PLASTIC SHOPPING BAGS:
ENVIRONMENTAL IMPACTS AND POLICY OPTIONS

by

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ABSTRACT

Due to public concern over the environmental impacts of plastic shopping bags many countries, states, towns and councils are implementing measures to address their use. While a number of individual retailers in New Zealand have taken steps to reduce plastic bag consumption, there has been limited national or regional government action to address plastic shopping bag use. While other countries have favoured economic instruments, such as Ireland's "PlasTax", under a cost benefit analysis research has identified that all policy interventions are cost inefficient.¹ This thesis uses a mixed comparative approach to investigate the environmental impacts of plastic shopping bags and consumption patterns, in relation to international practice, alternatives to plastic shopping bag, and policy options.

The mixed comparative approach used in this research is a combination of the philosophies underlying cost benefit analysis, sustainable development, triple bottom line reporting, case studies and policy analysis. Voluntary actions are identified as the least costly option, but achieve smaller reductions in plastic shopping bag use. In contrast regulatory actions are more likely to achieve greater reductions in plastic bag use, but are costly and have less public and political acceptance. Economic instruments while achieving modest to high reductions in plastic shopping bag use, are moderately costly, and also face acceptance and implementation constraints. However, due to strong public pressure for government intervention, and potential implications for future climate change and sustainability initiatives, it is suggested that economic instruments and regulatory options are the most likely choices for government policies to address plastic shopping bags.

Key words: plastic shopping bags, environmental impacts of plastic, environmental policy, New Zealand.

¹ Allen Consulting Group (2006) Phasing Out Light-Weight Plastic Bags, Costs and Benefits of Alternative Approaches. Report to the Environment Protection and Heritage Council.

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List of Acronyms

ACG	Allen Consulting Group
ACT	Australian Capital Territory
ADF	Advanced Disposal Fee
AMRF	Algalita Marine Research Foundation
ARA	Australian Retailers Association
CBA	Cost Benefit Analysis
MCS	Marine Conservation Society
EPHC	Environmental Protection and Heritage Council (Australia) ²
EPR	Extended Producer Responsibility
FOES	Friends of the Earth Scotland
HDPE	High-density polyethylene
DEH	Department of Environment and Heritage (Australia)
DEHLG	Department for Environment, Heritage and Local Government (Ireland)
LCA	Life Cycle Assessment
LDPE	Low-density polyethylene
LGA	Local Government Act (New Zealand 1974, 2000)
LWPB	Lightweight plastic bag
MFE	Ministry for the Environment (New Zealand)
MRC	Mandatory Retailer Charge
NEPM	National Environment Protection Measure (Australia)
NGO	Non-government organisation
NPA	National Packaging Accord (New Zealand)
NPC	National Packaging Covenant (Australia)
NOAA	National Ocean Service
NZPC	New Zealand Packaging Council
NZPA	New Zealand Packaging Accord 2004
NZPPA	New Zealand Paperboard Packaging Association
NZRA	New Zealand Retailers Association
OECD	Organisation of Economic Development
PCB	Polychlorinated biphenyls
PBWG	Plastic Bag Working Group (Australia)
PCE	Parliamentary Commissioner for the Environment (New Zealand)
POPs	Persistent organic pollutants
PS	Product Stewardship
PSB	Plastic Shopping Bag/s
RMA	Resource Management Act 1991
SCBC	Scottish Carrier Bag Consortium

² Previously DEH

1 Introduction

The environmental impacts of plastic shopping bags (PSB) have been the target of increased community concern and media attention around the world. The environmental impacts are a result of littered PSB primarily and secondly from the production and use of plastic. Littered PSB become entangled in and ingested by wildlife in marine and terrestrial environments. It is the very same characteristics that make plastic a versatile packaging material, durable, lightweight, and high strength, that also makes plastic litter easily spread, persistent, visible, and an essentially cumulative litter material (Allen Consulting Group (ACG) 2006 Page 20). Moreover, PSB are contributing to the widespread and lesser-known problem of plastic pollution having significant impacts on wildlife feeding, hormone production, impacting on reproduction, creating toxic chemical build up, effecting ecosystem processes and biodiversity. Both the negative aesthetics of PSB and the more significant ecological damage have negative socio-economic impacts.

Littered PSB contribute to the loss of visual aesthetics, the loss of wildlife and pristine wilderness areas, impacting the tourism industry and those employed within. Additional socio-economic impacts involve damage caused to personal property such as buildings, cars, boats and livestock, from entanglement and blocked drains, as well as social concerns about the non-essential use of a non-renewable resource (oil and natural gas).

The concerns about PSB use are characterised by two interrelated factors: environmental impacts, and their symbolic value (Nolan ITU 2002b). PSB “have become a politically incorrect symbol of the threat to the environment” (Byars 1995) which at a time of climate change debate is giving PSB important status. This concern has been demonstrated here in New Zealand when plastic bags were named the number one litter problem in a consumer study (New Zealand Paperboard Packaging Association (NZPPA) 2005).³

³ Litter Problem of Packaging, Plastic bags listed as number one, 49% respondents say huge problem, 29% problem, 12% neither, 6% not much of a problem, 4% no problem at all (NZPPA 2005 Page 18).

Despite this concern, there has been no significant lobbying for action, no investigation into possible actions to reduce PSB consumption, or the potential impacts from action in New Zealand. PSB have been labelled as a non-priority item for waste minimisation efforts (Ministry for the Environment (MFE) 2006, Allen Consulting Group (ACG) 2006, and Nolan ITU 2002b) as they are only a minor part of the solid waste stream; ACG (2006 Page 21) suggests that PSB are 0.02 percent of Australia's total solid waste.⁴ However, Nolan ITU (2002b) estimates that 95 percent of all PSB consumed end up in landfill,⁵ demonstrating the fleeting life of PSB.

The material characteristics of plastic bags, and the way we use them, amplifies concerns about their consumption. The fact is PSB are designed to be used once and then disposed (Environment Protection and Heritage Council (EPHC) 2007 Page 17), “after the bag has served its original purpose [transportation] they (consumers) view the bags as undesirable items” (EPHC 2007 Page 20). When this product design is combined with the high numbers used, and the encouraged consumption of this ‘free’ packaging the concerns about efficient resource use and the quantity of waste are warranted. Plastic bags have played a significant role in consumption and purchasing habits for the last thirty years.⁶ This has resulted in consumer expectation of PSB supply in a retail transaction, a use that is not often questioned. The way in which we use PSB is determined in part by their role in the packaging mix, as well as their material nature, which is explored below.

An Introduction to Plastic Shopping Bags

Plastic shopping bags are provided as the last stage in the packaging mix. Packaging plays an important function of protecting and preventing spoilage of food and goods. In addition, packaging is an integral part of product differentiation, and in most cases is the very source of product differentiation (Lewis and Sonneveld 2005). However, PSB are a “type of

⁴ 6.67 billion bags sent to landfill, weight of 40,020 tonnes, roughly 0.02% of Australia's solid waste (ACG 2006 Page 21)

⁵ 6.65 billion bags are disposed of in landfill/waste treatment facilities (from a total population of 6.9 billion bags) (Nolan ITU 2002b Page 9).

⁶ Plastic shopping bags are thought to have been in widespread use from the nineteen-seventies (McLaughlin 2007, PBWG 2002).

packaging that is not necessarily essential to the integrity of the product purchased” (EPHC 2007 Page 20), and therefore extraneous to marketing and protective functions. PSB have become a costly social “necessity” rather than holding a significant role in the packaging mix.

