy. This information is supplemented by detailed information on LWPB costs, consumption patterns and likely preferences for LWPB alternatives identified in the context of this study.

Each of the scenarios modelled for this study is described in Table 4.1 which summaries the key features that distinguish it for modelling purposes (see Appendix B for more detail). These features represent the 'shocks' applied to CGE model (see Section 4.2), and drive a realignment of equilibrium production and consumption outcomes. Each scenario has been attributed 'first round impacts' based on data drawn from the available literature and expert advice.

For instance, each scenario has been modelled according to likely impacts on a range of key factors including:

- administration costs – for government and industry, and differentiated according to costs of oversighting a ban, point of sale suasive approach or levy;
- training and staff costs – for retail staff, involved in delivering new point of sale bag handling arrangements;
- theft — from retailers, associated with increased theft of shopping baskets or trolleys (based on the Irish experience with 'PlasTax');
- replacement bag sales — affecting consumers and manufacturers; and
- capital costs — affecting retailers who may need to install new equipment and processes.

As a point of comparison, the input value of these policy shocks is summed over time and discounted to account for the fact that (even after adjusting for inflation) $100 worth of consumption today is more valuable than $100 in 5 years time. The resultant figures are called Net Present Values (NPVs) and are calculated on the basis of the patterns of costs and benefits over the period 2005 to 2016. An estimate of the total decrease in the number of littered LWPBs over the same period (relative to the situation in which current policy action stopped and bag use began to drift upward again in line with retail sales growth) is also shown.

Table 4.1

SUMMARY TABLE OF FORECAST INITIAL ECONOMIC AND ENVIRONMENTAL COSTS AND BENEFITS, IN COMPARISON TO 'NO FURTHER ACTION'

Scenario	Timing	Description	Key sectors affected by scenarios identified by the Environment Protection Heritage Council			
			Retail industry	Households	Government	Environment
1	Eliminate LWPBs by 2009	Comprehensive ban effective from 1 January 2009	• implementation costs (equipment modification, staff training, increased theft) • reduced revenue due to longer transaction times • increased cost due to in-store education and promotion • net cost ($432.9m)	• reduced consumption of LWPBs, increased consumption of alternatives • net benefit ($109.8m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($19.0m)	• reduction in litter • 360.6m fewer bags littered
2	**No further action** (ARA Code expires)	Code expired on 31 December 2005, then no further action.	• no impact	• trend toward pre-2002 purchase behaviour	• no impact	• no further policy impact • (expect litter increase)
3	**Extend Code**	**Continuation of 50 per cent reduction on 2002 bag ratio to 2016**	• **50 per cent of 2002 bag/sales ratio maintained over the period 2005-2020 for all large retailers, and half of all medium and small retailers** • **implementation costs and on-going costs (similar to Scenario 1)** • **net cost ($329.6m)**	• **50 per cent reduction of LWPB consumption, increased consumption of alternatives** • **net benefit ($82.9m)**	• **increased administrative expenses** • **reduced litter clean-up expenses** • **net benefit ($12.7m)**	• **reduction in litter** • **245.3m fewer bags littered**
4	Escalating charge (kept by retailers)	LWPB charge from 1 January 2007 at $0.05 per bag, $0.15 from 2008, $0.25 from 2009	• increased implementation costs and on-going costs (similar to Scenario 1) • increased administrative costs • increased revenues (from LWPB sales) • net cost ($663.4m)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net benefit ($1.6m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($23.1m)	• reduction in litter • 418.4m fewer bags littered

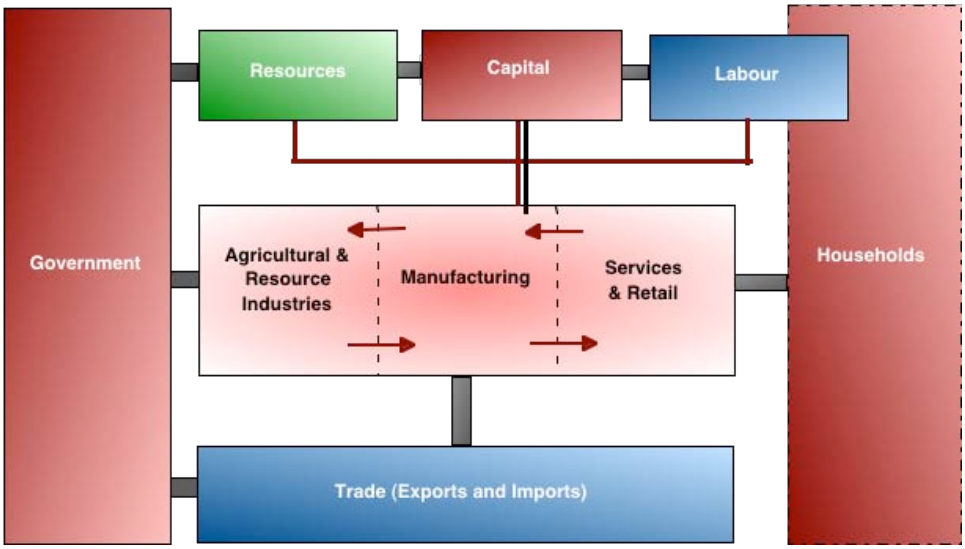
Scenario	Timing	Description	Key sectors affected by scenarios identified by the Environment Protection Heritage Council			
			Retail industry	Households	Government	Environment
5	Voluntary phase out to 2009, mandatory beyond	Linear phase out to zero between 2006 and 2009	• increased implementation costs and on-going costs (similar to Scenario 1) • net cost ($563.9m)	• reduced consumption of LWPBs, increased consumption of alternatives • net benefit ($136.5m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($23.9m)	• reduction in litter • 422.4m fewer bags littered
6	Earlier ban on LWPBs	Timing variations on Scenario 1	• see chapter 5	• see chapter 5	• see chapter 5	• see chapter 5
7	Disposal fee (cost recovery)	Fee charged to consumers ($0.05) to recover cost of effective LWPB disposal initiative from 1 January 2009	• increased implementation, on-going and administrative costs (similar to Scenario 4) • net cost ($433.9m)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net cost ($195.5m)	• increased administrative expenses (general) • increased administrative expenses (levy collection) • reduced litter clean-up expenses • net cost ($10.8m)	• reduction in litter • 300.5m fewer bags littered
8	Regulated price (kept by retailers)	Fee charged to consumers ($0.25), and applied by retailers from 1 January 2009	• increased implementation, on-going and administrative costs (similar to Scenario 4) • net cost ($620.8m) • (bag consumption & revenue approx zero @ price of $0.25 per bag)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net benefit ($152.1m)	• increased administrative expenses • reduced litter clean-up expenses • net benefit ($19.5m)	• reduction in litter • 360.6m fewer bags littered
9	Levy on LWPBs	LWPB levy ($0.10) applied at point of sale from 1 January 2009	• increased implementation, on-going and administrative costs (similar to Scenario 4) • net cost ($511.2m)	• reduced consumption of LWPBs (see demand curve), increased consumption of alternatives • net cost ($262.8m)	• increased administrative expenses (similar to Scenario 7) • reduced litter clean-up expenses • net cost ($12.9m)	• reduction in litter • 312.5m fewer bags littered

4.2 The modelling approach

Capturing all significant impacts, while ensuring that the overlap of effects does not result in double counting, is a critical requirement of cost benefit analysis. A network of relationships and interactions characterise a market economy, and it is important to distinguish between actual resource and welfare impacts and their reverberation along the value chain. For example, if $100 worth of resources was bought and on-sold five times, while representing $500 worth of economic activity within the economy (and affecting up to five different stakeholders), this activity would nevertheless represent a *net* change in consumption of $100. A stylised depiction if the structure of a general equilibrium model of the economy is provided in Figure 4.1.

Figure 4.1

STYLISED INTERACTIONS IN A GENERAL EQUILIBRIUM ECONOMIC MODEL



Economic models are a tool for keeping track of price, production and tax relationships within an economy and netting out 'transfer' effects. They are well suited to estimating the likely net impacts of policy changes at an economy-wide and industry level. The outcomes of the model should not be taken as exact predictions of future outcomes — rather, they are approximations and are best suited to indicating the signs (positive or negative), magnitude and relativities of changes likely to be induced by a policy or economic 'shock'.

The CGE model used in this analysis is the Monash Multi-Regional Forecasting — Green (known as MMRF-Green)[39] — see Box 4.1. The MMRF-Green model is recognised as one of the leading CGE models in Australia, and is used extensively by government and industry, and enjoys a strong reputation in Australia and overseas.

[39] See P. Adams, M. Horridge and G. Wittwer 2003, *MMRF-GREEN: A Dynamic Multi-Regional Applied General Equilibrium Model of the Australian Economy, Based on the MMR and MONASH Models*, CoPS/IMPACT Working Paper Number G-140, October.

Box 4.1

MMRF-GREEN

MMRF-Green model is a multi-regional, dynamic CGE model. It distinguishes up to eight Australian regions (six States and two Territories) and, depending on the application, up to 144 commodities/industries. The model recognises:

- domestic producers classified by industry and domestic region;
- investors similarly classified;
- up to eight region-specific household sectors;
- an aggregate foreign purchaser of the domestic economy's exports;
- flows of greenhouse gas emissions and energy usage by fuel and user;
- up to eight state and territory governments; and
- the federal government.

The model contains explicit representations of intra-regional, inter-regional and international trade flows based on regional input-output data developed by Monash University's Centre of Policy Studies, and includes detailed data on state and Federal government budgets, with each region modelled as a mini-economy. Second round effects are captured via the model's input-output linkages and account for economy-wide and international constraints.

The MMRF-Green model estimates the implications of policy (and resource) changes on an inter-industry and year-by-year basis. For the purposes of this exercise MMRF-Green can track economic impacts in terms of:

- national output, including breaking down the results to identify activity level changes for retailers, domestic industries associated with the manufacture of lightweight bags, re-usable bags, bin liners and replacement bags, and other upstream and downstream industries;
- employment (that is, changes in full time equivalent jobs);
- net impact on consumers (that is, by measuring the change in real net welfare);
- government budget positions;
- real wage levels; and
- the balance of trade (that is, regional international export earnings, international import expenditures and international balance of payments).

The model also provides a detailed representation of the energy sector and associated resource flows. In particular, it provides insight to the usage patterns of coal, oil and gas across the economy (the latter being important to plastics production) and forestry activity (important for paper production). The model also estimates the greenhouse gas implications of different production outcomes.

4.3 Comparison of identified scenarios

This section presents the estimates of the impacts on the relevant stakeholders in terms of whether they are better or worse off with the regulatory intervention than they would have been if the government had taken no action. The outputs of all of the policy options are therefore considered with respect to how much, and in which direction, they vary from Scenario 2 (that is, the scenario in which the government undertakes no further action). In specifying the impact of 'no further action' on the economy and the environment, it was assumed that the ARA Code and action under it would expire, and that the consumption of LWPBs would increase over time.

National impacts

Under Scenario 2, Group One retailers no longer incur the estimated annual cost of $21 million currently necessary to comply with the ARA Code. That is, 'no further action' results in a direct economic benefit to those involved in administration of the ARA Code (such as costs involved with staff training, awareness campaigns, etc are no longer incurred), but the environment suffers because LWPB consumption is no longer curtailed. Compared to Scenario 2 (the 'base' case), this benefit is removed under other 'action' policy scenarios.

The impact of the policy scenarios in comparison to 'business as usual' falls somewhere between the impact relative to Scenario 2 (that is, no further action), and the impact in comparison to Scenario 3 (that is, extension of the ARA Code to a wider group of retailers).

A summary of the headline results is presented in Table 4.2 for 2010 and 2016.

A key observation is that, as expected:

- the value of environmental damage avoided varies considerably between the different scenarios for 2016, ranging from a decrease of $3.1 million in Scenario 3 to $12.6 million in Scenarios 4 and 5; but
- the economic indicators show little variation between the scenarios, both in 2010 and in 2016.

However, it is important to look behind these headline results to gain a better understanding of the full impacts associated with the various options. This is done in the remainder of this section. Annual economic and environmental outcomes for each of the key scenarios, showing the impact of cost shocks and subsequent adjustment paths, are provided in Appendix C.

Table 4.2

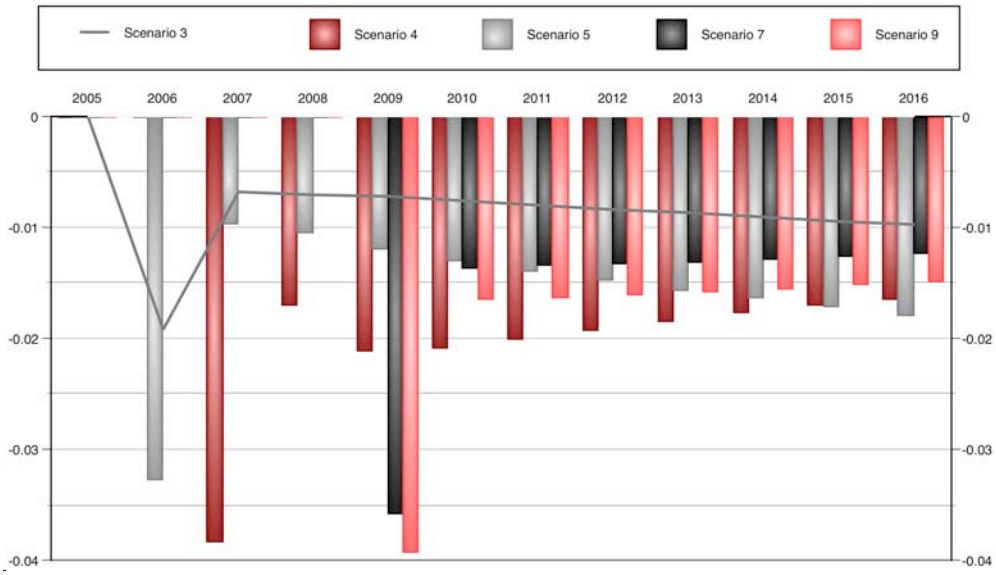
SUMMARY TABLE OF ECONOMIC AND ENVIRONMENTAL IMPACTS (DEVIATIONS FROM PROJECTED 'NO FURTHER ACTION (SCENARIO 2)' OUTCOMES, 2005 PRICES)