The cost of packaging (boxes, inserts, supports, bottles and tubs etcetera) is integrated in the cost of the product and passed onto the consumer. Consumers make no distinction between the product and the packaging, considering them to be one item (EPHC 2007 Page 20). This is not the case with plastic bags, the majority of PSB are supplied ‘free of charge’. However, the costs of supplying plastic bags are absorbed into product prices along with other overhead costs (EPHC 2007 Page 20, ACG 2006 Page 15). Therefore currently the majority of consumers who choose to use reusable bags, or bring their own PSB, are also paying for PSB in their purchase. It is estimated that consumers indirectly spend AUS \$10-\$15 annually on PSB (Nolan ITU 2002b), while the average cost of reusable bags is estimated to be AUS \$14.32 annually (Authors Calculation).⁷

Despite consumers ultimately paying for PSB, they are a convenience item and lose value once the service demanded is not required anymore.⁸ The services PSB provide, convenience and ease of transportation, are not directly charged for, and can result in the lack of value ascribed to the services provided. The lack of value and the nature of the PSB when combined with ubiquitous consumerism results in large numbers of PSB having once served their single use objective, being littered or sent to landfill. Although not directly charged for the design objective, the reuse opportunities of PSB provides an additional service to consumers that is not explicitly charged for, or taken into account by all consumers.⁹ PSB are convenient and have multiple uses, but tensions exist between convenience, consumption, social and environmental impacts.

⁷ The average cost of reusable bags is estimated to be \$14.32 annually. Costs of reusable bags \$1-\$1.80 (AUS) (ACG 2006 Page 15) an average of \$1.40 (AUS), and the average number of reusable bags required per year (average across common types using James and Grant (2005 Page 7) data 10.23 bags annually, resulting in a cost of \$14.32 (AUS). New Zealand reusable bags are selling between NZ\$0.75-\$2.00, with an average annual household cost of NZ\$14.05 (Authors Calculation 2007).

⁸ Products that are thrown away have lost social or cultural attractiveness, even if still in good working order (Lewis and Gertsakis 2001). The plastic bag transaction, where the product is used once and often thrown away demonstrates the lack of value held for this product.

⁹ In New Zealand approximately 81 percent of PSB accumulated are reused (Field Connection 2005).

Plastic

To understand the complexity of the impacts from the use of PSB it is necessary to have knowledge about the substance plastic. While plastic as a material has been heralded as a wonder product, little attention has been paid to the issues of its disposal, specifically its non-assimilation or non-biodegradability.

Modern plastics are made from polymers, which are “large molecules consisting of repeating units of monomers” (Lajeunesse 2004). One such molecule is ethene, which is represented chemically as C_2H_4 , or as a chemical diagram shown below in Figure 1.

Figure 1 Chemical Diagram of Ethene

Ethene is derived from naphtha, a natural gas produced from oil refining. Ethene is extracted from naphtha by high temperature cracking. Cracking is the process by which larger molecules are broken down into smaller ones (Nolan ITU 2002b Page 29). When ethene molecules are polymerised they become polyethylene (Lajeunesse 2004).¹⁰

Different processes of polymerisation create different forms of polyethylene. High Density Polyethylene (HDPE) and Low Density Polyethylene (LDPE) are the most commonly known forms¹¹. For example milk bottles are HDPE, and cling-film is LDPE. PSB are generally made from HDPE, or LDPE. The characteristics of these plastics are demonstrated in the New Zealand Plastics identification codes in Figure 2 below. The most common PSB is the HDPE ‘singlet’ bag or supermarket shopping bag. Singlet bags are made by two identical rectangle sheets fused together to form a bag with handles. LDPE

¹⁰ Polymerisation creates repeating units of monomers, in this case ethylene, to form polyethylene and polythene (most of the plastic shopping bag we use today are made from various forms of polyethylene).

¹¹ Other types of polyethylene include Linear Low Density Polyethylene (LLDPE), Medium Density Polyethylene (MDPE), and Very Low Density Polyethylene (VLDPE).

PSB are thicker than HDPE and often used in clothing, merchandise and department stores (Nolan ITU 2002b).

Figure 2: Main Plastic Bag Types

<ul style="list-style-type: none">– HDPE or High-Density Polyethylene– Crinkly shopping bags, milk bottles, juice and soft drink bottles– HDPE can be hard to semi-flexible, it is moisture resistant, opaque, easily processed and coloured.
<ul style="list-style-type: none">– LDPE or Low-Density Polyethylene– Thick shopping bags, glad-wrap, squeeze bottles and irrigation pipe.– LDPE is a soft, flexi, waxy surface that is translucent and scratches easily.

(Plastics NZ 2006)

While these distinctions are necessary for identification and recycling in practice, it is easier to define plastic bags by their function or use rather than material type, size, or shape for research and policy as specifications such as these are easily avoided (EPHC 2007 Page14). Nolan ITU (2002 Page 1) defines PSB as “a polymer carry bag provided or utilised at the point of sale for carrying and transporting retail goods. This includes all plastic retail carry bags but excludes produce bags used in-store, dry cleaning bags, garbage bags and other primary product packaging”. Subsequently, EPHC (2007 Page 14) have proposed the definition of “A plastic bag means 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”. Research has demonstrated “that the thickness and weight of a plastic bag does not impact on the ease with which it may become litter if placed in a waste receptacle and dispersed by the wind” (Verghese 2006). Therefore the definition of this research will address the function of plastic bags, shopping or carrier bags and not specify material or size of bags. This allows both the resource use and environmental impacts of littered PSB to be addressed.

This thesis examines the PSB debate globally and concludes by presenting policy options for action in New Zealand. I investigate: the environmental problems of PSB; production, use, and disposal in New Zealand; the life cycle analysis (LCA) of the alternatives to PSB. I also conduct a limited policy review, using international case studies, research, and a range of comparative measures.

2 Aim and Methodology

The aim of this thesis is to investigate the environmental problems associated with PSB use: to investigate how PSB are used and currently managed in New Zealand: to determine how PSB bags have been managed internationally: to conduct a review of potential options for actions to address PSB use in New Zealand, including alternatives to PSB and policy options.

Conceptual Framework

The analytic framework is based on the concept of cost benefit analysis (CBA): a method of comparing the benefits and costs ratio of alternative outcomes. However, due to the many factors that influence the plastic bag debate, and the shortfalls of a traditional CBA analysis a solely economic CBA was discarded in favour of a mixed comparative analysis.

The mixed comparative approach used in this research is a combination of the philosophies underlying cost benefit analysis, sustainable development, triple bottom line reporting, and policy analysis. This mixed comparative approach has been developed to exploit the comparative aspects of these frameworks, by acknowledging as many features of the issue as possible. While in the large part a traditional policy analysis the points of difference in my application lie in the inclusion of the philosophies of sustainable development¹², triple bottom line reporting¹³ and the specific inclusion of environmental measures.

¹² The Brundtland Commission benchmarked sustainable development in policy in 1987. The definition from this commission provides the definition of sustainable development as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987). Turner (1997) says that the dimensions of sustainability that are included in policy are impacts and costs to society and culture, economics, politics, environment, morality, equity and the needs of society. Young (1992) highlights that sustainable development looks at the long term or future effects of decisions and actions now, recognises the need to maintain ecological processes, and it looks at the benefits of improving the quality of life without denying the future generations the same quality of life.

¹³ “Triple bottom line analysis allows for [the] direct comparison between scenarios based on their economic, social and environmental implications. This increases transparency, but complexity also increases, [as] there can be disagreement about the relative importance of some indicators...Social effects can be particularly prone to these problems” (ACG 2006 Page 3).

A mixed comparative approach means recognising that there are multiple factors to be taken into account in any case for action. These factors may be collected using both qualitative and quantitative methods, and can be measured using different indicators (mixed methods).

In this particular application I bear in mind the New Zealand Ministry for the Environment's (MFE) framework for evaluating policy instruments for waste management and minimisation (MFE 2002b).¹⁴ The framework outlines four major elements: sound legislation and institutions, providing immediate and long-term minimisation and management, and the provision of information and communication. "Key characteristics" provide a foundation for policy selection: economic efficiency, cost effectiveness, fairness and equity, incentives for entrepreneurship, enforceability, compatibility with other policies, consistency with international obligations, and political acceptability.

Environmental policy analysis is often based on economic efficiency, environmental effectiveness, political effectiveness, administrative efficacy and impacts on technology (Hatch 2005). The frameworks I have chosen for comparison are economic, social/cultural, environmental, legal and political suggested by Bridgman and Davis (2000) for policy analysis, in addition to comparison of the implementation and administration of actions. Implementation and administration is included under legal framework for Bridgman and Davis (2000) but due to the political and government realities in New Zealand I have decided to analyse this separately. I now turn to each of the criteria in turn, and a table summarising criteria is presented on Table 1 below.

¹⁴ MFE, 2002 Policy Instruments for Waste Minimisation and Management, In Background to the New Zealand Solid Waste Strategy.

Table 1: Mixed Comparative Analysis Measures

Framework	Economic	Environmental	Legal
Measures	Cost of market goods or services to the provider, purchaser and user (Bridgman and Davis 2000). Cost of not taking action Cost of impacts Costs of action. Costs of benefits Best outcomes from funds Economic efficiency, cost effectiveness, incentives for entrepreneurship (MFE 2000)	Impacts to: Land Air Water Light Noise Biodiversity Ecological Sustainability Habitat Preservation Environmental Quality (Bridgman and Davis 2000) Natural Ecosystem processes	Existing legislation Distribution of power and jurisdiction Health and safety Accountability Compliance Enforcement Human Rights (Bridgman and Davis 2000) Sound legislation Fairness, Equity Enforcement Legal compatibility (MFE 2000)
Framework	Implementation	Political	Social/Cultural
Measures	Existing institutions and processes Institutional acceptability Public Acceptability Practicality Immediate and long term minimisation and management Information and communication (MFE 2000) Enforcement	Ruling party's policy and goals Associated ministry's goals Political input Reaction on political media (Bridgman and Davis 2000) Political acceptance (MFE 2000)	Consequences for specific groups (Bridgman and Davis 2000) Elderly Differently able Industry and employees People who use natural areas Fairness and Equity (MFE 2000)

Economic Efficiency

Economic efficiency can be defined as more units of outcome per unit of investment (Doven 2005). However, economic efficiency is not the only measure within an economic framework. A traditional CBA requires that “the benefits must exceed the present value of costs” (Organisation of Economic Development (OECD) 2006 Page 17), and that the outcomes must produce the greatest economic benefit to society (Bridgman and Davis 2000). This comparison requires purely quantitative comparison of aspects, which presents difficulties in quantification of non-market goods, hard to quantify factors (Heinzerling and Ackerman 2000, Pierrehumbert 2005), and that a dollar value is a narrow class of

comparison (Sen 2002).¹⁵ While Pierrehumbert (2005) also points out that a CBA compares non-comparable factors, however this is a critique that can be applied to all comparative analyses.

In contrast to a traditional CBA, a cost effective analysis recognises that not all factors can be compared, and is based instead on whether a policy can achieve its goals efficiently (Weimar and Vining 1992). As such it compares the alternatives on the basis of the most gain with the available budget (Bridgman and Davis 2000). Whilst a cost effective analysis is considerate of non-market goods, recognises that not all benefits can be measured, and that not all costs can be anticipated (Bridgman and Davis 2000).

Another take on a traditional CBA is an opportunity cost analysis. This requires an estimate of the **cost of not taking action** in addition to the cost of taking action, which results in a net benefit being the real measure of a policy option (Bridgman and Davis 2000).

In this thesis the measures used for economic analysis are: the cost of market goods or services to the provider, purchaser and user (Bridgman and Davis 2000). This includes the cost of not taking action, i.e. the cost of impacts from consumption of PSB and the cost of loosing a turtle from ingestion of a plastic bag, as well as the costs of action.

Environmental Effectiveness

Environmental effectiveness can be viewed as the likelihood of a policy achieving its environmental goals, be it the elimination of something from the environment, or an improvement of the impacts on the environment. A significant aspect of environmental policy is the potential for lag time between the policy's creation and inception to its visible environmental benefits. Variations in this lag time can make evaluation of environmental policy difficult at times. The measures for an environmental analysis used in this thesis are:

¹⁵ Additional critiques of CBA is the analysis does not recognise inequity of cost, that is who suffers, that there are economic biases in the calculation and methodology that are subject to the economists judgement, with no public participation, as the distributional effects are not factored into CBA, and that the use of discounting can not apply to non-economic goods, moreover discounting minimises the effects of lag time for and long term environmental impacts (Heinzerling and Ackerman 2000 and Pierrehumbert 2005).

the impacts on land, air, water, light, noise, biodiversity, ecosystem sustainability, habitat preservation, environmental quality (Bridgman and Davis 2000) and ecosystem processes.

Political Efficiency

Political efficiency or the feasibility of options and second best options (Hatch 2005) also needs to be taken into account in each application of environmental policy. Attention needs to be given to the political receptiveness and realities of any suggested environmental policy. Political realities include sensitivity to the policy goals of a ministry, but acknowledging that these are not always the best goals, having appropriate political input in the analysis, being aware of the ruling party's principles, as well as having awareness of the political media (Bridgman and Davis 2000).

Legal Implications

The legal framework for analysis rests on the measure that any management options must be also be sensitive to existing waste and litter legislation, or any other applicable legislation existing or that may be enacted. Other measures of legal analysis are: the limits of power and jurisdiction, health and safety implications, compliance with existing institutions, accountability, enforcement, and relation to human rights.

Administrative Efficiency

The implications of policy instruments to the responsibilities of central and local government are a significant practical reality to be considered when evaluating policy instruments. More specifically, the impacts of policies and actions that delegates that delegates management to local government, in light of recent debates across New Zealand about local rates increases. Moreover, attention will be paid to the specific concerns relating to management option's practical application (funding, management responsibility, maintenance, administration and enforcement). Evaluating the administrative efficacy of options entails considering the implementation and compliance costs of policy. Hatch (2005) proffers that collaboration is a policy design feature that facilitates compliance, but can come at the cost of consultation and administration.

Socio-Cultural Measures

The measures for the social and cultural analysis are based on the consequences for society. It is important to acknowledge groups of society: women, indigenous people, rural communities, those for whom English is not a first language (Bridgman and Davis 2000), as well as elderly, and differently able. Additionally, it is necessary to define all social issues related to each alternative. In the case of plastic bags littering could be seen as a socially negative impact. It is necessary to complete a full life cycle assessment of plastic bags to reasonably assess the social impacts (Ferrera and Poularde 2003) of their use, which is unfortunately outside the capacity of this thesis.

Another important group of society in this research is industry. The impacts of policy on industry are an important consideration of the policy evaluation, and are intimately linked to impacts on technology. Hatch (2005) states the effects of policy on technology needs to be addressed and it made sure that the policy does not stifle innovation through overly prescriptive regulation. Ferrara and Plourde (2003) point out that a comparative social evaluation of different packaging systems requires an accurate assessment of the life-cycle impacts of each container, solid waste, litter, air, water pollution and energy use. While this would add significantly to this analysis it is outside the capacity of this research.