	2010					2016				
	Scen.3	Scen.4	Scen.5	Scen.7	Scen.9	Scen.3	Scen.4	Scen.5	Scen.7	Scen.9
Gross domestic product ($m)	-69.6 (-0.01)%	-189.1 (-0.02)%	-117.5 (-0.01)%	-123.6 (-0.01)%	-149.5 (-0.02)%	-105.2 (-0.01)%	-175.8 (-0.02)%	-191.7 (-0.02)%	-132.2 (-0.01)%	-158.8 (-0.01)%
Household income ($m)	-56.2 (-0.01)%	-126.7 (-0.02)%	-95.0 (-0.01)%	-88.3 (-0.01)%	-105.8 (-0.01)%	-91.4 (-0.01)%	-131.8 (-0.01)%	-166.5 (-0.02)%	-97.0 (-0.01)%	-116.1 (-0.01)%
Household expenditure ($m)	-34.6 (-0.01)%	-74.1 (-0.01)%	-58.1 (-0.01)%	-52.8 (-0.01)%	-62.6 (-0.01)%	-59.0 (-0.01)%	-83.4 (-0.01)%	-107.3 (-0.02)%	-60.8 (-0.01)%	-72.6 (-0.01)%
Retail industry value added ($m)	-4.6 (-0.03)%	-2.6 (-0.02)%	-7.9 (-0.05)%	-6.0 (-0.04)%	-7.5 (-0.04)%	-8.1 (-0.04)%	-4.3 (-0.02)%	-7.5 (-0.04)%	-5.4 (-0.03)%	-6.5 (-0.03)%
Plastic products value added ($m)	-17.7 (-0.58)%	-12.4 (-0.4)%	-32.3 (-1.05)%	-6.5 (-0.21)%	-10.1 (-0.33)%	-20.2 (-0.62)%	-16.0 (-0.49)%	-38.1 (-1.16)%	-8.3 (-0.25)%	-12.8 (-0.39)%
Paper products value added ($m)	4.4 (0.07)%	7.7 (0.13)%	8.2 (0.13)%	2.2 (0.04)%	4.1 (0.07)%	5.7 (0.08)%	11.1 (0.16)%	10.8 (0.16)%	4.0 (0.06)%	7.0 (0.1)%
Environmental damage ($m)	-20.6 (-48.74)%	-42.3 (-100)%	-42.3 (-100)%	-35.3 (-83.33)%	-36.7 (-86.67)%	-23.9 (-48.74)%	-49.0 (-100)%	-49.0 (-100)%	-40.9 (-83.33)%	-42.5 (-86.67)%
Greenhouse gas emissions (Kt CO_2e)	-58.0 (-0.01)%	-148.1 (-0.02)%	-99.4 (-0.02)%	-95.8 (-0.02)%	-116.1 (-0.02)%	-77.3 (-0.01)%	-167.1 (-0.02)%	-140.2 (-0.02)%	-117.2 (-0.02)%	-145.2 (-0.02)%

Gross domestic product (GDP) is reduced under each of the policy scenarios. This pattern can be seen in the annual GDP outcomes depicted in Figure 4.2, which shows outcomes relative to a 'no further action' base case and also highlights outcomes relative to Scenario 3 results which represent 'extension of the ARA Code'. Changes in household income (an important welfare measure that abstracts from international trade effects) exhibit a similar pattern.

Figure 4.2

REAL GROSS DOMESTIC PRODUCT, PERCENTAGE DEVIATION FROM 'NO FURTHER ACTION' — 2005 TO 2016



This is due to a number of factors. Key among these are:

- in the scenarios where the consumption of plastic bags is reduced, consumers substitute LWPBs with re-usable bags. One third of the LWPBs consumed in Australia is produced domestically, however all of the re-usable bags consumed in Australia are fully imported. An increase in the value of imports can decrease GDP.
- as value added decreases and imports increase, holding everything else constant, household income also decreases. This could be due to a decline in employment, or a fall in the productivity of labour. Reduced household income is generally followed by reduced demand and lower household expenditure, which in turn can reduce GDP until the economy stabilises.

However, it should be noted that while value added to the retail services industry may decrease — because the retail services industry is paying people to train its staff, refit the check-outs to cater for the alternatives to LWPBs or undertake the auditing necessary for implementing and administering a levy or direct LWPB charge — there is likely to be an increase in the value added of the industries from which the retail services industry sources its inputs, and this is taken into consideration by the CGE model.

As Figure 4.2 shows, the extent to which GDP in each of the policy scenarios varies from GDP in Scenario 2 is less than 0.05 per cent in the years between 2005 and 2016. That is, GDP under each of the 'action' scenarios is generally at least 99.95 per cent of what would be under a no further action scenario. Not surprisingly, plastic bags policy, carried forward in a range of manifestations, does not appear to have a major impact on the Australian economy. However, industry level impacts can be significant, as can the value of impacts when considered in aggregate dollar terms.

The greatest impact to GDP occurs in the year in which the policy is introduced, because this is the year in which the up-front expenditure associated with implementing the policy option is incurred. Subsequently, the deviation of the policy options from Scenario 2 declines in magnitude as the economy stabilises.

The reduction in GDP can be attributed to the reduced value added of the retail services industry and the plastic and rubber products manufacturing industry, although this is off-set to some extent by increases in the value added of the paper products manufacturing industry. Given that the large impacts occur in the initial year of each scenario, it is useful to look at the present value[40] of the impacts over time, particularly since the polices come into effect in different years.[41]

In evaluating the present values of the impact on GDP, the costs associated with policies that come into effect sooner have a higher present value than policies that are implemented later. This is because the costs are discounted over a shorter period. As a result, in present value terms, Scenario 4 has the greatest impact on GDP because it is one of the first to come into effect, and has one of the highest up-front costs (see Table 4.3).

Table 4.3

PRESENT VALUE OF POLICY IMPACTS ON REAL GDP — 2005 TO 2016 ($MILLION)

Scenario 3	Scenario 4	Scenario 5	Scenario 7	Scenario 9
-$646	-$1293	-$1093	-$768	-$900

Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

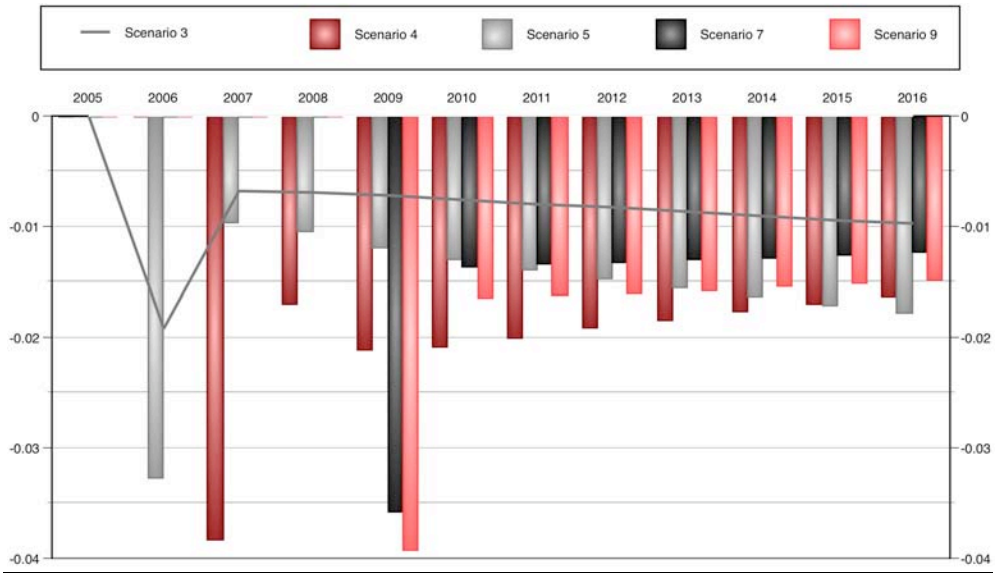
In Scenarios 4, 7 and 9, retailers have higher on-going costs initially, due to the administrative arrangements around levies and charges, and the expenditure on in-store education and promotion (see Figure 4.3). Expenditure on these activities falls over time, due to changes in consumer behaviour, and improvements in administrative efficiency. In Scenarios 3 and 5, on-going costs to the retail services industry start out lower in comparison, but increase in-line with growth in the industry.

[40] NPV analysis is a method used for comparably evaluating investments in very dissimilar projects by discounting the current and projected future cash inflows and outflows back to the present value based on the discount rate, or cost of capital, of the firm.

[41] In this case, the NPV of costs between 2005 and 2016 was calculated using a 7 per cent discount rate, with 2005 as 'year zero'.

Figure 4.3

REAL RETAIL SERVICES INDUSTRY VALUE ADDED, PERCENTAGE DEVIATION FROM 'NO FURTHER ACTION' — 2005 TO 2016



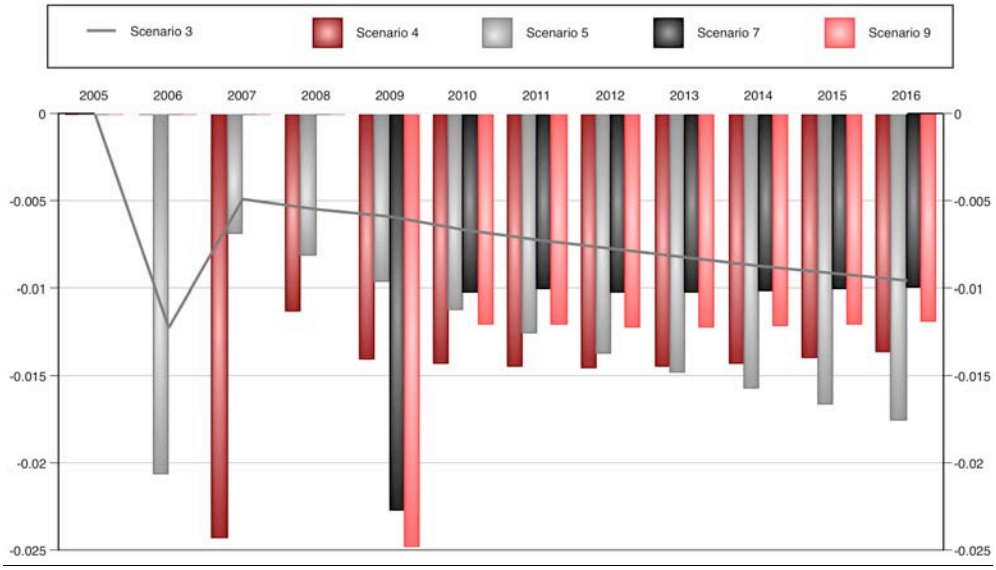
As the estimated rate of growth in the retail services industry is higher than the rate of growth for GDP, the costs to retailers under Scenarios 3 and 5 increase over time. Costs to retailers in Scenarios 4, 7 and 9 would start to grow in-line with retail services industry growth rates once efficiency gains have been fully exploited — assumed to occur ten years after the introduction of the relevant policy.

The up-front costs incurred by the retail services industry should be analysed taking into consideration the fact that these costs are assumed to occur in comparison to a scenario in which there is no further government action, and in which the ARA Code expires. Subsequently, when new policy initiatives are introduced in each of the alternative scenarios, it is necessary to factor these up-front costs back into the model because, based on the stated assumption that the ARA Code behaviours 'atrophy' in Scenario 2, all retailers enjoy the benefit of non-compliance between 1 January 2006 and the implementation or uptake of a subsequent initiative. The reduction in the consumption of LWPBs under each of the policy scenarios has a direct impact on both the plastic and paper products manufacturing industries. The impacts to these sectors are discussed with reference to Table 4.4.

Household income is closely linked with value added and with GDP. When value added falls, payments to capital and labour decrease, either because they have been less effective in production, or because more expenditure is allocated to intermediate inputs. As a result, household expenditure falls (see Figure 4.4). The proportion by which it falls is directly linked to the reduction in GDP and, once income and expenditures from changed export and import volumes are taken into account, reflects aggregate costs (relative to business as usual) about half to two thirds those reported for GDP.

Figure 4.4

REAL HOUSEHOLD EXPENDITURE, PERCENTAGE DEVIATION FROM 'NO FURTHER ACTION' — 2005 TO 2016

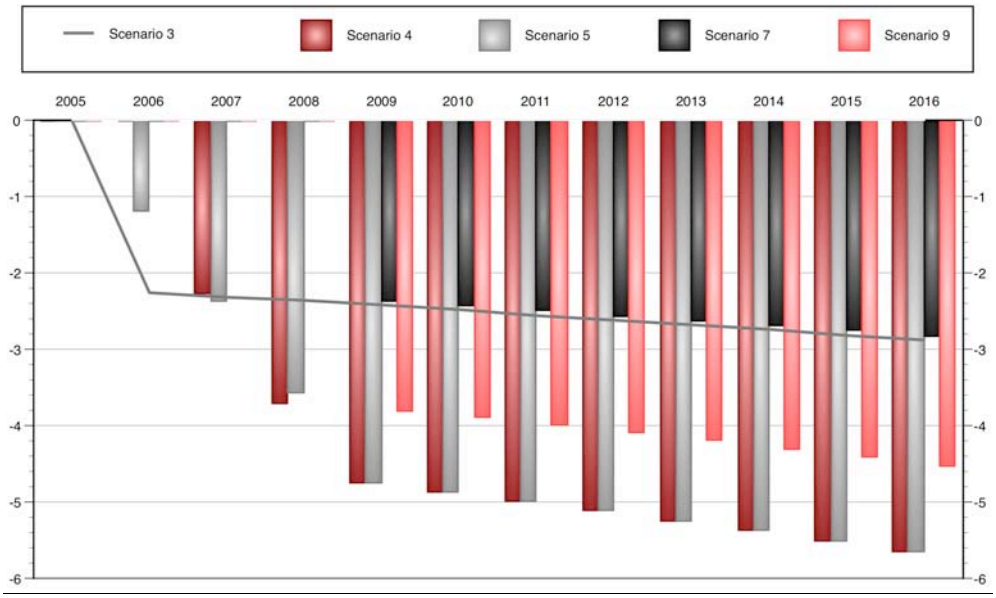


Generally, however, environmental benefits rise in line with economic costs. It is the more expensive policy options (Scenarios 4 and 5) that are the most effective at reducing the number of LWPBs consumed, as shown in Figure 4.5.

Perverse effects also need to be considered — such as the possibility that an advance disposal fee (as in Scenario 7) could lead to a more 'relaxed' attitude to littering and increase its incidence above assumed levels.

Figure 4.5

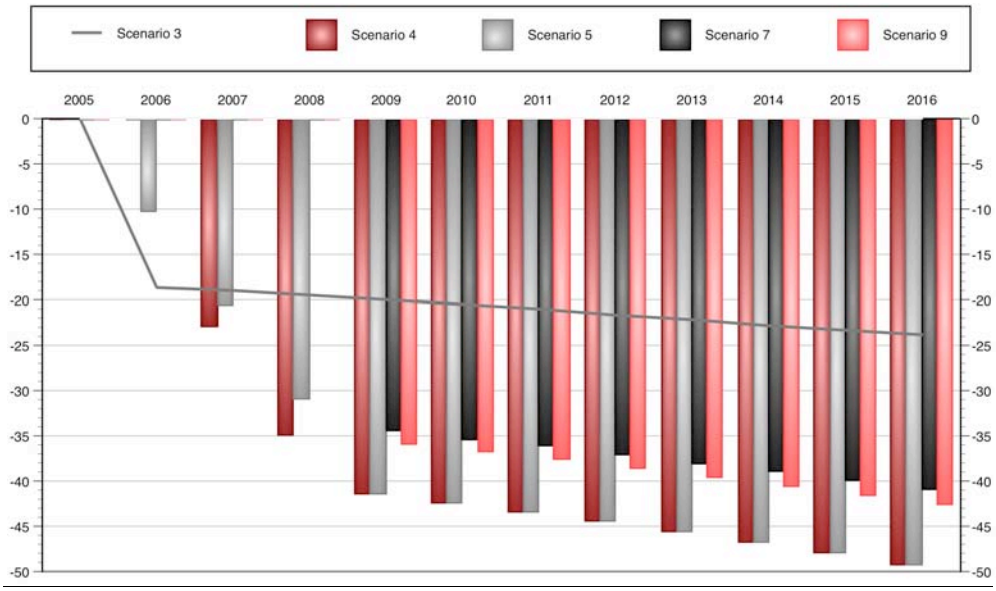
LWPB CONSUMPTION, ABSOLUTE DEVIATION FROM 'NO FURTHER ACTION' — 2005 TO 2016, BILLIONS OF LWPBS



However, it is not the reduction in the consumption of LWPBs that is of most interest, but the reduction in the number of LWPBs littered, and the value placed on this reduction in environmental damage. Figure 4.6 shows the impact on the environmental damage caused by LWPBs, as estimated using the valuation discussed in section 3.5.