The key words used to source literature informing this research are discussed below, key words are grouped into focussed areas. The initial international general search used keywords such as: plastic bag, plastic bags, plastic, lightweight plastic bags, singlet bags, supermarket bags, and carrier bags. The keywords used in the search for environmental impacts associated with plastic bags are: plastic bag litter, plastic litter, pollution, plastic pollution, marine pollution, and waste packaging. The search for LCA literature uses keywords of; life cycle of plastic bags, plastic bag uses, plastic bag recycling, plastic bag production, manufacture of plastic bags, disposal of plastic bags. International research and documents about international practice are located initially through the general international search, and then by specific country searches. These individual searches use keywords such as: plastic bag management, actions to reduce plastic bags, reduce plastic bags, community action and environmental issues. Searches for policy analysis literature

uses keywords of: policy analysis, policy review, evaluation of policy tools, policy instruments, evaluation of regulation, evaluation of economic instruments, product specific taxes, evaluation of voluntary policy, evaluation of information and education campaigns, extended producer responsibility, extended product responsibility.

Primary Methods

While international research and practice can inform the analysis of options, only New Zealand specific data and stakeholder input can produce the information required for an adequate evaluation of options for action in New Zealand. Adequate analysis requires evaluating for acceptance, practicalities of implementation, monitoring and enforcement of management, information gathered through primary research. Ethics approval to undertake primary research was gained on the 11th September 2006 (Ethics Approval: No 102/2006) from the Victoria University Human Ethics Committee. Ethics approval requires that informed consent is obtained from participants before they are involved in research, the consent form used in this research can be seen in appendix 3.

Both questionnaires and interviews were used in primary research. The questions were based on the same set of questions for each group, to provide ability to conduct either interviews or surveys with each stakeholder group. Interviews are based on semi-structured interviews, with questions listed providing an interview guide rather than a strict schedule for interviews (Bryman 2001). The semi-structured interview was chosen to allow flexibility in the interview process, leeway in replies (Bryman 2001), and allow for additional themes to be raised by the interviewee (Beardsworth and Keil 1992).

Primary research for this thesis involves interviews and postal surveys with members of five stakeholder groups in New Zealand; manufacturers/importer/distributors, retailers, recycling operators, environmental organisations and government. The information and input from key stakeholders is consistent with the TBL and comparative methodology used for this research. Key stakeholders are determined by those identified in international literature, and those recognized as participants in the life cycle material flow of plastic bags in New Zealand. A major stakeholder, and one with significant sway over action taken are

consumers, or general public. This stakeholder group is not included in this primary research due to ethical and practical limitations. However, consumer attitudes and opinions are represented through secondary research. I now take a look at the roles of the other stakeholder groups.

Manufacturers, Importers and Distributors were combined as one stakeholder entity due to the small number of firms producing plastic bags in New Zealand. Manufacturers, distributors and importers are collated using phone and Internet directories (using keyword searches of “plastics bags” and “packaging”), and a contact database on the Plastics New Zealand website.¹⁶ Questions for this stakeholder group obtains information about the size or percentage of operations devoted to plastic bags, and specifically to ‘singlet’ style shopping bags, and investigate the alternatives to plastic bags being produced or distributed. These questions are to determine the magnitude of impact from management action to industry. In addition, questions relating to awareness of international actions and preferred actions for New Zealand were also asked to gauge awareness, barriers, and benefits from management actions to reduce plastic shopping bag consumption in New Zealand (A full list of questions presented in Appendix 2).

Recycling operators were found using phone and Internet directories (using keyword searches of “recycling”, “plastic recycling” and “recyclers”), and a recycling operator database on the Plastics New Zealand website. Questions to this stakeholder group were to attain understanding of the current levels of recycling of plastic bags, the technical and logistical barriers to recycling plastic bags and to determine practical issues involved of plastic shopping bag recycling. Questions about awareness of international actions and preferred measures for New Zealand were also asked to gauge perceived and practical barriers and benefits from the management of PSB in New Zealand (A full list of questions presented in Appendix 2).

Retailers have specific concerns about the management of PSB, as they have borne the brunt of the majority of international management actions. Retailers are divided into two

¹⁶ www.plastics.org.nz

groups, supermarkets and all other retailers. Supermarkets are identified as the major source of plastic bags (Nolan ITU 2002b). The New Zealand Packaging Accord (NZPA) sector action plan, to reduce plastic shopping bag consumption, addresses 95 percent of supermarkets in New Zealand (New Zealand Packaging Council (NZPC) 2005).

Supermarket recruitments were initially sought through phone and Internet directory searches using keywords “supermarkets”. However, as the majority of supermarkets in New Zealand are managed through supermarket groups as either franchise or nationally operated, head offices of supermarket groups are contacted instead (contact details were accessed via supermarket group websites).

Supermarket questions were designed to gain an understanding of organisational structure, to obtain use data of PSB, and to identify the sale and or use of alternatives to PSB. Additional information is sought regarding the efforts of supermarkets to achieve the NZPA sector action plan goals to reduce plastic shopping bag consumption.¹⁷

Retailers other than supermarkets are recruited via phone and Internet directory searches in the Wellington region (due to the location of researcher) using multiple key words under each category of retailer. The general categories are: food supplier, liquor and convenience; petrol stations, gardening, home wares, department stores; appliance and electronic; fashion (clothing, shoes and accessories); and trade supplies (hardware, electrical, plumbing etcetera). These categories are loosely based on categories presented in the New Zealand Retailers Association (NZRA) report (Albertson 2006).¹⁸ Questions are to collect information about the types of bags used, to obtain use data, to identify the sale and or use of alternatives to PSB, as well as questions to gauge the perceived and practical barriers and benefits from management actions (A full list of questions can be found in appendix 2).

¹⁷ The NZPA sector action plan contains goals relating to in-store training, data collection, reduction targets, and efficient use of bags and results of trials outlined in the NZPA sector plan. The NZPA 2004 is discussed in more detail on page 64.

¹⁸ The Retail Market in New Zealand (Albertson 2006).

Central government is represented through the Ministry for the Environment (MFE), and questions for this agency sought to address the practical realities of management options and likelihood of management with government intervention.

The participation of non-government organisations (NGO) and environmental agencies in this research provides a third party view of the plastic shopping bag debate, a view providing additional options for management and evaluation of options. NGO's involved are those, by their own description, are involved with waste and littering, and are recruited via contact details on websites. Questions to this group are to find another group perspective of the issue that may uncover inconsistencies or issues not raised by those involved in proposed actions, such as environmental impacts, community and social issues, as well as preferred options for management.

Objectives

Objective 1: Investigate Environmental Problems Associated With Plastic Bag Use.

Objective one of this research involves the conducting of a literature review on the impacts of plastic bags, litter and pollution using international and New Zealand research. Research directly related to the plastic bag debate, such as environmental impact statements, consultation documents and cost benefit analyses are used, as well as literature on pollution, litter and environmental impacts of using plastic. The literature review will establish the level of environmental impact of PSB, as well as determining gaps between perceived and actual environmental impacts.

Objective 2: Investigate How Plastic Bags Are Used and Managed in New Zealand.

Objective two determines the national consumption of PSB via evaluation of New Zealand consumption data, and is informed by models of use from international studies. An analysis of the life cycle of PSB in New Zealand is informed by existing research, with New Zealand specific data used where available. Additional information is gathered through primary research interviews and surveys with key stakeholders.