Figure 4.6

VALUATION OF ENVIRONMENTAL DAMAGE, ABSOLUTE DEVIATION FROM 'NO FURTHER ACTION' — 2005 TO 2016, $M



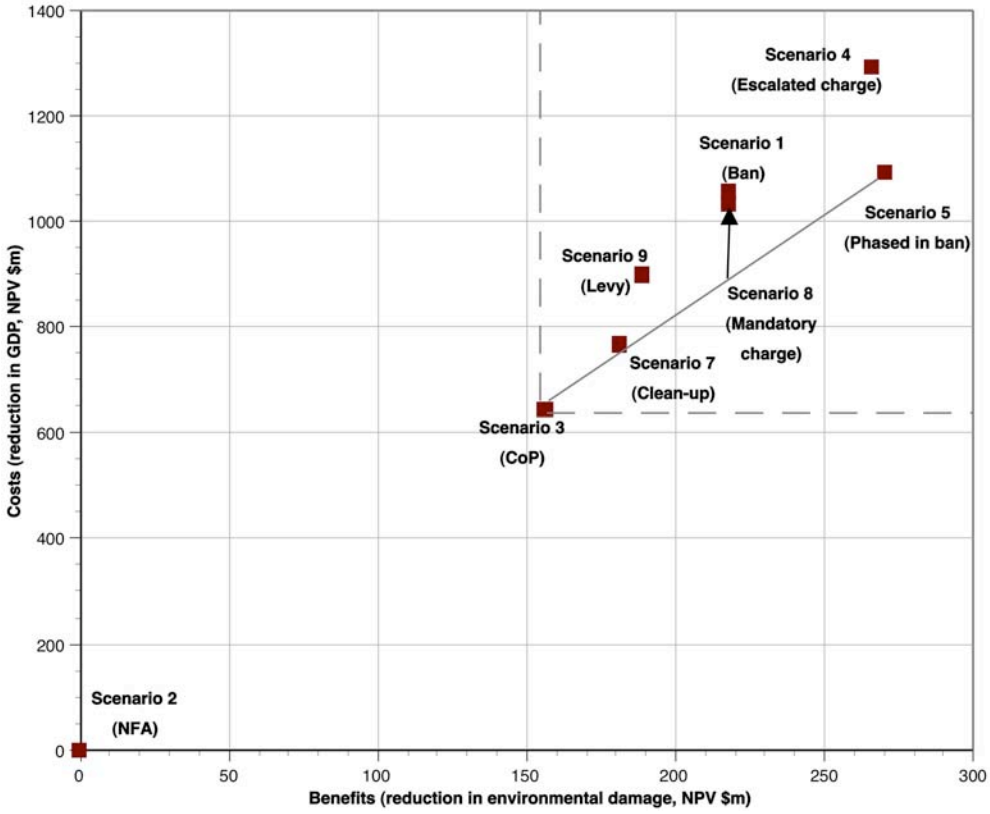
While both Scenario 3 and Scenario 7 reduce consumption of LWPBs by around 50 per cent relative to Scenario 2, the impact on environmental damage is greater in Scenario 7 because a price is charged for LWPBs, meaning that those who litter 'free' LWPBs because they have no further use for them are less likely to purchase one. Secondly, as an advance 'clean-up' fee is collected and allocated to cleaning up littered LWPBs, the proportion of consumed LWPBs that end up in the litter stream under Scenario 7 is far less than in Scenario 3 — 0.29 per cent, as opposed to 0.87 per cent.

Reflecting this focus on the relationship between economic and environmental impacts, Figure 4.7 shows the tradeoffs involved in the change scenarios. The implication to be drawn from Figure 4.7 is that, of the scenarios identified by the Environment Protection and Heritage Council, the efficiency frontier (that is, the options that represent the most efficient tradeoffs) is represented by Scenarios 3, 5 and 7.

These policies also have modest consequential greenhouse impacts, ranging from a maximum scenario impact of 150 000 tonnes per year saved in the initial period to 170 000 tonnes per year later. However, the analysis suggests that these greenhouse savings are achieved at a relatively high cost per tonne, (for example, in Scenario 4, the reduction in greenhouse gas emissions occurs at a cost of approximately $1200 per tonne). Obviously, these GDP impacts need to be spread across the package of environmental benefits. However, it is reasonably clear that greenhouse savings are unlikely to provide a significant additional benefit for this policy analysis.

Figure 4.7

THE RELATIONSHIP BETWEEN ECONOMIC AND ENVIRONMENTAL COSTS UNDER VARIOUS SCENARIOS



Even when comparing the trade-offs 'as if' Scenario 3 were the base case, the ranking of the policy options, and the efficient frontier, remain unchanged.

Sectoral impacts

The retail sector is the lynchpin when thinking about policy regarding LWPBs as increased retail sector costs leads to fall in GDP. A fall in output means that there is a reduction in the labour and capital employed to produce that output, which leads to a fall in household income. Households adjust for this reduced income by spending less — this reduction in demand affects output in other industries, which has a secondary impact on GDP.

While there are obviously employment shocks to a number of industries, the major industries affected, as categorised by MMRF-Green are:

- paper products manufacturing;
- plastic products manufacturing; and
- retail services.

Focusing on these industries, Table 4.4 shows both the NPV for output in these industries, and the average annual change in employment. Key observations include:

- in all the 'change scenarios' average employment increases in the retail services industry (for example, additional training requirements, handling requirements, etc), but as this is not accompanied by any demand growth or offsetting efficiencies industry value add decreases; and
- reductions in employment in the plastic product manufacturing industry exceed gains in the paper products manufacturing industry.

Table 4.4

OUTPUT AND EMPLOYMENT IMPACTS IN SELECTED INDUSTRIES (RELATIVE TO 'NO FURTHER ACTION'), 2005 TO 2016

Scenario	Industry value added	Employment
	NPV ($m)	Average deviation (no.)
Paper products manufacturing		
Scenario 3	**$31.6**	**84.0**
Scenario 4	$48.6	138.0
Scenario 5	$50.4	143.0
Scenario 7	$12.8	39.0
Scenario 9	$23.9	72.0
Plastic products manufacturing		
Scenario 3	**-$129.3**	**-208.0**
Scenario 4	-$68.7	-128.0
Scenario 5	-$206.6	-349.0
Scenario 7	-$36.3	-68.0
Scenario 9	-$55.7	-104.0
Retail services		
Scenario 3	**-$46.0**	**363.0**
Scenario 4	-$26.6	697.0
Scenario 5	-$53.0	633.0
Scenario 7	-$36.4	486.0
Scenario 9	-$43.4	575.0

Regional impacts

The impact of the scenarios on gross state product (GSP) — the sum of value added across each of the industries within each state (Table 4.5) reveals that under no scenario does any state or territory increase total GSP, although there are likely to be redistributions between industries within scenarios. The impact of industry value added in Tasmania is relatively small compared to the other states and territories, in part because the Tasmanian state economy is relatively small, but also because Tasmania's paper products manufacturing industry increases its value added, driven by an increase in the demand for paper substitutes for LWPBs.

Table 4.5

NPV OF CHANGES IN GROSS STATE PRODUCT (2005 TO 2016, $ MILLION)

	Scenarios				
	3	4	5	7	9
NSW	**-$148.1**	-$427.2	-$263.1	-$251.5	-$292.7
Vic	**-$363.6**	-$334.8	-$582.8	-$202.0	-$238.8
Qld	**-$48.3**	-$199.0	-$89.9	-$115.8	-$134.0
SA	**-$17.5**	-$81.1	-$33.1	-$47.7	-$56.8
WA	**-$55.9**	-$196.1	-$101.1	-$116.2	-$137.9
Tas	**-$0.4**	-$10.5	-$1.5	-$7.3	-$7.6
NT	**-$8.4**	-$30.0	-$15.0	-$18.7	-$22.3
ACT	**-$3.9**	-$14.4	-$7.0	-$8.9	-$10.1

Looking at the impact of the proposed scenarios on household income — the best general measure of economic welfare — reveals that there is significant relative variation across jurisdictions in the different scenarios (see Table 4.6).

Table 4.6

NPV OF CHANGES IN HOUSEHOLD INCOME (2005 TO 2016, $ MILLION)

	Scenarios				
	3	4	5	7	9
NSW	**-$92.9**	-$258.3	-$165.3	-$154.0	-$177.6
Vic	**-$316.2**	-$241.3	-$513.8	-$149.1	-$175.8
Qld	**-$24.3**	-$126.6	-$46.2	-$73.6	-$84.0
SA	**-$10.8**	-$52.1	-$20.3	-$30.3	-$36.0
WA	**-$50.3**	-$176.3	-$90.5	-$108.6	-$129.6
Tas	**$0.9**	-$3.5	$1.2	-$3.0	-$2.4
NT	**-$9.1**	-$30.7	-$16.3	-$19.7	-$23.6
ACT	**-$4.5**	-$10.2	-$7.9	-$6.5	-$7.2

Chapter 5

Other issues: sensitivity, practicality and societal values

This chapter discusses important additional factors — that is, beyond those captured in the modelling presented in the previous chapter — that can bear on policy design decisions and pathways for phasing out LWPBs.

Modelling provides a holistic and consistent means of tracking and assessing impacts that work their way through a system. The can provide powerful insights to 'ripple' effects and the magnitude of changes likely to be observed.

However, results can be affected by the nature of the exogenous shocks introduced to the system and the assumptions that underpin the model itself. Models, by their nature, are abstractions and simplifications of reality — they cannot capture all the impacts or behavioural characteristics of markets or individuals. Modelling is a valuable tool for policymakers but does not replace the need to consider wider issues that can affect policy design and outcomes. Significant issues are considered in the following sections.

5.1 Timing

Timing can have an important impact on the costs and effectiveness of policy implementation. An obvious example of this is where discrete events and 'windows of opportunity' exist that can significantly affect costs or potential benefits. However, there are also subtle factors that can affect the calculation of costs and benefits associated with the timing of policy implementation. Key factors in this category (that can be treated as 'variables' in a cost benefit modelling context) are:

- the effect of time preference or 'discount rates' (that is, the rate at which future costs and benefits are discounted relative to those in an earlier period);
- changes in the pattern of costs and benefits that can arise from delayed or advanced action; and
- methodologies for deriving estimates for social and environmental impacts (a discussion of aspects of the environmental valuation model used in this report is provided in Appendix D).

Importantly, the effect of discounting in cost-benefit analysis is to place a higher weighting on near term outcomes and a diminishing weighting on outcomes that occur further into the future. By accentuating early year costs and benefits over delayed costs and benefits, discounting will tend to bias consideration of timing in favour of actions that have the effect of bringing forward a net benefit, or delaying a net cost. The distribution of these costs and benefits over time is also important.

Underlying growth in the economy means that changes that affect, for example, the percentage of bags that are recycled or discarded as litter in a particular year, or changes in industry output shares, can translate into different dollar costs because of base year effects. For example, a policy that reduces GDP by 0.1 per cent represents a dollar cost of $1 billion in an economy of $1000 billion, but only half that in an economy half the size. Differences in policy timing, coupled with discounting effects can fundamentally affect the NPVs of different policy approaches in a modelling context.

Table 5.1 presents the NPVs of the policy options analysed in the previous chapter, revised to reflect differences in implementation date and discount rate. For consistency, values are calculated between 2005 and 2016, with estimates reflected as current year expenditure equivalents (that is, all NPVs are calculated from a 2005 base year).

Table 5.1

NPV IMPLICATIONS OF CHANGES IN SCENARIO TIMING AND DISCOUNT RATE, $M

Scenario	As modelled	Advanced one year	Delayed one year	4% per annum	10% per annum
Scenario 1	-839.3	-944.2	-741.9	-1002.2	-709.8
Scenario 3	**-489.7**	**-549.5**	**-433.8**	**-569.9**	**-426.5**
Scenario 4	-1026.8	-1124.9	-929.4	-1201.6	-887.1
Scenario 5	-822.9	-926.9	-726.3	-957.1	-717.5
Scenario 6	**See Scenario 1 'advanced and delayed implementation results'**				
Scenario 7	-586.5	-651.9	-522.3	-704.7	-492.8
Scenario 8	-817.3	-907.0	-728.0	-985.9	-684.1
Scenario 9	-711.3	-793.2	-630.8	-857.7	-595.6

Notes: The NPVs for the 'as modelled' scenarios were calculated using a 'standard' discount rate of 7 per cent per annum. Net economic impacts for Scenario 2 are not reported because these reflect expiry of the ARA Code on a pre-agreed timetable, and represent a no further action 'baseline' result.

The results of Table 5.1 indicate a general trend toward higher costs if policy action is brought forward. This is because the effect of action is estimated to entail net costs (in both annual and NPV terms) — taking costly action earlier tends to increase estimates of NPV costs. The additional NPV cost of advanced policy implementation is generally in the order of 9 to 13 per cent. For the specific case of bringing forward a ban on bags (specified as Scenario 6, and in line with the project brief), the NPV cost of a bag ban from 2009 is estimated at around $800 million. A ban from 2008 is likely to cost around $950 million in net present value terms.

Using lower discount rates tends to make out-year costs closer to their undiscounted values and also has the effect of making the NPV estimate bigger. For the scenarios presented above, the choice of discount rate (that is, in moving from a rate of 7 per cent per annum to a rate of either 4 per cent or 10 per cent) can raise (or lower) the NPV estimate of a scenario by around 20 per cent. Again, the dominance of out-year net economic costs over estimated environmental benefits is the key driver of these results.

5.2 Practical issues

Cost benefit analysis of policy options provides an insight to the likely impacts of measures — if implementation and coverage proceeds as expected. However, in moving to phase out LWPBs policymakers must also consider the need for supplementary actions designed to reinforce policy objectives, or close 'loop holes' that could see those objectives undermined over time. Practical problems, and implications for policy design, are discussed below.

Avoiding a switch to undesirable substitutes

The policy options reviewed in this study focus on a reduction in LWPBs, and the substitution of a combination of re-usable bags and a point of sale alternative (in this case, a paper carry bag) to perform the function currently carried out by LWPBs. This is a rational 'cost driven' behavioural scenario.

However, there is a range of close substitutes for LWPBs and it is feasible that pressure to eliminate *light-weight* plastic bags could simply serve to stimulate the use of heavier plastic bags, or some other bag variant, in similar numbers. In essence, there is risk that the policy may shift rather than alleviate the problem.

Some supermarkets have already replaced LWPBs in the check-out with thicker plastic bags, and a suggestion that these be reused by customers. Other retailers might find more ingenious and less constructive ways to reduce LWPB use. This is a problem well known to those engaged in drafting legislation — definitions and requirements need to be specified in a way that eliminates 'loop holes' that could be used to undermine the effectiveness of the new law.

Numerous examples of the ingenuity of legislative drafters and those who would avoid requirements laid down by governments can be found in the history of tax law, the commercial tariff concession system and other regulation. If legislation is to be developed to address the problems associated with LWPBs — environmental damage, and a symptom of modern 'throw-away' society — it will be important to identify and eliminate opportunities for regulatory avoidance.

Appropriate legislation would need to consider and respond to the full set of 'problem bags', focusing on those that are currently attracting the attention of policy makers (that is, LWPBs — or more specifically, high density polyethylene singlet-type bags below a certain weight) and also those that might be readily substituted for them.

Nolan-ITU provides examples of a range of bags that might be offered as a replacement for LWPBs.[42] These include the:

- wave-top high density polyethylene (HDPE) bag;
- 'boutique' style low density polyethylene (LDPE) bag (as commonly provided by department stores);
- re-usable LDPE bags; and
- biodegradable bags (for example, starch or polymer-based).

[42] Nolan ITU 2005, op. cit.

Of course, re-usable bags and single use paper bags also figure in the array of 'bag substitute' choices.

The response of retailers to pressure to phase out LWPBs, in terms of the bags they offer customers as replacements, will be a critical factor in the overall success of the policy. It is likely that the aims of Environment Ministers would be thwarted if elimination of 4.3 billion LWPBs simply led to the introduction of an extra 4.3 billion LDPE boutique bags or wave top HDPE bags to the national waste stream.

Promoting re-usables

Even in the case of a substitute paper carry bag (assumed to be the fallback bag 'technology' in this study when a re-usable bag is not convenient) it can be argued that more environmentally benign bag options are available and should be promoted by policymakers. Elimination of LWPBs will not necessarily stimulate retailer actions and consumer responses that align with fully specified environmental goals. This highlights the need to explicitly specify and respond to the LWPB problem.

If the 'problem' with LWPBs is that they are a symbolic example of unnecessary waste within our society, then it is likely that policymakers' deeper purpose in targeting reduction of LWPB consumption is encouraging the uptake of more resource efficient alternatives (that is, to encourage customers to use re-usable bags whenever possible, or no bags at all).

If this is a reasonable synthesis of policymaker objectives, then the issue becomes one of how best to achieve this behavioural change and divert customer choice away from disposable bags toward less resource intensive options.

Solutions to this question are likely to involve either the ongoing cooperation of retailers in limiting the range and availability of bags offered at point of sale so that bag use is constrained to an 'environmentally friendly' set, or ensuring that retailers impose an explicit price on all 'throw away' bags, thereby shifting the economics of bag use in favour of re-usables.

Given the challenges involved in minimising definitional loopholes, and mandating the availability (or non-availability) of particular bags by retailers, the use of a minimum price-based approach applied to the widest range of single use bags promises to be the most practical and effective means of encouraging an overall reduction in throw away bags, and a substitution toward long lived re-usables.

The support and cooperation of retailers would be important to the streamlined implementation of a price-based approach. The scenarios examined explore some useful approaches to introducing a point of sale price on bags — including schemes where retailers are allowed to keep the proceeds of a mandatory bag charge (representing a potentially significant windfall to these businesses). Such mechanisms are likely to be an effective means of winning retailer support — although high price elasticities of demand for bags mean that potential revenues quickly drop off at increasing price levels.

Revenue sharing and pricing arrangements should also be considered in terms of compensation for reduced retailer profits, and the potential efficiencies available to customers from re-usable bags in an environment where the cost of bags is transparent (rather than loaded into grocery prices). As noted in chapter 3, the price of disposable bags does not have to be very high for consumers to recognise and respond to the financial benefits of a re-usable bag.

Potential for inconsistent action under a voluntary approach

Two scenarios put forward for examination in this study relate to voluntary action. These introduce the option of a voluntary charge to be applied by retailers, and the possibility of a voluntary approach to phasing out LWPBs by 2009 (adopted in the first instance by members of the ARA Code).

Voluntary approaches carry the potential benefit for retailers, and the economy, of allowing maximum flexibility in achieving agreed outcomes. The downside of voluntary approaches is that they can suffer from a lack of coordination and lead to disparate action (including the possibility of inaction by some) that can magnify costs and reduce incentives to deliver on commitments. Structure and coverage are important determinants of the effectiveness of a voluntary approach.

A key problem that can undermine voluntary approaches is the risk of 'free riding'. This arises in situations where a firm expects that it will be better off if others take action, and it does not. For LWPBs, this can arise if a party to the ARA Code perceives an advantage in moving more slowly to achieve agreed commitments than its competitors. In extreme cases, the incentive to lag others in implementing policies that can impose costs or reduce profits can paralyse action altogether.

For those looking to fulfil commitments, lack of coordinated action at an industry level can raise the threat of first mover *disadvantage*, and unnecessarily raising their costs or potential loss of market share. Incentives for delayed action or 'shirking' under an extension of the ARA Code can be expected to increase as the phase-out timetable becomes more ambitious and expected costs rise. Free riding can also be an issue for ARA Code members who take action to eliminate LWPBs (or introduce bag charges) in an environment where their smaller competitors do not. This goes to the issue of coverage.

Within this study it has been assumed that all large retailers will comply with the extended ARA Code, and that 50 per cent of small and medium retailers will comply. The remaining 50 per cent of small and medium retailers may not comply, as they are under no obligation to follow the lead of ARA Code members. This represents a risk to the effectiveness of a phase out strategy based on voluntary action. The extent to which this risk is realised depends on competitiveness conditions on the retail market and the response of customers to differences in relative costs and 'branding'.

For the voluntary options analysed in previous chapters, it has been assumed that customers of large supermarkets (and other ARA Code members) are unlikely to switch shopping locations on the basis of a bag charge that might represent (at most) a dollar or two per weekly shopping trip. In fact, some businesses that have introduced bag charges have noted an increase in customer satisfaction and numbers — which they attribute to perceptions of increased social and environmental responsibility[43]. Moreover, even in the face of bag charges, many customers may still perceive that their overall grocery bill is still lower than if they had bought the same basket of goods elsewhere.

The response of small retailers is also difficult to predict. It may be, as assumed, that they will adopt a strategy of continuing to offer LWPBs while their larger competitors phase out bags by introducing explicit prices or availability constraints. However, given the structure of the industry and the leadership role played by the major retailing chains, it is feasible that smaller players might actually follow the lead of ARA Code members — particularly if this represents an opportunity to introduce and profit from a charge on bags.

The likely consequence of these effects is an empirical question requiring deeper analysis of the structure of the retail industry and pricing approaches applied within it. However, it is possible to make the following broad observations about the potential impact of a voluntary policy approach to phasing out LWPBs in Australia:

- a voluntary approach can invite disparate action, unless specific targets are agreed and monitored for individual businesses;
- similarities in business operations and cost structures (as is likely to be exhibited by major supermarkets, and retailers) allow for a more consistent policy treatment and can facilitate negotiation of an effective mandatory approach;
- the dominance of major retail and supermarket chains in Australia is such that volunteerism among non-members of the ARA Code is unlikely to significantly weaken LWPB reduction efforts under the ARA Code;
- greater coverage and constancy of effort are likely to deliver increasing gains in terms of both economic and environmental impacts.

The concentrated nature of retailing means that policymakers have an excellent opportunity to engage major players, and develop a firm plan for further action.

The Organisation for Economic Cooperation and Development (OECD) has recently completed an international study of voluntary environmental measures, and their effectiveness. Detailed observations and advice to policymakers interested in designing such approaches are presented in Box 5.1. This advice aligns with the broad observations outlined above, and also provides some further insight to the challenges and opportunities that can be associated with continued emphasis on voluntary approaches.

[43] Nolan-ITU 2002, op. cit., p. 50.

Box 5.1

KEY OECD PERSPECTIVES ON VOLUNTARY ENVIRONMENTAL POLICY MEASURES

- While the environmental targets of most – but not all – voluntary approaches seem to have been met, there are only a few cases where such approaches have been found to contribute to environmental improvements *significantly different* from what would have happened anyway.
- Hence, the environmental effectiveness of voluntary approaches is still questionable.
- This could indicate that a significant degree of 'regulatory capture' has taken place.
- But it remains unclear what would have been the – realistic – alternative to a given policy or policy combination. Would there in practice have been sufficient political willingness to give priority to reaching ambitious environmental targets – if that, for instance, could jeopardise the (often modest) employment in the most affected (highly polluting) sectors?
- The broadening use of voluntary approaches seems to reflect the fact that policy-makers have tried to find an instrument through which one could avoid having to make such trade-offs. It is, however, unlikely that difficult trade-offs can be avoided if more ambitious environmental target are to be met in the future.
- Voluntary approaches are generally designed to limit the impacts of environmental policies on the production costs of participating firms. However, when firms do not face an appropriate marginal incentive to abate pollution (from a tax, or from the value of a tradable emissions permit), environmental policy largely fails to stimulate a reduction in demand for the products that cause environmental problems in their production.
- The *economic efficiency* of voluntary approaches is *generally low* – as they seldom incorporate mechanisms to equalise marginal abatement costs between all producers, *inter alia* because environmental targets tend to be set for individual firms or sectors, rather than at a national level.
- Voluntary approaches can sometimes be put in place more rapidly than alternative policy instruments, like new regulations or economic instruments. However the likelihood of a voluntary approach providing any environmental improvements beyond 'Business-as-Usual' depends strongly on their quality.
- A 'first best' approach would be to replace the 'command and control' policies by economy-wide economic instruments – taxes or tradable permits – where technically and administratively possible.
- A 'second best' option could be to improve the flexibility of pre-existing 'command-and-control' regulations, instead of a piece-meal approach that lets only a few companies attain environmental improvements in a more flexible manner.
- The performance of many voluntary approaches would be improved if there were a real threat of other instruments being used if (appropriately set) targets are not met. However, if it is likely – or widely believed – that the alternative policy would entail significant negative social impacts, the credibility of such threats may not be great.
- Various types of administrative and transaction costs vary greatly between different voluntary approaches. If too few resources are spent in their preparation, negotiation and enforcement, their environmental impacts are likely to be very modest.

Source: Extracted from OECD 2003, *Voluntary Approaches for Environmental Policy: Effectiveness, Efficiency and Usage in Policy Mixes*, Organisation for Economic Cooperation and Development, Paris, pp. 14-15

5.3 Social impacts

The third dimension of a fully comprehensive cost benefit analysis is consideration of social impacts arising from policy changes. Though there are often overlaps (and therefore a need to avoid double counting), social impacts need to be considered alongside economic and environmental factors in determining whether intended policy reforms and objectives are likely to represent an improvement for society as a whole. As such, assessment of social impact can involve consideration of distributional issues (for example, how will costs and benefits be distributed across income or demographic groups within society) or compatibility with cultural requirements — the current debate on industrial relations reform and its implications for family values is a good example of this; consideration of proposed anti-terrorism laws and implications for personal rights is another.

The net social benefit arising from elimination of LWPBs (and increased uptake of re-usable bags as a consequence) is a subject of debate. Some argue that significant social benefits will accrue to elimination of LWPBs because they are a symbol of waste within society, and such action would represent a first step toward greater environmental consciousness and stewardship. For instance, a:

> factor that needs to be understood in the debate about shopping bags is symbolic value. The plastics and packaging industries came under intense pressure in the 1970s and 1980s because 'they had become a politically incorrect symbol of the threat to the environment' (Bayers, 1995). A cultural analysis of plastics in the United States noted that: By definition the plastics industry was everything ecological activists wanted to expunge from the American experience. Since the early twentieth century, promoters of industrial chemistry and synthetic materials had boasted of transcending age-old limits of transitional materials by extending scientific control over nature. During the 1920s predictions of an expanding stream of inexpensive artificial goods had suggested material abundance as the basis for a utopian democracy. By the final third of the century that transcendence threatened to drain natural resources and pollute the society that supported it by generating a flow of irrecoverable, inassimilable materials — garbage, society's excrement. (Meikle 1995: 264)

> To some extent the concerns about the large number of plastic shopping bags consumed in Australia, and their high level of visibility in domestic waste and litter, are representative of much broader concerns about plastics and packaging. This does not mean that concerns about plastic shopping bags are any less important or urgent from a policy perspective. It does mean however, that the development of policy solutions needs to consider social and cultural issues as well as the scientific facts about environmental impact. Policy measures to reduce consumption (or impacts) of shopping bags are likely to be well received in the community.[44]

Consumer surveys also suggest that action to reduce LWPBs would have popular support. Environmental surveys commonly detect concern over litter and waste issues, and the high volume (and profile) of plastic bags in society make them a target for policy action. For example, a survey conducted for the NSW Department of Environment and Conservation in 2004, found the environment to be a middle ranked (and unprompted) concern among the 805 participants, with waste being raised as an issue in about 10 per cent of responses focused in this area, and ranking fourth in terms of priority categories (see Table 5.2).

[44] Re-usable Bags, Facts About Plastic Bags, http://www.re-usablebags.com.au/plasticbags.htm, Accessed 28 November 2005.

Table 5.2

NSW SURVEY RESPONSES ON PRIORITY ENVIRONMENTAL CONCERNS

issue	First response	Second response	Total responses
Water quality	42	20	62
Pollution (general)	14	10	23
Air quality	14	16	30
Waste	5	9	14
Flora and fauna protection	3	5	8
Urban management	2	5	7
Land degradation	1	1	2
Energy conservation	0	1	1
Chemicals & pesticides	2	2	4
Noise	1	3	4
Other	3	4	7
Don't know/none	13	11	24

Source: Department of Environment and Conservation (NSW) 2004, *The Environment and Ethnic Communities in 2004: A Survey of the Environmental Knowledge, Attitudes and Behaviours of Eight Ethnic Communities in NSW*, DEC Social Research Series, Sydney, p. 23.

Notably, disaggregation of category responses reveals that nearly all the concern over waste was focused on litter issues, with 'litter and dumping of rubbish' accounting for 12 of the 14 recorded responses, and ranking third in the tally of 27 disaggregated responses.

On the other hand, industry groups such as the Plastics and Chemicals Industry Association, while recognising the need for improved resource use and waste reduction in society, point to the benefits that bags provide and their contribution to health, convenience and general amenity (see Box 5.2). These issues must also be weighed in determining appropriate social values.