Both the national consumption levels and the life cycle approach determine the extent of PSB consumption. Estimations take into account the number and weight of bags used, littered, reused and sent to landfill. International comparisons and consumption models enhance estimations.

New Zealander's opinions, use, and disposal of PSB are drawn from secondary sources that have specifically investigated PSB and broader environmental issues. Primary research on public attitudes and opinions requires resources outside the scope of this thesis.

However, a public opinion and PSB use survey would provide a more comprehensive investigation of behaviours and attitudes that would help to inform evaluations of options for management of PSB as well as future sustainability initiatives.

Current management activities for PSB, and an examination of solid waste and littering legislation in New Zealand is carried out to investigate the current context of management for PSB. An Internet and media search is conducted to ensure non-government driven actions are included. The New Zealand Packaging Accord 2004 (NZPA) is currently the key document for the management of PSB in New Zealand and a review of this voluntary measure is conducted, and compares the NZPA to the Australian National Packaging Covenant (NPC 2005). Examining current management actions provides a picture of what is happening in New Zealand, and insight into the social climate in relation to plastic shopping bag use.

Objective 3: To Determine How Plastic Bags Have Been Managed Internationally

For this objective I identify three international examples of the management of PSB. These examples are presented as case studies to provide an in-depth analysis of effects from management strategically reducing PSB consumption. Case studies are based on the experiences of PSB management actions in Ireland and Australia. The case study approach is concerned with the complexity and particular nature of a given situation (Stake 1995), and the extensive examination associated with a single event, in a specific location (Bryman 2001). The case study approach is adopted to allow the examination of unique

features of each case, providing a better understanding of impacts and issues resulting from policy and management reducing PSB consumption.

Theoretically case studies are categorised into; critical, unique or extreme, revelatory or comparative (Bryman 2001). While these case studies contain aspects of all of these elements, I am aiming to learn about the factors in each case that leads to the successful take up and acceptance of policies. Ireland's experience particularly, demonstrates all three factors of case studies, new, it has a unique situation, has international interest, and the elements for comparison.

The case studies presented are located at a national level, and could be identified as a cross-cultural comparative design. Comparing these case studies will provide an opportunity to understand each individual situation, and allows for differences and similarities to be drawn between each experience.¹⁹ Outcomes can be drawn from the impact of policy instruments, while not taking away each case's specific contextual factors and individual reactions. These case studies are presented to demonstrate and identify the complexities of policy implementation specific to plastic shopping bag use and to provide an understanding of each context's effect on the success of policy tools.

A comparative design provides a better situation to create theories (Yin 1984 and Eisenhardt 1989) about the impacts of policy tools on plastic bag consumption. However, the comparison of case studies has been criticised as detracting from specific contextual elements of each case, as attention is averted to the ways in which cases can be contrasted (Dyer and Wilkins 1991). In this research case studies are intended to demonstrate the contextual and specific impacts of policies to reduce plastic bag consumption, and provide an understanding of potential and probable impacts and reactions. The case studies are not intended to provide an intense comparison of experiences, and will not result in a theory of

¹⁹ The undertaking a comparative design cross culturally are sensitive to the difficulties of all cross-cultural research. Difficulties include issues such as comparability, cultural variations and differences, validity of data/evidence used, and accessibility. This research is based on both qualitative and quantitative research methods and is particularly sensitive to these difficulties. However the lack of an intense comparison between cases presented, taking contextual factors into consideration, and allowing for New Zealand specific attitudes and realities goes some way to address these difficulties.

generalised impacts and acceptance of such policies to distract from the contextual insights associated with qualitative case studies (Bryman 2001). The case studies provide in depth examples of international practice, illustrating two policy options. In addition, the lessons learnt in each application serves to highlight aspects that policy writers need to be aware of, or need of specific attention, as well as encouraging innovative tools for change in New Zealand.

Objective 4: Policy Analysis, Addressing Plastic Shopping Bag Use in New Zealand.

Many of the potential policy options for management of PSB use include the use or encouragement of alternatives to PSB. It is important that the endorsed alternatives are not more damaging or have significant negative impacts. The alternatives to PSB are identified through existing literature, as well as additional alternative options available in New Zealand. Literature is used to investigate and compare the environmental impacts of alternatives as a full LCA is outside the scope of this research. The exploration of alternatives to PSB provides an introductory analysis of alternatives to PSB production, use, life span and disposal.

The potential policy tools for the management of PSB are: regulation, economic instruments, voluntary measures, and information and education campaigns. A limited review of tools will determine what the tool is, how it works, and how it would be applied to New Zealand to manage PSB. For brevity the full list of policy options to address PSB is presented in appendix 9. While all the policy options are explored, only three are analysed using the full set of measures presented in the mixed comparative model. As outlined in my conceptual framework a mixed comparative methodology is used to acknowledge the many complexities of environmental management issues.

This research aims to provide a snapshot of New Zealand's attitudes, use and potential management options for PSB, and does not recommend a single approach to address PSB in New Zealand. The absence of a recommendation is in light of the realities of environmental policy approaches in New Zealand. Even if a policy tool is recommended the likelihood of uptake is significantly inhibited by environmental policy history, and that public concern must be of a significant level for government to address PSB. The

environmental impacts of PSB have driven public concern about the use of PSB in Australia, Ireland and around the world; I now turn to investigate the environmental impacts of PSB.

3 Environmental Impacts of Plastic Shopping Bags

This chapter investigates the environmental impacts of PSB, and their contribution to the wider issue of plastic litter and pollution. The environmental impacts of PSB are directly related to the effects of pollution from littered plastic bags. These impacts are aesthetic disturbance, effects of litter on marine life, wildlife and livestock, and the socio economic impacts from flooding caused by blocked drains and sewers. Additional to the impacts of plastic bags, there are less known environmental impacts associated to the manufacture and use of plastic.²⁰ The environmental impacts of plastic have been researched from the nineteen seventies, and new discoveries are being made continually. Research is presenting alarming results as to the disruption of reproduction and behaviours of animals, food chains and ecosystem functions. Compounding these impacts is the fact that plastic is used heavily in the packaging mix and is the most common item found littered.

Plastic Shopping Bags as Litter

Plastic bags are the last item added to the packaging mix, supplied at the point of sale for the transport or separation of goods and materials. Plastic bags are commonly used as a disposable item and are highly likely to be discarded after an initial use. The method of disposal of plastic bags is greatly affected by the destination of the plastic bag. Plastic bags used in outdoor destinations, such as picnics and sports events, are more likely to be littered or thrown away before a subsequent use is possible. In comparison bags whose destination is 'home' are more likely to be reused or recycled (Nolan ITU 2002b, ACG 2005 and EPCH 2007). Australian research estimates between 6-9 percent of plastic bags are littered, that is between 40-60 million (ACG 2006 Page vi). It is estimated that New

²⁰ To an extent public concern about PSB is currently absorbed by the environmental impacts of littered PSB, and is less focussed on the oil use of PSB. PSB proponents draw attention to ethene is produced by oil refinement for vehicle fuel; therefore its production is unlikely to drop (Cadman et al 2005). However the resource use argument is that this ethene no longer used for PSB could easily be chemical feedstock for other uses (Cadman et al 2005) such as medical apparatus, other packaging, and other materials made from or partially from ethene based plastics.