Box 5.2

PRODUCER PERSPECTIVES ON LIGHT WEIGHT PLASTIC BAGS

- Analysis of litter collections proves less than 1 per cent of litter is plastic supermarket checkout bags (Source: Clean Up Australia)
- Overseas research indicates that people worry less about littering if they think products will degrade
- Banning plastic bags will not solve the litter problem. It is a behavioural issue, not a product issue
- Best solution is education, a strong focus on recycling and enforcement of penalties for littering
- Plastic bags are photo-degradable but need U.V. light
- Could be made bio-degradable with starch and other additives but not a solution:-
  a. Would send wrong message to those who litter
  b. Will destroy the existing and emerging plastics recycling industry
  c. The process of degradation will give off greenhouse gases
  d. Degradation will increase risk of ground water contamination in landfill where most bags finish up
- 75 per cent of plastic shopping bags have a recognised second use as kitchen tidy liners, nappy bags, household storage, etc. This is a very efficient second use product that conserves resources and should be encouraged.
- All plastic waste to landfill represents around 4 per cent of landfill
- Australian public respond positively to recycling and leads the world
- Plastic bags have handles and are waterproof
- Paper cost is 800 per cent higher than plastic, which would be passed onto consumers
- Paper uses four times the energy on a cradle to grave analysis
- Plastic leaves the smallest footprint on earth's environment
- Bring your own bag? — not practical for many people
- Shopping habits have changed - we shop more often and on impulse
- Tests with bag-free lanes show people want speed and convenience
- Population change - older people, weight is an issue if bags over-filled
- Health problems with contaminated bags used previously for fresh meat or cleaning products, then for vegetables. Who will be responsible for food safety?
- Slower checkouts increase costs for consumers
- Bag costs impact heavily on people in society who can least afford it.

Plastic Bags are safe, non-toxic, used in food packaging, efficient and low cost to consumers, recyclable, re-usable and use the least amount of earth's resources. Polling shows people want a solution without radically changing their lifestyle. People want recycling as it offers a solution and they are doing their bit for the environment

Source: Plastics and Chemical Industry Association, 'Plastic bags', http://www.pacia.org.au/index.cfm?menuaction=mem&mmid=009&mid=009.002, Accessed 30 November 2005.

Ultimately, it is up to policymakers to judge the social merits of pursuing symbolic objectives, recognising that such actions will entail economic costs. Issues of public perception and cultural acceptance can also attach to the means and rate at which a LWPB phase out is achieved. This set of issues is also linked to consumer sentiment, and best judged by political decision-makers. The value of social benefits necessary to balance the cost of options and deliver a positive net present value is discussed in the following chapter.

Chapter 6

Conclusions

In comparison to the *status quo*, all change options identified by the Environment Protection and Heritage Council produce outcomes in which the estimated economic and environmental costs exceed the benefits by substantial margins. As shown in earlier chapters, this negative outcome is:

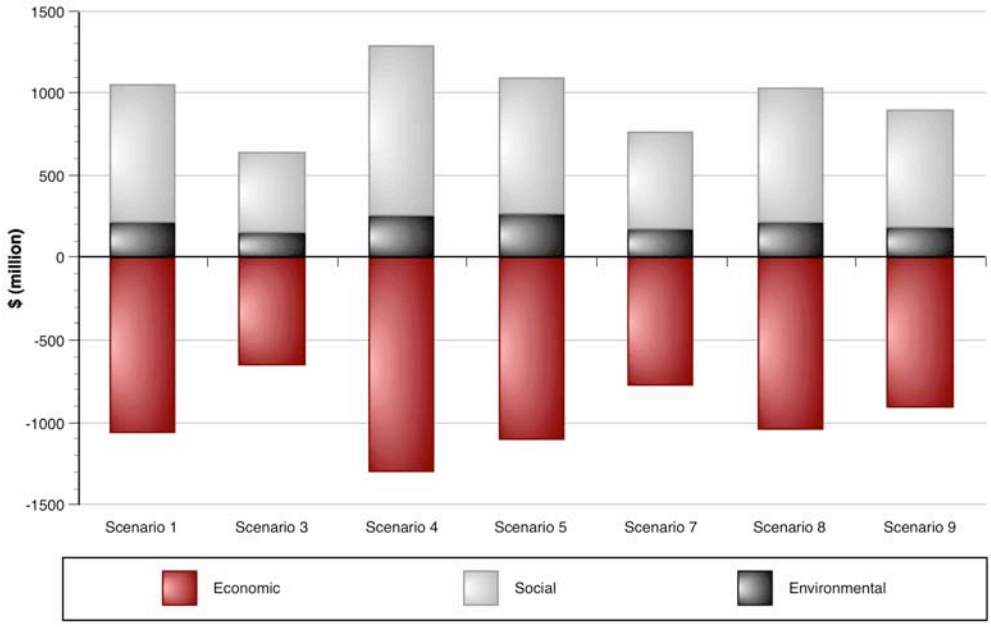
- driven by the interaction of adjustment costs for industry and higher costs for industry and/or consumers associated with the switch to LWPB alternatives; and
- relatively insensitive to alternative implementation dates and alternative discount rates (that is, the scenarios all still have a significantly negative impact on national income).

6.1 Full impact outcomes

Figure 6.1 depicts the net present value of costs and benefits estimated for the economic and environmental impacts of LWPB phase out scenarios covered in this study. Importantly, it shows the significant social benefits that must be attributed to different LWPB phase out options for the net present value of these initiatives to be positive — that is, for net benefits to accrue to these actions. In most cases, a net present value (NPV) of social benefits of around $500 million to $1 billion is required to justify the phase out of LWPBs, relative to a 'no further action' scenario.

Figure 6.1

REQUIRED SOCIAL BENEFIT TO DELIVER A 'BREAK EVEN' NPV RESULT RELATIVE TO SCENARIO 2 — 'NO FURTHER ACTION'



Scenario 2 is not explicitly depicted here. It represents a baseline or 'inaction' scenario in which the current ARA Code on LWPBs expires and no further action is taken. Modest administrative savings are associated with this outcome, but LWPB usage and associated environmental damage costs grow unabated. In the period from 2005 to 2016 in the absence of further action (as reflected in the scenarios) an estimated 83.3 billion LWPBs will enter the waste stream and an additional 724.7 million will wind up as litter.

A smaller social benefit (equivalent to an NPV of around $0.75 billion) is required to balance the economic costs associated with Scenario 3, but this is mainly due to the fact that bags are not fully eliminated under this option — instead they are subject to ongoing suasive pressure through continuation of the ARA Code of practice, assumed to maintain bag usage as a proportion of retail sales at current levels. Commensurate growth in the number of LWPBs in the waste stream, and consequential environmental damage effects, explain the lower net environmental benefits associated with this approach. It is less costly, but it also achieves less.

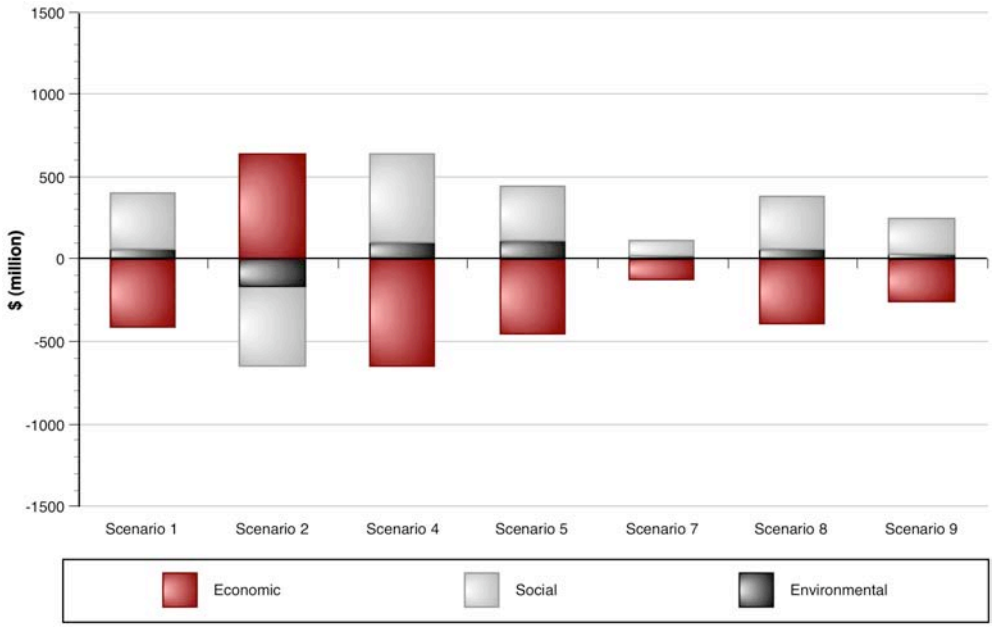
Scenario 7 is also a lower cost option, but it also does not eliminate all plastic bags. Rather, this option depicts a bag levy designed to recoup the cost of a litter elimination campaign in which LWPBs are successfully removed. A litter campaign funded to a level of over $300 million (and rising through time) focussing exclusively on collection of LWPB's is assumed to achieve this purpose. This represents an effective bounty of about 50 cents per littered bag, and an expenditure level about 50 per cent higher than the total amount currently spent on all public litter collection in Australia.

Other scenarios depicted achieve elimination of LWPBs, but at higher levels of economic cost and with only a moderate additional environmental benefit. This reflects the fact that only a small percentage (under 1 per cent) of LWPBs arise as litter — the rest are disposed of in landfill. The calculations represented here reflect the costs of attempting to eliminate 100 per cent of LWPBs in order to get at the less than 1 per cent of LWPBs that are the principal cause of environmental damage.

While none of the modelled scenarios is representative of 'business as usual' the value of the social impact necessary under each of the options is likely to be between the impact necessary under Scenario 2 and Scenario 3 — the extension of the ARA Code. The required social benefit to deliver a 'break even' NPV result relative to Scenario 3 is shown in Figure 6.2. Moving to a ban, if the 'fallback position' for future policy is to continue actions along the lines of those already implemented, would be justified if the perceived social benefit (out to 2016 — measured in net present value terms) is in the order of several hundred million dollars.

Figure 6.2

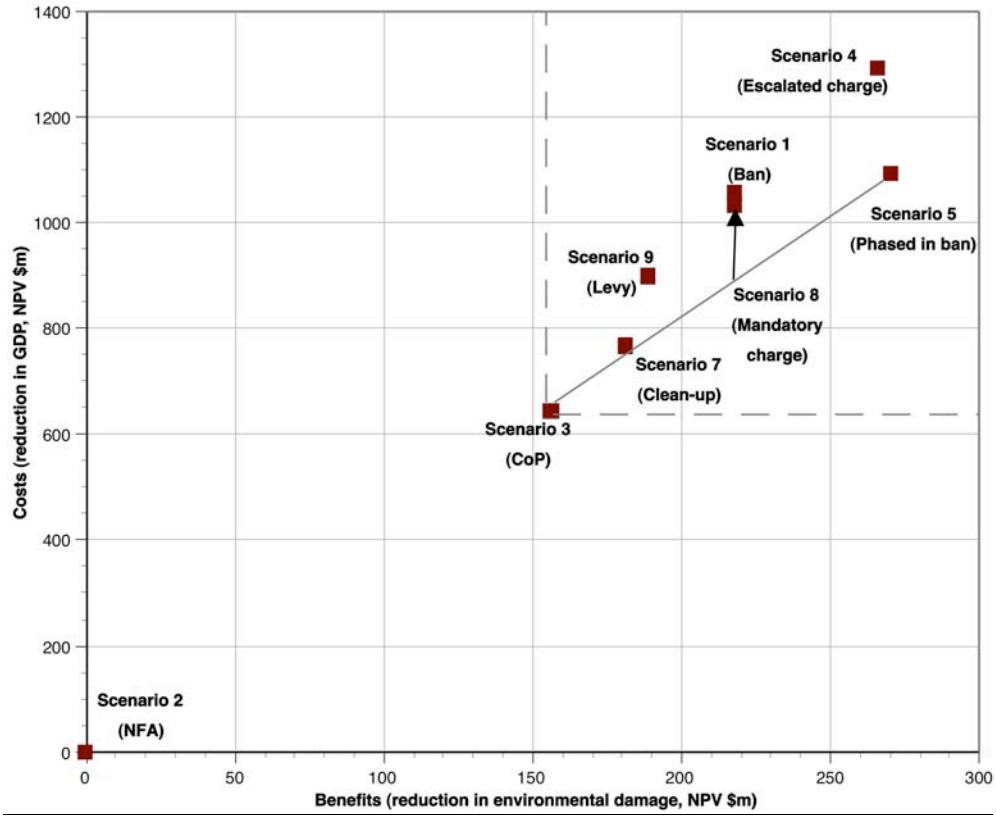
REQUIRED SOCIAL BENEFIT TO DELIVER A 'BREAK EVEN' NPV RESULT RELATIVE TO SCENARIO 3 — 'EXTENDED ARA CODE OF PRACTICE'



Reflecting the relationship between economic and environmental impacts, Figure D.2 shows the tradeoffs involved in the modelled change scenarios, with the clear implication that the efficiency frontier (that is, the options that represent the most efficient tradeoffs) are Scenarios 3, 5, and 7.

Figure 6.3

THE RELATIONSHIP BETWEEN ECONOMIC AND ENVIRONMENTAL COSTS UNDER VARIOUS SCENARIOS



6.2 Key policy observations

As highlighted in Figure 6.1, non-captured benefits of an elimination policy for LWPBs must be substantial to outweigh its cost, and this is not fundamentally altered by the mechanism that is applied, although phasing strategies tend to result in earlier (and therefore, in NPV terms, higher) costs. Essentially, this is because the regulatory mechanisms under consideration aim to remove *all* LWPBs, when the environmental benefits are derived by the elimination of the less than one per cent of LWPBs that are a problem (that is, those that are littered).

The dominance of economic costs over environmental benefits is likely to be insensitive to changes in the estimates of environmental damages arising from discarded LWPBS. Setting the social impact aside, the environmental damage attributable to an LWPB would need to begin at around $2.50 to $3.00 each before the net present value (NPV) of the LWPB elimination policy options broke even. This is equivalent to the economic cost of the measures, divided by the amount of litter reduction achieved by each over the analysis period. Higher values would need to be attributed to these benefits (on a per bag basis) if the incremental value of litter reduction showed diminishing environmental returns (eg. halving the number of bags induced more than half of the pay-off).

The analysis shows that the environmental benefits from eliminating the 1 bag in a 100 that is a problem do not come close to justifying the costs associated with eliminating the other 99, and this is likely to be true over a wide range of environmental values.

Nevertheless, it is clear that policymakers are responding to a strong sentiment within society to take action on bags. A change in social behaviour can be affected by imposing a relatively modest fee on LWPBs, allowing consumers to benefit from investing in a re-usable bag, and reducing the incidence of transactions in which a consumer accepts an LWPB without thought, and subsequently discarded without thought. It remains an open question as to whether such non-quantified benefits would be sufficient to offset the significant net costs identified in this study.