Zealanders litter between 14.7 and 22 million plastic bags annually (Authors Calculation). Plastic bags become litter in two ways, intentional and inadvertent littering. Inadvertent littering includes bags blown from bins, recycling and landfill sites (Nolan ITU 2002b, ACG 2006 and EPHC 2007). While some littered bags are collected through municipal litter collections (it is suggested 0.2 percent of littered bags are cleaned up (ACG 2006)), other bags persist in urban and rural environments. These bags either become air/water-borne litter, or remain stationary eventually disintegrating into minute pieces. The number of plastic bags in the environment is effectively cumulative due to plastic bags durability and life span as litter (EPHC 2007).

Notwithstanding their durability, plastic bags are environmentally degradable, meaning that they disintegrate when exposed to natural environmental forces such as ultra-violet rays, wind or water. Plastic bags disintegrate or erode to the point where there is “plastic dust” (Algalita Marine Research Foundation (AMRF) 2006) or minute pieces of plastic that are left in the environment. However, plastic bags do not readily erode and there are numerous estimates for degradation times, ranging from 50 years up to 1000 years (Westway 2004, Williams 2004). The rate of degradation depends on both the composition of the bag and the environmental situation of the receiving environment (Williams 1992)²¹. Plastic bags take much longer to break down in water than on land,²² thus compounding impacts from a plastic bag’s persistence over time (EPHC 2007 Page 24). A HDPE singlet bag is estimated to persist as litter for two years before it is reduced to small particles, and will float in water for six months before sinking (James and Grant 2005). This persistence of plastic bags in the environment leads to increased visual pollution, creating aesthetic disturbance.

²¹ Environmental factors affecting the degradability are physical chemical factors, such as pH, temperature, soil structure, redox potential, moisture, nutrient and oxygen availability, and the presence of inhibitors (Williams 1992). Microbiological factors affecting the degradation are, the abundance, distribution, diversity, activity and adaptation (Palmisano and Pettigrew 1992).

²² Due to lower seawater temperature compared to ambient air temperature (EPCH 2007 Page 24).

Aesthetic Impacts of Littered Plastic Shopping Bags

The aesthetic disturbance of littered plastic bags has arisen in recent years as plastic bags have been identified as an environmental and consumer nuisance, both domestically and internationally. The pervasive nature of littered PSB is demonstrated in Australia, where plastic bags are in the top 20 items collected in litter clean-ups (ACG 2006). Litter surveys and litter clean ups list plastic items as the most common material found (Marine Conservation Society (MCS) 2006, Clean Up Australia 2001, 2002, 2003, 2004, 2005 and 2006).²³ During the International Coastal Clean Up (organised by the Ocean Conservancy) in 2002 plastic bags made-up 5.4 percent of all litter collected, were the eighth most common item found, as well as being first in the dangerous debris list (MCS 2004, ACG 2006).²⁴

While New Zealanders have named plastic bags as the number one litter problem (New Zealand Paperboard Packaging Association (NZPPA) 2005) there is a lack of evidence to support this belief.²⁵ The characteristics of plastic bags lead to their prominence in the litter stream, characteristics such as visibility, persistence and ease of dispersal (EPHC 2007 Page 22). These characteristics contribute the difference in the perception of the environmental impact and the actual environmental impact of plastic bags. Despite the disagreements between campaigners about the beliefs and actual impacts of plastic bags,²⁶ community concerns about the consumption of plastic bags and their visibility as litter and waste are considered to be “representative of much broader concerns about plastic and packaging” (Nolan ITU 2002a Page 2). Moreover, plastic bags that exist as litter and pollution can be seen as symbolic of our “throw-away” (Denne, Livesey and McNeil 1989), and “wasteful” society (PBWG 2002). Plastic bags have become a politically incorrect symbol of the threat to the environment (Byars 1995). While plastic bags by

²³ Clean Up Australia’s annual Rubbish Reports has placed plastic as the most common material found, at levels of 2001 34%, 2002 34%, 2003 36%, 2004 37%, 2005 32% and 2006 33.7%. The MCS (2004) reports that across international surveys plastic accounts for more than 50% materials found and 162 pieces are found per kilometre of beach in the United Kingdom (MCS 2003).

²⁴ Dangerous debris are defined as debris that have maimed or killed animals, debris are listed according to the number of animals found dead on the survey, either entangled or ingested by animal (MCS 2004)

²⁵ Litter Problem of Packaging, Plastic bags listed as number one, 49% respondents say huge problem, 29% problem, 12% neither, 6% not much of a problem, 4% no problem at all (NZPPA 2005 Page 18).

²⁶ Pro plastic bag campaigners refute the argument there is a real environmental threat from plastic bags (Scottish Carrier Bag Consortium 2005).

themselves may not be a large environmental threat, they are symbolic of deeper environmental and resource use concerns (Nolan ITU 2002b). Nolan ITU (2002b Page 2) identifies that these concerns need to be addressed, with respect and specific attention required to these social and cultural issues, as well as scientific and economic issues (Nolan ITU 2002b). A significant social concern is the ecological impacts of using and littering PSB.

Ecological Impacts of Plastic Shopping Bags

The majority of ecological impacts of plastic bags are a result of the effects from plastic bags as litter and pollution. Environmental impacts are evident both from bags as a whole item, littered raw plastic materials and from littered bags that have eroded in the environment to release microscopic plastic particles. In this way, littered plastic bags contribute to the larger issue of plastic pollution.

Terrestrial plastic bag litter does not appear to be a major problem for wildlife (Nolan ITU 2002b & ACG 2006). However livestock have been known to consume plastic bags, causing illness and fatalities (KIMO 2000). In contrast, plastic bags are a common sight in the marine environment, and cause a myriad of problems for wildlife. The impacts of marine litter are compounded by land-based sources contributing up to 80 percent of marine debris (Gregory 1989, 1991).²⁷ However there have been documented cases of ocean borne plastic bags being blown onshore and inland causing terrestrial problems (Wace 1995). Marine pollution is not limited to near shore; plastic bags have been found more than 300 kilometres offshore, trapped in undersea lava formations 3.2 kilometres below the surface (Dive Discover 2006). This demonstrates how easily plastic bags and other marine litter can be dispersed. Litter can travel thousands of miles being carried by oceanic currents (Ebbesmeyer 2003) far away from the source of litter. The ability of marine litter to be dispersed widely increases the potential for litter to become entangled with or ingested by marine life.

²⁷ Sources include; people that litter, municipal landfills, transportation of garbage and debris, open trash collection containers at businesses or public venues, industrial facilities, beach visitors (www.plasticdebris.org, Accessed 12/10/06).

Marine Entanglement

Marine wildlife can become entangled in plastic bags and other marine debris, inhibiting movement and normal behaviour. This reduces the ability of animals to hunt, feed, reproduce, and breathe, potentially leading to death. Furthermore, after the effected animal dies, the plastic bag (or marine debris) is often freed, and able to entangle or be ingested by another animal (EPHC 2007, Department of Conservation (New Zealand) 1990, Mattlin and Cawthorn 1986). The United Kingdom's Marine Conservation Society suggests that more than a million seabirds and 100,000 mammals and sea turtles die globally each year from entanglement in, or ingestion of plastics (Owen 2006). Wallace's 1985 study of "Debris Entanglement in the Marine Environment" estimated that 100,000 marine mammal deaths per year in the North Pacific related to entanglement. While Laist's 1997 study found at least 267 species worldwide had been affected through both entanglement and ingestion of marine debris (see figure 3 below), including sea turtles, seabirds, marine mammals as well as numerous fish and crustaceans.²⁸

Figure 3. Marine Ingestion and Entanglement of Marine Plastic Litter

In addition to the commonly reported and emotive wildlife entanglements, plastic bags and other marine debris also become entangled in corals. Endangering the entire reef ecosystem by smothering corals (Donohue et al 2001, Donohue 2005, US National Oceanic and Atmospheric Administration 2006, Donohue and Foley 2007), preventing essential sunlight

²⁸ These species include 86% all sea turtles species, 44% all seabird species and 43% all marine mammal species (Laist 1997). For further reading Please see: Ainley et al 1990, Day 1980, Day et al 1985, Balaz 1985, Fowler 1987, Fry et al 1987, Ryan 1987, Ryan, Connell and Gardner 1988, Robards 1993, Bjorndal et al 1994, Laist 1997, Ogi 1990, Ryan 1990, Moore et al 2001, Boren et al 2006 (New Zealand fur seals).

from reaching corals (Goldberg 1997 and MCS 2004), or becoming entangled in the coral and breaking the coral heads through wave motion (Donohue et al 2001, Donohue 2005) seen below in figure 4. A further issue of marine litter is the ingestion of sea borne debris by marine life.