Given this uncertainty, and the government and industry commitment to phase out single use LWPBs, Table 6.2 shows a ranking of the identified change scenarios (that is, not including the 'no further action' scenario) against a number of alternative criteria. This exhibits a mixed pattern of rankings, and policy makers may put different weightings on these criteria.

Table 6.1

SUMMARY TABLE OF ECONOMIC AND ENVIRONMENTAL COSTS AND BENEFITS

Scenario	Costs (PV, $m)	Benefits (PV, $m)	Litter reduction (millions)	Maximise Benefits	Minimise Costs	Maximise benefit: cost ratio
1. Eliminate LWPBs by 2009	-$1057.1	$217.8	360.6	3	5	6
3. Extend ARA Code	**-$646.0**	$156.3	233.2	**7**	***1***	**2**
4. Voluntary charge	-$1293.1	$266.3	418.4	2	7	7
5. Voluntary phase out to 2009, mandatory beyond	-$1093.5	$270.6	422.4	***1***	6	***1***
7. Disposal fee (cost recovery)	-$767.9	$181.5	300.5	6	2	3
8. Regulated price (kept by retailers)	-$1035.1	$217.8	360.6	3	4	4
9. Levy on LWPBs	-$900.0	$188.7	312.5	5	3	5

Magnitudes also need to be put in perspective. The essence of a NPV calculation is to collapse future costs and benefits into a value relevant to the current year through the use of a discount factor. The estimates tabled above reflect the outlook of impacts between 2005 and 2016 at a discount rate of 7 per cent per annum. In broad terms, LWPB phase out scenarios reflect costs to the economy of around $100 million per year — consistently less than 0.02 per cent of gross domestic product, but by no means a trivial amount.

Social benefit requirements can also be considered on a per bag basis. Between 2006 and 2016 approximately 59.3 billion bags are due to be consumed in Australia on a 'business as usual' basis (that is, no further action, and expiry of the ARA Code), with 515.8 million of these ending in the litter stream. A number of the policies analysed above drive this to around zero (recall that consumers are likely to buy plastic bags for garbage disposal in response to a ban). Required social net present values, calculated per eliminated and littered bag, are shown in Table 6.2.

Table 6.2

REQUIRED SOCIAL NPV ON A PER BAG 'CONSUMPTION-REDUCED' AND 'LITTER –REDUCED' BASIS

Scenario	Required 'break even' NPV ($m)	LWPB consumption foregone (billions)	Required NPV per bag – reduced consumption ($)	Required NPV per bag – reduced litter ($)
1. Eliminate LWPBs by 2009	$839.30	41.5	$0.025	$2.33
3. Extend ARA Code	$489.67	26.8	$0.024	$2.10
4. Voluntary charge	$1026.80	47.4	$0.027	$2.45
5. Voluntary phase out to 2009, mandatory beyond	$822.87	48.6	$0.023	$1.95
7. Disposal fee (cost recovery)	$586.47	20.7	$0.037	$1.95
8. Regulated price (kept by retailers)	$817.34	41.5	$0.025	$2.27
9. Levy on LWPBs	$711.29	33.2	$0.027	$2.28

Table 6.2 indicates that the cost of bag reduction policies can be justified on a net present value (NPV) basis if policymakers judge that the social benefit (over and above economic and environmental considerations) from reducing bag consumption exceeds around 2.4 cents per bag (for each of the tens of billions of bags that would otherwise be consumed in future years). If the perceived social benefit is focused on litter reduction, then the NPV of this social benefit must be at least $1.95 per bag to begin to justify the policy options examined — in addition to the environmental benefit that would be generated.

It remains for policymakers to consider these estimates, and review them in the context of further issues associated with practicality, stakeholder acceptability and wider environmental and social opportunities. However, some broad observations on these issues and how they might be reflected in a preferred policy outcome are discussed briefly below.

'Navigation points' for policy development

The foregoing analysis highlights the impact of different policy approaches to reducing the use of LWPBs in our society. Different approaches generate different mixes of costs and benefits, but all phase out options generate high costs relative to the environmental benefit they generate. This is because environmental costs are chiefly associated with littered bags, and these represent less than 1 per cent of bags used. The remaining bags go to landfill, and their environmental impact is relatively benign in this location. Social disdain for LWPBs is a legitimate issue for policymakers to respond to, but there is risk that outlawing bags might see the current plethora of LWPBs replaced by a plethora of some other convenient and low cost disposable bag.

This study has highlighted some key characteristics that can act as navigation points for the development of an efficient and effective policy for reducing the environmentally adverse and socially undesirable implications of LWPBs. These are:

- the 'free' status of LWPBs generates no incentive for consumers to reduce their use of these items;
- experience has shown that consumption of LWPBs falls off significantly at modest prices;
- re-usable bags are a highly cost effective alternative to LWPBs, but consumers cannot pocket this benefit if the cost of LWPBs continues to be spread across the cost of groceries and other goods;
- consumers will continue to face circumstances where a LWPB is an efficient option for their carrying needs (eg. to carry refrigerated products, for impulse purchases, etc); and
- environmental benefits flow from reductions in littered bags.

These findings, supported by the comparison of modelled options, suggest that a price-based approach is likely to be considerably more cost-effective than a ban in circumstances where it allows for residual bag use. That is, when a price is used to drive a significant reduction in bag consumption but allows those consumers who put a high value on LWPBs to continue to access them. Policymakers have the opportunity to weave these characteristics into a 'package' of measures that balances the economic, environmental and social issues involved.

Appendix A

Abbreviations

ARA Code	Australian Retailers Association *Code of Practice for the Management of Plastic Bags*
CGE	Computable general equilibrium
GDP	Gross domestic product
HDPE	High-density polyethylene
LDPE	Low-density polyethylene
LWPB	Light-weight plastic bag
NEPM	National Environment Protection (Used Packaging Materials) Measure
NPC	National Packaging Covenant
NPV	Net present value

Appendix B

Overview of policy shocks input to the MMRF-Green model

The model of consumer demand and alternatives for LWPBs is a key driver of the modelling. It is important that a simple and representative set of assumptions be used to inform subsequent MONASH modelling work. The following specifications describe the policy scenarios for modelling work. Some of these are closely related, and a core set of these will forward for MONASH modelling. Other results and variants can be interpolated from key scenario model outcomes.

B.1 General industry behavioural assumptions

- Retailers pass full cost of bags onto customers.
- The cost to retailers of the current Code of Practice arrangements for LWPBs is around $21 million per annum. This is reflected in staff training costs, in-store promotion and signage and administrative costs associated with ARA Code responsibilities.
- The substitution elasticity of large and small retail/ supermarket service providers is 0.5 (that is, a 1 per cent increase in supermarket prices will see a 0.5 per cent reduction in patronage, and migration to smaller traders).

Scenario specifications

1. Eliminate LWPBs by 2009

Timing: comprehensive ban effective from 1 January 2009

Key assumptions:

Industry — adapted from Nolan-ITU's cost-benefit analysis.[45]

- One-off cost to retailers of $187 million ($65 million for staff training, $120 million for increased theft — based on the Irish experience — and $1.7 million to modify equipment to cater for LWPB substitutes)
- On-going costs to retailers caused by increased transaction times/administration costs of $60 million annually.
- No costs to retailers associated with in-store education and promotion.
- No costs to retailers associated with in administration.
- **All other impacts modelled by MMRF-Green**

Households — Based on demand curve for LWPBs

- 100 per cent reduction in the consumption of LWPBs from 2009 onwards, at $0.03 per LWPB ($142 million in 2009)

[45] DEH internal document.

- Re-usable bags consumed as substitutes for 95 per cent of LWPBs foregone, at a replacement rate of about 125 LWPBs for each re-usable, at $1.40 per re-usable ($50 million in 2009).
- Paper bags consumed as substitutes for 5 per cent of LWPBs foregone, at a replacement rate of one for one, at $0.15 per bag ($36 million in 2009).
- Bin-liners consumed as substitutes for 100 per cent of LWPBs foregone, at a replacement rate of one for seven, at $0.05 per bin-liner ($36 million in 2009).
- **All other impacts modelled by MMRF-Green**

Government — Based on Nolan-ITU studies, and consultation with DEH

- Reduction in expenditure on litter clean-up for stray LWPBs ($4 million).
- On-going costs of 0.1 full-time-equivalent for administration and monitoring for each jurisdiction (nine jurisdictions, at $11 000 each, $99 000).
- **All other impacts modelled by MMRF-Green**

2. No further action (Code of Practice expires – the base case)

Timing: current practice runs to 31 December 2005, then no further action

Key assumptions:

Industry — DEH

- Reduction to retailers in the costs of complying with the CoP (approximately $21 million annually).

Households

- Continuation of 2005 LWPB consumption, increasing gradually over time (2.5 per cent annually).

Government

- No change.

3. Extend Code

Timing: Reduction in the consumption of LWPBs of 50 per cent, among all of the large retailers, and half of the small and medium retailers.

Key assumptions:

Industry — adapted from Nolan-ITU's cost-benefit analysis.[46]

- One-off cost to retailers not currently part of the ARA Code of $100 million .
- On-going costs to retailers not currently part of the Code caused by increased transaction times/administration costs of $9 million annually.
- On-going costs to retailers associated with in-store education and promotion of $22 million annually.

[46] Ibid.

- No costs to retailers associated with in administration.
- **All other impacts modelled by MMRF-Green**

Households — Based on demand curve for LWPBs

- Approximately 50 per cent reduction in the consumption of LWPBs from 2006 onwards, at $0.03 per LWPB ($68 million in 2006)
- Re-usable bags consumed as substitutes for 95 per cent of LWPBs foregone, at a replacement rate of about 125 LWPBs for each re-usable, at $1.40 per re-usable ($24 million in 2006).
- Paper bags consumed as substitutes for 5 per cent of LWPBs foregone, at a replacement rate of one for one, at $0.15 per bag ($17 million in 2006).
- Bin-liners consumed as substitutes for 100 per cent of LWPBs foregone, at a replacement rate of one for seven, at $0.05 per bin-liner ($17 million in 2006).
- **All other impacts modelled by MMRF-Green**

Government

- On-going costs of 0.1 full-time-equivalent for administering the code and monitoring compliance for each jurisdiction (nine jurisdictions, at $11 000 each, $99 000).
- Reduction in expenditure on litter clean-up for stray LWPBs ($2 million in 2006).
- **All other impacts modelled by MMRF-Green**

4. Gradually escalated charge

Timing: *LWPB charge from 1 January 2007 at $0.05 per bag, $0.15 from 2008, $0.25 from 2009.*

Key assumptions:

Industry — adapted from Nolan-ITU's cost-benefit analysis.[47]

- One-off cost to all retailers in 2007 of $187 million.
- On-going costs to all retailers caused by increased transaction times/administration costs (inversely related to LWPB consumption, $58 million in 2007, increasing to $82 million in 2009 and then linearly declining to $55 million in 2017 due to improved administrative efficiency).
- On-going costs to retailers associated with in-store education and promotion (starting at $10 million in 2007 and linearly declining to nothing by 2017).
- **All other impacts modelled by MMRF-Green**

Households — Based on demand curve for LWPBs

[47] Ibid.

- Approximately 50 per cent reduction in the consumption of LWPBs in 2007, 80 per cent reduction in 2008 and 100 per cent reduction in 2009, at $0.03 per LWPB ($68 million in 2007, $111 million in 2008 and $142 million in 2009)
- Off-set by increase in the amount spent on LWPBs at the charged price, 50 per cent of LWPBs at an additional $0.02 per LWPB ($45 million in 2007), 20 per cent of LWPBs at an additional $0.12 per LWPB ($111 million in 2008). No expenditure on LWPBs from 2009 onwards.
- Re-usable bags consumed as substitutes for 95 per cent of LWPBs foregone, at a replacement rate of about 125 LWPBs for each re-usable, at $1.40 per re-usable ($24 million in 2007, $39 million in 2008 and $50 million in 2009).
- Paper bags consumed as substitutes for 5 per cent of LWPBs foregone, at a replacement rate of one for one, at $0.15 per bag ($17 million in 2007, $28 million in 2008 and $36 million in 2009).
- Bin-liners consumed as substitutes for 100 per cent of LWPBs foregone, at a replacement rate of one for seven, at $0.05 per bin-liner ($17 million in 2007).
- **All other impacts modelled by MMRF-Green**

Government

- On-going costs of 0.1 full-time-equivalent for administration and monitoring for each jurisdiction (nine jurisdictions, at $11 000 each, $99 000).
- Reduction in expenditure on litter clean-up for stray LWPBs ($2 million in 2007, $3 million in 2008 and $4 million from 2009 onwards).
- **All other impacts modelled by MMRF-Green**

5. Voluntary phase out to 2009, mandatory beyond

Timing: 2006-08; Phase from current levels to zero (Code members), mandatory for all retailers beyond 1 Jan 2009.

Key assumptions:

Industry — adapted from Nolan-ITU's cost-benefit analysis.[48]

- One-off cost to all retailers in 2006 of $187 million.
- On-going costs to all retailers caused by increased transaction times/administration costs (inversely related to LWPB consumption, $15 million in 2007, increasing linearly to $60 million in 2009).
- On-going costs to retailers associated with in-store education and promotion (starting at $10 million in 2006 and linearly declining to nothing by 2010).
- No costs to retailers associated with administration.
- **All other impacts modelled by MMRF-Green**

Households — Based on demand curve for LWPBs

[48] Ibid.

- Linear reduction in the consumption of LWPBs to zero between 2006 and 2009, at $0.03 per LWPB ($35 million in 2006, $71 million in 2007, $107 million in 2008, and $142 million in 2009).
- Re-usable bags consumed as substitutes for 95 per cent of LWPBs foregone, at a replacement rate of about 125 LWPBs for each re-usable, at $1.40 per re-usable ($13 million in 2006, $25 million in 2007, $38 million in 2008, and $50 million in 2009).
- Paper bags consumed as substitutes for 5 per cent of LWPBs foregone, at a replacement rate of one for one, at $0.15 per re-bag ($13 million in 2006, $25 million in 2007, $38 million in 2008, and $50 million in 2009).
- Bin-liners consumed as substitutes for 100 per cent of LWPBs foregone, at a replacement rate of one for seven, at $0.05 per bin-liner ($13 million in 2006, $25 million in 2007, $38 million in 2008, and $50 million in 2009).
- **All other impacts modelled by MMRF-Green**

Government

- On-going costs of 0.1 full-time-equivalent for administration and monitoring for each jurisdiction (nine jurisdictions, at $11 000 each, $99 000).
- Reduction in expenditure on litter clean-up for stray LWPBs ($1 million in 2006, $2 million in 2007, $3 million in 2008, and $4 million in 2009).
- **All other impacts modelled by MMRF-Green**

6. Ban on LW plastic bags (early implementation)

Timing: Ban in place from 1 Jan 2007, 1 Jan 2008 (an experiment in timing).

Key assumptions:

- Linearity in model can be used to interpolate results for this scenario.

7. Disposal fee (cost recovery)

Timing: Additional fee of $0.02 applied by retailers to recover cost of effective LWPB disposal initiative from 1 January 2009 (making LWPB price = $0.05).

Currently, $4 million spent on cleaning up LWPBs, only cleaning up 20 million of the 60 million LWPBs littered. To clean-up the remaining 40 million, assuming decreasing marginal return on effort, is estimated at costing an additional $56 million. $60 million required, need roughly $0.02 per LWPB for 4 billion bags currently consumed.

Key assumptions:

Industry — adapted from Nolan-ITU's cost-benefit analysis.[49]

- One-off cost to all retailers in 2009 of $187 million (ie. tooling up costs incurred if preparatory action is not undertaken in advance of official commencement of obligations).

[49] Ibid.

- On-going costs to all retailers caused by increased transaction times/administration costs (starting at $58 million in 2009 and linearly declining to $55 million in 2019 to capture improved administrative efficiency).
- On-going costs to retailers associated with in-store education and promotion (starting at $10 million in 2009 and linearly declining to nothing by 2019).
- **All other impacts modelled by MMRF-Green**

Households — Based on demand curve for LWPBs

- 50 per cent reduction in the consumption of LWPBs from 2009 onwards, at $0.03 per LWPB ($71 million in 2009).
- Off-set by increase in the amount spent on LWPBs at the charged price, 50 per cent of LWPBs at an additional $0.02 per LWPB ($47 million in 2009).
- Re-usable bags consumed as substitutes for 95 per cent of LWPBs foregone, at a replacement rate of about 125 LWPBs for each re-usable, at $1.40 per re-usable ($25 million in 2009).
- Paper bags consumed as substitutes for 5 per cent of LWPBs foregone, at a replacement rate of one for one, at $0.15 per bag ($18 million in 2009).
- Bin-liners consumed as substitutes for 100 per cent of LWPBs foregone, at a replacement rate of one for seven, at $0.05 per bin-liner ($18 million in 2009).
- **All other impacts modelled by MMRF-Green**

Government

- On-going costs of 0.1 full-time-equivalent for administration and monitoring for each jurisdiction (nine jurisdictions, at $11 000 each, $99 000).
- Reduction in expenditure on litter clean-up for stray LWPBs ($2 million in 2009).
- Increased income from levy, less cost (assumed 8 per cent of amount collected) of collecting the levy ($44 million in 2009).
- **All other impacts modelled by MMRF-Green**

8. Regulated price (kept by retailers)

Timing: Fee of $0.25 applied by retailers from 1 January 2009.

Key assumptions:

Linearly interpolated from Scenario 4.

+9. Levy

Timing: LWPB levy of an additional $0.07 applied at point of sale from 1 January 2009.

Key assumptions:

Industry — adapted from Nolan-ITU's cost-benefit analysis.[50]

- One-off cost to all retailers in 2009 of $187 million.
- On-going costs to all retailers caused by increased transaction times/administration costs (starting at $76 million in 2009 and linearly declining to $52 million in 2019 to capture improved administrative efficiency).
- On-going costs to retailers associated with in-store education and promotion (starting at $10 million in 2009 and linearly declining to nothing by 2019).
- **All other impacts modelled by MMRF-Green**

Households — Based on demand curve for LWPBs

- 80per cent reduction in the consumption of LWPBs from 2009 onwards, at $0.03 per LWPB ($114 million in 2009).
- Off-set by increase in the amount spent on LWPBs at the charged price, 20 per cent of LWPBs at an additional $0.07 per LWPB ($66 million in 2009).
- Re-usable bags consumed as substitutes for 95 per cent of LWPBs foregone, at a replacement rate of about 125 LWPBs for each re-usable, at $1.40 per re-usable ($40 million in 2009).
- Paper bags consumed as substitutes for 5 per cent of LWPBs foregone, at a replacement rate of one for one, at $0.15 per bag ($28 million in 2009).
- Bin-liners consumed as substitutes for 100 per cent of LWPBs foregone, at a replacement rate of one for seven, at $0.05 per bin-liner ($28 million in 2009).
- **All other impacts modelled by MMRF-Green**

Government

- On-going costs of 0.1 full-time-equivalent for administration and monitoring for each jurisdiction (nine jurisdictions, at $11 000 each, $99 000).
- Reduction in expenditure on litter clean-up for stray LWPBs ($3 million from 2009).
- Increased income from levy, less cost (assumed 8 per cent of amount collected) of collecting the levy ($61 million in 2009).
- **All other impacts modelled by MMRF-Green**

[50] Ibid.

Appendix C

Scenario summary outcomes

The following tables show annual impacts of policy scenarios from 2005 to 2016. Economic costs are calculated relative to gross domestic outcomes under a 'no further action' scenario, while environmental benefits reflect the estimated reduction in environmental damage associated with reduced LWPB consumption.

C.1 Modelled scenarios

Table C.1

SCENARIO THREE — EXTENSION OF THE CODE OF PRACTICE

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Model inputs – economic													
Retail industry ($m)	-$329.6	$0.0	-$131.3	-$31.5	-$31.5	-$31.5	-$31.5	-$31.5	-$31.5	-$31.5	-$31.5	-$31.5	-$31.5
Households ($m)	$82.9	$0.0	$9.9	$10.2	$10.4	$10.7	$10.9	$11.2	$11.5	$11.8	$12.1	$12.4	$12.7
Government ($m)	$12.7	$0.0	$1.8	$1.9	$1.8	$1.8	$1.7	$1.7	$1.6	$1.6	$1.5	$1.5	$1.5
Model inputs - environmental													
LWPBs consumed (millions)	-26 815.2	0.0	-2148.1	-2201.8	-2256.8	-2313.2	-2371.0	-2430.3	-2491.1	-2553.4	-2617.2	-2682.6	-2749.7
LWPBs littered (millions)	-233.2	0.0	-18.6	-19.1	-19.6	-20.1	-20.6	-21.1	-21.7	-22.2	-22.8	-23.3	-23.9
Model outputs - economic													
GDP ($m)	-$646.0	$0.0	-$156.9	-$57.6	-$60.5	-$64.4	-$69.6	-$75.0	-$80.5	-$86.4	-$92.5	-$98.7	-$105.2
Household income ($m)	-$507.3	$0.0	-$107.2	-$40.3	-$45.0	-$49.8	-$56.2	-$62.3	-$68.1	-$73.8	-$79.6	-$85.5	-$91.4
Household expenditure ($m)	-$307.1	$0.0	-$57.2	-$23.8	-$27.0	-$30.2	-$34.6	-$38.7	-$42.7	-$46.7	-$50.7	-$54.8	-$59.0
Retail industry value added ($m)	-$26.6	$0.0	-$7.9	-$2.1	-$2.2	-$2.3	-$2.6	-$2.9	-$3.1	-$3.4	-$3.7	-$4.0	-$4.3
Plastic products industry value added ($m)	-$129.3	$0.0	-$13.7	-$14.6	-$15.9	-$17.1	-$17.7	-$18.2	-$18.6	-$19.1	-$19.4	-$19.8	-$20.2
Paper products industry value added ($m)	$31.6	$0.0	$1.8	$3.4	$3.9	$4.2	$4.4	$4.7	$4.9	$5.1	$5.3	$5.5	$5.7
Model outputs - environment													
Environmental damage ($m)	-$156.3	$0.0	-$18.7	-$19.1	-$19.6	-$20.1	-$20.6	-$21.1	-$21.7	-$22.2	-$22.8	-$23.3	-$23.9

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

Table C.2

SCENARIO FOUR — GRADUALLY ESCALATED CHARGE

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Model inputs – economic													
Retail industry ($m)	-$663.4	$0.0	$0.0	-$255.7	-$82.9	-$90.2	-$85.8	-$81.4	-$77.0	-$72.7	-$68.3	-$63.9	-$59.5
Households ($m)	$1.6	$0.0	$0.0	-$35.3	-$94.9	$20.8	$21.3	$21.9	$22.4	$23.0	$23.6	$24.1	$24.7
Government ($m)	$23.1	$0.0	-$0.1	$1.9	$3.1	$3.9	$3.9	$3.9	$3.9	$3.9	$3.9	$3.9	$3.9
Model inputs - environmental													
LWPBs consumed (millions)	-47 428.4	0.0	0.0	-2258.8	-3704.5	-4746.4	-4865.1	-4986.7	-5111.3	-5239.1	-5370.1	-5504.4	-5642.0
LWPBs littered (millions)	-418.4	0.0	0.0	-22.9	-34.9	-41.3	-42.3	-43.4	-44.4	-45.6	-46.7	-47.9	-49.1
Model outputs - economic													
GDP ($m)	-$1293.1	$0.0	$0.0	-$320.5	-$145.7	-$186.9	-$189.1	-$187.0	-$184.3	-$181.8	-$179.7	-$177.7	-$175.8
Household income ($m)	-$529.0	$0.0	$0.0	-$116.0	-$55.6	-$71.0	-$74.1	-$77.2	-$79.7	-$81.5	-$82.6	-$83.2	-$83.4
Household expenditure ($m)	-$899.0	$0.0	$0.0	-$216.6	-$95.2	-$123.4	-$126.7	-$129.4	-$131.5	-$132.6	-$132.9	-$132.6	-$131.8
Retail industry value added ($m)	-$53.0	$0.0	$0.0	-$15.5	-$1.9	-$7.6	-$7.9	-$8.0	-$8.0	-$7.9	-$7.8	-$7.6	-$7.5
Plastic products industry value added ($m)	-$68.7	$0.0	$0.0	-$3.2	$1.5	-$10.9	-$12.4	-$13.4	-$14.1	-$14.7	-$15.2	-$15.6	-$16.0
Paper products industry value added ($m)	$48.6	$0.0	$0.0	$0.7	$5.1	$6.8	$7.7	$8.5	$9.1	$9.6	$10.2	$10.6	$11.1
Model outputs - environment													
Environmental damage ($m)	-$266.3	$0.0	$0.0	-$22.9	-$34.9	-$41.3	-$42.3	-$43.4	-$44.4	-$45.6	-$46.7	-$47.9	-$49.1

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

Table C.3

SCENARIO FIVE — PHASED BAN

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Model inputs – economic													
Retail industry ($m)	-$563.9	$0.0	-$212.5	-$37.5	-$49.8	-$62.1	-$59.5	-$59.5	-$59.5	-$59.5	-$59.5	-$59.5	-$59.5
Households ($m)	$136.5	$0.0	$5.2	$10.4	$15.6	$20.8	$21.3	$21.9	$22.4	$23.0	$23.6	$24.1	$24.7
Government ($m)	$23.9	$0.0	$0.9	$1.9	$2.9	$3.9	$3.9	$3.9	$3.9	$3.9	$3.9	$3.9	$3.9
Model inputs - environmental													
LWPBs consumed (millions)	-48 570.9	0.0	-1182.5	-2367.7	-3555.6	-4746.4	-4865.1	-4986.7	-5111.3	-5239.1	-5370.1	-5504.4	-5642.0
LWPBs littered (millions)	-422.4	0.0	-10.3	-20.6	-30.9	-41.3	-42.3	-43.4	-44.4	-45.6	-46.7	-47.9	-49.1
Model outputs - economic													
GDP ($m)	-$1,093.5	$0.0	-$266.5	-$80.4	-$90.1	-$105.5	-$117.5	-$129.5	-$141.6	-$153.8	-$166.2	-$178.8	-$191.7
Household income ($m)	-$859.1	$0.0	-$180.1	-$55.0	-$66.4	-$80.7	-$95.0	-$108.0	-$120.1	-$131.8	-$143.3	-$154.9	-$166.5
Household expenditure ($m)	-$520.1	$0.0	-$95.9	-$32.9	-$39.7	-$48.4	-$58.1	-$66.9	-$75.2	-$83.2	-$91.2	-$99.2	-$107.3
Retail industry value added ($m)	-$46.0	$0.0	-$13.3	-$2.8	-$3.3	-$4.0	-$4.6	-$5.2	-$5.8	-$6.3	-$6.9	-$7.5	-$8.1
Plastic products industry value added ($m)	-$206.6	$0.0	-$8.7	-$14.3	-$22.1	-$30.3	-$32.3	-$33.7	-$34.8	-$35.7	-$36.5	-$37.3	-$38.1
Paper products industry value added ($m)	$50.4	$0.0	-$1.0	$2.9	$5.1	$7.3	$8.2	$8.8	$9.2	$9.7	$10.1	$10.4	$10.8
Model outputs - environment													
Environmental damage ($m)	-$270.6	-$10.3	-$20.6	-$30.9	-$41.3	-$42.3	-$43.4	-$44.4	-$45.6	-$46.7	-$47.9	-$49.1	-$50.3

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

Table C.4

SCENARIO SEVEN — ADVANCE CLEAN UP FEE

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Model inputs – economic													
Retail industry ($m)	-$433.9	$0.0	$0.0	$0.0	$0.0	-$250.6	-$65.9	-$63.4	-$60.9	-$58.4	-$55.8	-$53.3	-$50.8
Households ($m)	-$195.5	$0.0	$0.0	$0.0	$0.0	-$37.1	-$38.0	-$38.9	-$39.9	-$40.9	-$41.9	-$43.0	-$44.0
Government ($m)	-$10.8	$0.0	$0.0	$0.0	$0.0	-$1.9	-$2.0	-$2.1	-$2.2	-$2.3	-$2.4	-$2.5	-$2.6
Model inputs - environmental													
LWPBs consumed (millions)	-20 732.5	0.0	0.0	0.0	0.0	-2373.2	-2432.5	-2493.3	-2555.7	-2619.6	-2685.1	-2752.2	-2821.0
LWPBs littered (millions)	-300.5	0.0	0.0	0.0	0.0	-34.4	-35.3	-36.1	-37.0	-38.0	-38.9	-39.9	-40.9
Model outputs - economic													
GDP ($m)	-$767.9	$0.0	$0.0	$0.0	$0.0	-$316.9	-$123.6	-$125.4	-$127.3	-$128.8	-$130.1	-$131.2	-$132.2
Household income ($m)	-$544.8	$0.0	$0.0	$0.0	$0.0	-$214.0	-$88.3	-$89.5	-$92.3	-$93.9	-$95.3	-$96.2	-$97.0
Household expenditure ($m)	-$320.3	$0.0	$0.0	$0.0	$0.0	-$114.4	-$52.8	-$53.7	-$55.9	-$57.5	-$58.8	-$59.9	-$60.8
Retail industry value added ($m)	-$36.4	$0.0	$0.0	$0.0	$0.0	-$17.4	-$6.0	-$5.7	-$5.6	-$5.5	-$5.5	-$5.4	-$5.4
Plastic products industry value added ($m)	-$36.3	$0.0	$0.0	$0.0	$0.0	-$7.6	-$6.5	-$7.0	-$7.3	-$7.6	-$7.8	-$8.1	-$8.3
Paper products industry value added ($m)	$12.8	$0.0	$0.0	$0.0	$0.0	-$0.4	$2.2	$2.7	$3.1	$3.4	$3.6	$3.8	$4.0
Model outputs - environment													
Environmental damage ($m)	-$181.5	$0.0	$0.0	$0.0	-$34.4	-$35.3	-$36.1	-$37.0	-$38.0	-$38.9	-$39.9	-$40.9	-$41.9