Figure 4. Plastic Shopping Bag Smothering Coral

Marine Ingestion

There is consensus that the ingestion of plastic bags and marine debris is the result of plastic bags looking like food, such as a jellyfish or squid. Additionally to the documented turtles and sea birds ingesting plastic bags, whales, dolphins, manatees, and large fish also ingest plastic bags and other marine litter.²⁹ Turtles are frequently found with plastic bags blocking the oesophagus, stomach or intestines.³⁰ Plastic bags blocking digestive tracts can inhibit proper feeding, that eventually leads to death by starvation. The ingestion of plastics reduces feeding stimulus (Ryan 1988, Azzarello and Van-Vleet 1987), hinders fat deposits, effecting migration and breeding (Connor and Smith 1982), gastric enzyme secretion, lower steroid hormone levels, delayed ovulation and reproductive failure (Azzarello and Van-Vleet 1987). Moreover, the ingestion of plastic materials leads to the accumulation of toxic chemicals, polychlorinated biphenyls (PCB) and heavy metals (Carpenter and Smith 1972, Carpenter et al 1972, Rothstein 1973, Ryan, Connell, and Gardner 1988, Zitko and

²⁹ In 2002 a Minke whale was found with 800kg of plastic bags and packaging in its stomach (GECC 2002). A Cuviers beaked whale (predominately a deep sea species) was found washed up in Scotland in 2004. Under study it was discovered that “the entrance to the stomach was completely blocked with a cylinder of tightly packed shredded black plastic bin-liner bags and fishing twine” (Hebridean Whale and Dolphin Trust 2006). See also Derriak 2002, for a review of marine ingestion research.

³⁰ Thomas et al (2002) found 75.9% of captured Loggerhead turtles had plastic debris in their digestive tracts. See also Balzars (1985), Mattlin and Cawthorn (1986), Carr 1986, 1987, O’Hara et al (1988), Bugoni et al (1994), Godley et al (1998), Reid (1998), and Laist (1997), Bugoni et al 2001, and Tomas et al 2002.

Hanlon 1991, Moore et al 2001, Lee et al 2001, Casey 2007). There are serious impacts to animals and species survival when plastic is ingested, putting pressure on biodiversity of marine life.

Ocean biodiversity is further impacted by marine debris, like plastic bags, that are used by 'invader species' that are bio-security hazards. These species use marine debris to travel long distances and find new habitats to invade (Winston 1982, Gregory (1991) Winston, Gregory and Stevens 1997, Derraik 2002, Greenpeace 2006).³¹ It is thought that the bryozoan *Membranipora tuberculata* came to New Zealand over the Tasman Sea from Australia on plastic pellets (Gregory 1978). Despite this evidence there are those who remain sceptical of the impacts of littered PSB and other marine debris.

While there is sufficient evidence of the impacts of entanglement and ingestion of plastic and other marine debris, this research is often criticised when used in anti-litter or anti plastic bag campaigns. Entanglement and ingestion research is problematic, therefore the frequency and quantity of research undertaken is limited. The nature of entanglement and ingestion research is problematic due to expense, labour intensive, and time consuming. Equipment and labour required for marine based research is expensive and offshore research is particularly demanding. Land based entanglement research is dependent on what is washed up and currents that are affected by weather events. Despite these limitations, the problem of entanglement may be underestimated, as most victims are likely undiscovered over vast oceans, as they either sink or are eaten by predators (Wolfe 1987). Moreover, the steady growth in the quantity of debris also contributes to the underestimation of marine entanglement and ingestion, as increased marine debris leads to increased entanglement and ingestion of debris.

³¹ Floating plastics can provide a ready surface for organisms to live on, plants and animals can be transported far outside their normal habitat, invading new habitats and possibly become nuisance species (Greenpeace <http://oceans.greenpeace.org/en/our-oceans/pollution/trash-vortex> Accessed 12/10/06). Plastics floating at sea can acquire encrusting organisms such as bacteria, diatoms, algae, barnacles, hydroids, and tunicates (Carpenter et al 1972, Carpenter and Smith 1972, Michin 1996, Clark 1997).

Plastic Marine Debris

In the last decade there have been noted increases in the levels of marine and terrestrial litter. The most significant component of litter across all collections and research is plastic, specifically plastic packaging. The impacts of littered plastic have been discovered to last well past the life of the product made from plastic, as plastic continues to have an impact across ecosystems and down to minute microscopic levels. Moreover, plastic marine debris has been found to contain toxic chemicals, and to absorb toxic pollutants from the environment. This makes the impacts of plastic ingestion and ubiquitous plastic pollution serious and potentially devastating for entire food chains.

In the United Kingdom the density of litter on beaches is increasing. In 2006 there was 1,988.7 items of litter per kilometre of coast (MCS 2007). This represents an overall increase in litter density on beaches of 90.3 percent since litter surveys began in 1994 (1,045 items of litter per kilometre in 1994, and 1,981 in 1995) (MCS 2007). While it is estimated that ships discard 6.5 million tonnes of plastic annually (Clark 1997), the impacts of marine litter is compounded by land-based sources. A litter clean up in New Zealand in 1990 found 1,000 items of litter per kilometre (Smith and Tooker 1990), and the litter found was predominantly from foreign sources (Gregory and Ryan 1997).³² Pacific nations are vulnerable to the greatest impact of foreign origin marine debris (Hay 1992), much of which is brought near shore and coastal areas due to weather conditions and ocean currents (Morishige et al 2007). The marine debris and litter has a significant impact on Pacific nation's subsistence fishing and tourism. Conversely, it is noted that while litter is a negative impact on tourism, the act of tourism itself generates a large amount of waste and litter, which also has a significant impact on Pacific nations (Gregory 1999).

The same beach clean in United Kingdom as mentioned above, also discovered that 75 percent of litter collected was plastic (Smith and Tooker 1990). Consistent with international collections, plastic is the most prevalent item collected in litter clean ups, and has consistently accounted for more than 50 percent of litter in United Kingdom litter

³² The Greenpeace N.Z. "Adopt-a-Beach" Campaign, October 1989-May 1990. The litter found during this clean up had a significantly high proportion of foreign origin debris, 10:1 foreign litter to New Zealand origin litter (Gregory and Ryan 1997).

surveys (MCS 2007) and between 60-90 percent in marine surveys (Galangi et al 1995, Gregory and Ryan 1997, Takada et al 2006, Rios, Moore, and Jones 2007, & Morishige, et al 2007).