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

Table C.5

SCENARIO NINE — LEVY

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Model inputs – economic													
Retail industry ($m)	-$511.2	$0.0	$0.0	$0.0	$0.0	-$273.6	-$82.9	-$79.5	-$76.1	-$72.6	-$69.2	-$65.8	-$62.4
Households ($m)	-$262.8	$0.0	$0.0	$0.0	$0.0	-$49.8	-$51.0	-$52.3	-$53.6	-$55.0	-$56.3	-$57.7	-$59.2
Government ($m)	-$12.9	$0.0	$0.0	$0.0	$0.0	-$2.2	-$2.3	-$2.5	-$2.6	-$2.8	-$2.9	-$3.1	-$3.2
Model inputs - environmental													
LWPBs consumed (millions)	-33 172.0	0.0	0.0	0.0	0.0	-3797.1	-3892.0	-3989.3	-4089.1	-4191.3	-4296.1	-4403.5	-4513.6
LWPBs littered (millions)	-312.5	0.0	0.0	0.0	0.0	-35.8	-36.7	-37.6	-38.5	-39.5	-40.5	-41.5	-42.5
Model outputs - economic													
GDP ($m)	-$900.0	$0.0	$0.0	$0.0	$0.0	-$347.1	-$149.5	-$151.7	-$154.0	-$155.6	-$157.0	-$158.0	-$158.8
Household income ($m)	-$636.4	$0.0	$0.0	$0.0	$0.0	-$233.9	-$105.8	-$107.6	-$110.9	-$112.9	-$114.4	-$115.4	-$116.1
Household expenditure ($m)	-$373.7	$0.0	$0.0	$0.0	$0.0	-$125.0	-$62.6	-$64.1	-$66.9	-$68.8	-$70.4	-$71.6	-$72.6
Retail industry value added ($m)	-$43.4	$0.0	$0.0	$0.0	$0.0	-$19.1	-$7.5	-$7.2	-$7.1	-$6.9	-$6.8	-$6.7	-$6.5
Plastic products industry value added ($m)	-$55.7	$0.0	$0.0	$0.0	$0.0	-$10.7	-$10.1	-$10.9	-$11.4	-$11.8	-$12.2	-$12.5	-$12.8
Paper products industry value added ($m)	$23.9	$0.0	$0.0	$0.0	$0.0	$1.1	$4.1	$4.9	$5.4	$5.9	$6.3	$6.6	$7.0
Model outputs - environment													
Environmental damage ($m)	-$188.7	$0.0	$0.0	$0.0	$0.0	-$35.8	-$36.7	-$37.6	-$38.5	-$39.5	-$40.5	-$41.5	-$42.5

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

C.2 Imputed scenarios

Scenarios 1 and 8 were not modelled using the MMRF-Green CGE model. The impacts of these policy scenarios were imputed using the results of the MMRF-Green CGE modelling for Scenarios 5 and 4, respectively. The impacts on GDP and on environmental damage imputed for Scenarios 1 and 8 are shown below.

Table C.6

SCENARIO ONE — BAN

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GDP ($m)	-$1,057.1	$0.0	$0.0	$0.0	$0.0	-$572.7	-$117.5	-$129.5	-$141.6	-$153.8	-$166.2	-$178.8	-$191.7
Environmental damage ($m)	-$217.8	$0.0	$0.0	$0.0	$0.0	-$41.3	-$42.3	-$43.4	-$44.4	-$45.6	-$46.7	-$47.9	-$49.1

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

Table C.7

SCENARIO EIGHT — MANDATORY CHARGE

	NPV*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GDP ($m)	-$1,035.1	$0.0	$0.0	$0.0	$0.0	-$371.6	-$189.1	-$187.0	-$184.3	-$181.8	-$179.7	-$177.7	-$175.8
Environmental damage ($m)	-$217.8	$0.0	$0.0	$0.0	$0.0	-$41.3	-$42.3	-$43.4	-$44.4	-$45.6	-$46.7	-$47.9	-$49.1

*Net Present Value (NPV)
Note: The net present values are calculated as the sum of costs and benefits that arise in the years 2005 to 2016 (inclusive), discounted at 7 per cent per annum.

Appendix D

Possible non-linearity in environmental damage

In developing estimates in this report, care has been taken to be as methodical as possible in valuing environmental damages and associated benefits from reducing LWPB usage. An environmental damage valuation model was developed for this purpose. Given the absence of markets for wildlife, aesthetic values and pollutants (including the damage attributable to greenhouse gas emissions) there is room for speculation around the values arrived at, and the focus on littered bags as the chief environmental culprit. This reflects the need to draw on value indicators rather than raw speculation.

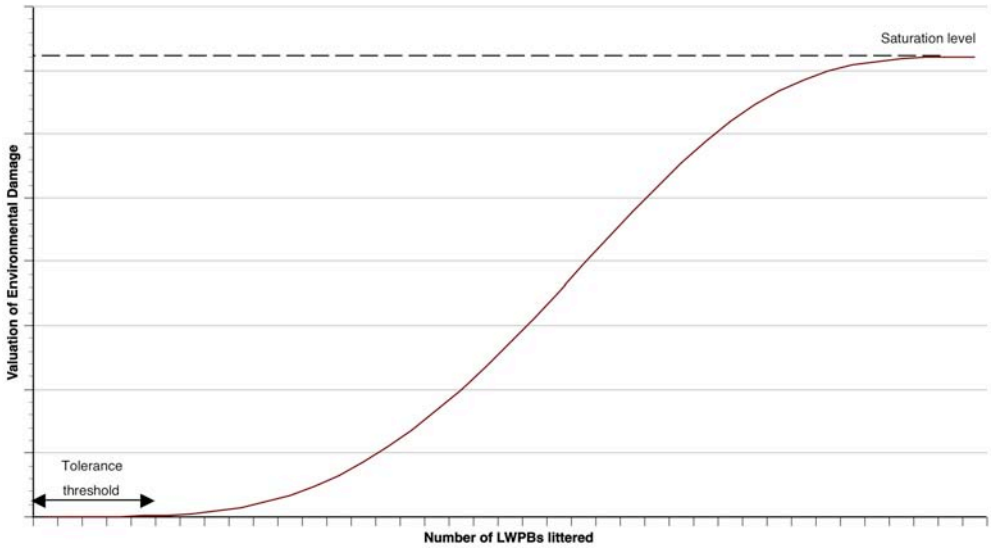
The starting value of $1 for every LWPB that was kept out of or retrieved from the litter stream was one of the critical factors in determining the environmental benefits. For the benefits of the policy options to outweigh the estimated costs, Australians would need to value the reduction in environmental damage at around $5 per LWPB. Changing the value to $5 per LWPB would linearly increase the benefits five-fold, while reducing the value to $0.50 per LWPB would halve the estimated benefits.

Another factor is that the value placed on a reduction in environmental damage may not necessarily be linear. This takes into account considerations of absorptive capacity (or tolerance of low level irritants), increasing marginal damage and saturation — beyond which point the marginal (negative) contribution of additional pollutant falls because the core value of the environment, landscape or ecosystem in question has effectively been destroyed. For example, people may be willing to tolerate a certain number of LWPBs in the environment initially, because they are few and far between. As the number of LWPBs in the litter stream increases, people become less tolerant, and are willing to pay more for each additional bag littered.

Once a certain threshold is reached, however, the amount that people are willing to pay starts to decrease — people are willing to pay more to reduce the number of LWPBs in the litter stream from 50 million bags to 40 million bags than they are to reduce the number of LWPBs in the litter stream from 200 million bags to 190 million bags, even though in each case, the number of LWPBs in question is the same. Eventually, a ‘saturation point’ is reached, where the damage has already been done, and people perceive that the marginal damage done by additional LWPBs is very small. A stylised damage function with these characteristics is depicted in Figure D.1.

Figure D.1

A STYLISED 'ENVIRONMENTAL DAMAGE CURVE'



In considering environmental damage due to LWPBs it is possible that marginal costs may follow this pattern. For reduction in aesthetic landscape values, it could be that deterioration will not only increase as more bags pollute the local environment, but that the rate of the increase in damage might begin to rise as the number of bags exceeds some minimum threshold. Damage to ecosystems and habitat also tend to exhibit an ability to tolerate low levels of irritation — although thresholds differ according to the host and irritant in question.[51]

The corollary of this functional approach to environmental damage is that reductions in levels of pollution (in this case LWPBs) will carry relatively higher pay-offs early, but have reduced pay-offs as pollution levels drop back toward tolerance thresholds levels. Subsequently, the first 10 per cent of effort expended would have a greater return than the second 10 per cent, which would in turn have a greater return than the third 10 per cent, and so on — the approach is summarised in Box D.1.

[51] See for example, the discussion of biological adaptive capability in Allen Consulting Group 2005, *Climate Change Risk and Vulnerability: Promoting an Efficient Adaptation Response in Australia*, Australian Greenhouse Office, Canberra.

Box D.1

THE 'NON-LINEAR' ENVIRONMENTAL VALUATION

Reflecting this declining return on effort in the valuation of environmental damage could be done by assuming that the total number of bags that could be released into the environment in one year is 60 million bags. Dividing this amount into deciles, the first 6 million LWPBs removed from the environment would be valued at $1 per LWPB. The second 6 million LWPBs to be removed would be valued at $0.82 per LWPB, and then so on down to $0.66, $0.52, $0.40, $0.30, $0.22, $0.16, $0.12 and then $0.10 — so that the last decile valued at 10 per cent of the first. Under this valuation, the maximum environmental benefit that can be obtained is $25.8 million — compared to the $50 million that can be achieved if the removal of *each* LWPB is valued at $1.00. If the starting value were changed from $1.00 to $0.50, then the total benefit attainable is halved — to around $13 million.

As shown in Table D.1, introducing non-linearity to the valuation of the environmental damage attributable to LWPBs has a significant impact on the net cost of each of the policy scenarios, however, it does not have much of an effect on the rankings of each of the scenarios.

Table D.1

NPV IMPLICATIONS OF CHANGES IN ENVIRONMENTAL DAMAGE MODELLING, $M

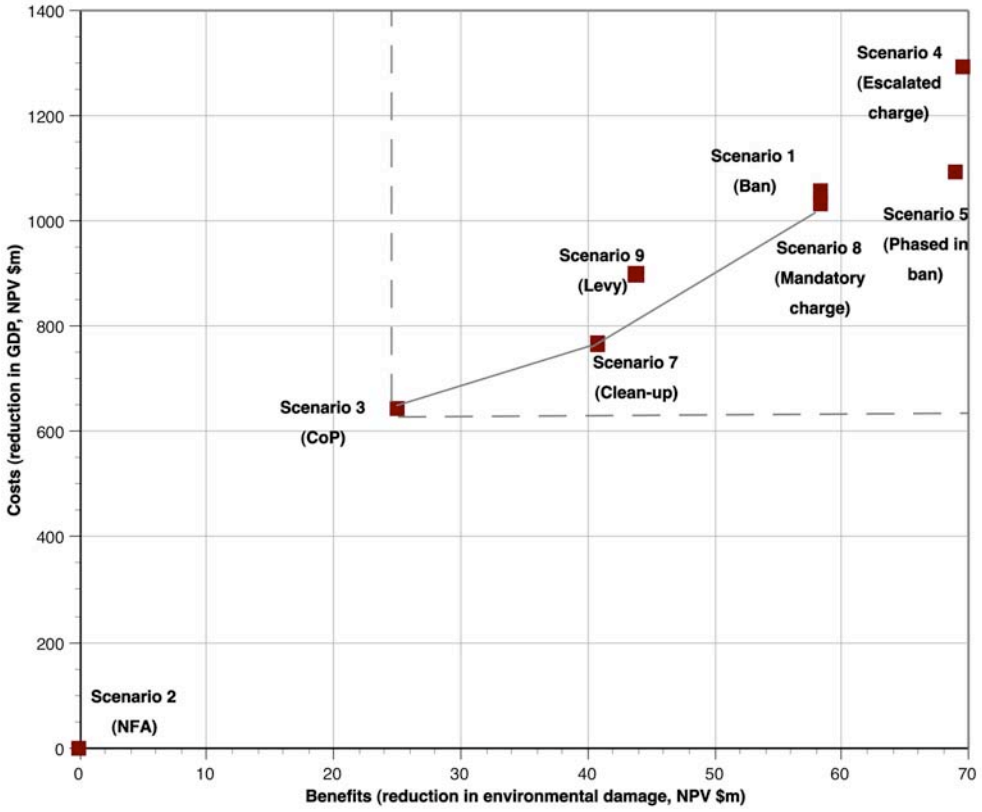
Scenario	$0.50 — linear	$1.00 — linear	$5.00 — linear	$0.50 — non-linear	$1.00 — non-linear	$5.00 — non-linear
Scenario 1	-$948	-$839	$33	-$999	-$940	-$474
Scenario 3	-$568	-$490	$136	-$621	-$596	-$396
Scenario 4	-$1160	-$1027	$38	-$1224	-$1154	-$597
Scenario 5	-$958	-$823	$260	-$1024	-$955	-$403
Scenario 7	-$677	-$586	$139	-$727	-$686	-$360
Scenario 8	-$926	-$817	$54	-$977	-$918	-$452
Scenario 9	-$806	-$711	$44	-$856	-$812	-$461

Notes: The NPVs for the 'as modelled' scenarios were calculated using a 'standard' discount rate of 7 per cent per annum. Net economic impacts for Scenario 2 are not reported because these reflect expiry of the ARA Code on a pre-agreed timetable, and represent a no further action 'baseline' result.

Figure D.2 shows the tradeoffs between economic costs and environmental benefits in the situation in which a non-linear environmental damage model is used, with a starting value of $0.50 for the first 6 million LWPBs removed. Under this alternative, the net costs are significantly higher, because the environmental benefits are around a quarter of what they were previously. The efficient frontier of policy options using a non-linear approach is made up Scenarios 3, 7 and 8.

Figure D.2

ALTERNATIVE ENVIRONMENTAL DAMAGE VALUATION — THE RELATIONSHIP BETWEEN ECONOMIC AND ENVIRONMENTAL COSTS UNDER VARIOUS SCENARIOS



Importantly, while the non-linearity model has intuitive appeal it also has some problems. At present, there is not enough information to estimate the shape of this damage function, or our location on it — though it is probably safe to assume that there are very few locations in Australia where the litter has reached saturation point and marginal impacts will be effectively zero. Additionally, although we are in a position to make reasonable (ballpark) estimates of the number of plastic bags entering the litter stream each year, we have less reliable information on the stock of bags already resident in the landscape.

Given these complexities, and the desirability of avoiding assumption laden analysis, the non-linear model can be useful in providing an alternative perspective on the challenge of estimating marginal environmental damage and benefits. But the demands of this approach can be unsuited to a data poor environment, such as litter.

Appendix E

Sources

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