The abundance of plastic debris found throughout the world's oceans is widely documented (Colton et al. 1974, Shiber 1979; Ryan 1988, Palmisano and Pettigrew 1992, Shaw and Day 1994; Golberg 1995, Gregory 1996, Gregory and Ryan 1997, Guillet 1997, Gregory 1999, Henderson 2001, Derraik 2002, Ericksson and Burton 2003, Otley and Ingham 2003, McDermid and McMullen 2004, Thompson et al 2004, Moore et al 2001, 2002, Barnes 2005, Takada 2006, Rios, Moore and Jones 2007, Morishige et al 2007). Moreover, there has been a documented increase in the abundance of plastic in the oceans (Day and Shaw 1987, Day, Shaw and Igrell 1990, Moore et al 2001), and a documented increase in the frequency and amount of plastic ingested by marine life as a result of the increased amounts of plastic (Robards, Piatt and Wohl 1995). As a result of the current conditions, plastics have been identified as an important global marine pollution problem for the twenty first century; due to the pervasiveness plastic pollution is a chronic and global problem (Gregory 1999).

Figure 5 Plastic Resin Pellets (Source Takada 2006)

Littered plastic is not isolated to the littering of used PSB and other plastic items, but occurs at all stages of plastic and packaging life stages. An environmental impact of the manufacture of plastic bags and other plastic materials is from pollution from the raw plastic material pellets used to make plastic items (Rios, Moore and Jones 2007, Takada et

al 2006, Moore et al 2001, Mato et al 2001, Ryan 1988, Ryan, Connell and Gardner 1988.³³ Plastic pellets, the raw material plastic, are the least noticeable forms of plastic pollution due to their size and colour (1-5mm across and clear, white, or off white the most common (Redford, Trulli and Trulli 1997, Gregory 1999, & Takada et al 2006)). However they are the most ubiquitous form of plastic pollution in oceans and on beaches worldwide (Redford, Trulli and Trulli 1997). Plastic pellets are found across the Pacific, and in surprising quantities for the remote non-industrialized places such as Tonga, Rarotonga and Fiji (Gregory 1999). On New Zealand beaches they are found in considerable amounts, in counts over 100,000 raw plastic granules per square metre of coast (Gregory 1989).

Toxic Chemicals and Persistent Organic Pollutants

Plastic contains toxic chemicals, and due to plastic's material qualities it also absorbs toxic pollutants from the environment. Raw plastic pellets are the best type of transport for persistent organic pollutants (POPs) such as DDT³⁴, PCBs, bisphenol A (BPA), perfluorooctanoic acid (PFOAs), poly-bromated diphenyl ethers (PBDE), phthalates (Casey 2007) and nonylphenols (NP) DDE (Mato et al 2007). Pellets can absorb up to one million times the amount of chemicals in the surrounding waters, making the pellets toxic and saturated with poison (Moore 2007). A significant concern related to these toxic pellets is their resemblance to fish eggs, leading to millions of fish consuming these toxic pellets, which we then catch and eat (Casey 2007).

In addition to the raw plastic pellets another lesser known litter and environmental problem is the plastic "scrubbers" used in hand cleaners, cosmetics, and air blasting (Gregory 1996). These plastic scrubbers are up to 0.5 millimetres wide, and are often polyethylene or polystyrene (Gregory 1996, Zitko and Hanson 1991). Moreover, the plastic scrubbers used in air blasting to remove paint off metal surfaces are often reused up to six times. As a result of reuse, the scrubbers contain heavy metals, and when plastic scrubbers are eventually disposed of they are often discarded in wastewater and taken out to sea (Gregory 1996).

³³ Packaging manufacturing is resource and energy intensive, with 93% of materials not used in the final product, and 80% of the final products are discarded after a single use (MFE 2002a).

³⁴ DDT (dichloro-diphenyl-trichloroethane), a pesticide and insecticide used in the late 1940s, greatly restricted in the 1970s and now banned for general use in the US and Canada (Rios, Moore and Jones 2007).

Biological Impacts of Plastic Pollution

The ever-increasing quantity of plastic in the environment produces cumulative impacts damaging flora and fauna. Plastic polymers remain in the environment, and are never absorbed into environmental cycles. These inorganic plastic particles sit in food chains, creating problems such as false feelings of satiation when ingested (Moore 2002), reduces feeding stimuli (Ryan 1988 and Azzarello and Van-Vleet 1987), hinders fat build up that effects migration and breeding (Connor and Smith 1982), effects gastric enzyme secretion, reduces steroid hormone levels, delays ovulation, resulting in reproductive failure (Azzarello and Van-Vleet 1987), creates internal injuries and death (Derraik 2002).

Moreover the ingestion of plastic materials leads to the accumulation of toxic chemicals (Ryan et al 1986, Carpenter and Smith 1972, Carpenter et al 1972, Rothstein 1973, Zitko and Hanlon 1991, Mato et al 2001), heavy metals (Moore et al 2001, Casey 2007) and persistent organic pollutants (POPs) (Ryan 1988, Ryan et al 1988, Mato et al 2001, Lee, Tanabe and Koh 2001, Takada et al 2006, Rios, Moore and Jones 2007). The build up of these chemicals can lead to reproductive disorders, increased risk of disease, disruption of the endocrine system, and death (Carpenter et al 1972, Bourne and Imber 1982, van Franeker 1985, Ryan, Connell, and Gardner 1988, Ryan 1988, Soto, Justicia, Wray and Sonnernsnein 1991, Jobling and Sumpter 1993, Jobling et al 1996, Routledge and Sumpter 1996, Auman, Ludwig, Giesg and Colborn 1997, and Lee, Tanabe and Koh 2001).

In addition to the build up of plastic associated chemicals, there is evidence of plastic pollution on the seafloor. Research has found 80-85 percent of seafloor samples contain debris (Kanehiro et al 1995). Plastic pollution at this level interferes with the benthic biota (Hess et al 1999, Lee, Tanabe and Koh 2001), seafloor biota and ecosystem functions (Goldberg 1994, Gregory, 1996 & Goldberg1997).³⁵ A further area of similar research is the rapidly escalating Garbage Patch in the South Pacific.

The Garbage Patch

This area of the Pacific Ocean has a high concentration of human produced ocean waste; this is due to the Central Pacific Gyre. One thousand nautical miles between the

³⁵ Plastic pollution at this level inhibits the gas exchange with water and sediment, anoxia or hypoxia in the benthos effects this ecosystem function and biota (Goldberg 1994).

Californian coast and Hawaii, currents move water-borne litter (which is as small as plastic polymers and as large as shipping containers) to this area, now known as the “Garbage Patch” (Bock 2006). The Garbage Patch is an accumulation of waste from around the world, and represents the impacts of waste at both the macro and micro levels. The “Garbage Patch” is twice the size of Texas³⁶ and the flotsam is dispersed, floating at all levels in the water column (Bock 2006, Thompson et al 2004, and Moore and Allen 2000). Seawater samples in this area have produced results of a ratio of one pound of plankton to six pounds of plastic particles (Moore et al 2001 and AMRF 2002).³⁷ This ratio of plastic to plankton provides a serious global threat to marine biota (Derraik 2002 and AMRF 2002) and ecosystems in and dependant on oceans (Goldberg 1994 & Takada 2006).

Plastic pollution is a pervasive and global environmental threat. More than forty years of records show that there is plastic debris in ocean samples from the poles to the equator (Thompson et al 2004). Results from these samples have demonstrated there was approximately three times more plastic in the water column in the 1990s compared with the 1960s, a significant increase (Owen 2004 and Thompson et al 2004). The amount of plastic material in the ocean is continuing to increase over time (Day and Shaw 1987 and Moore et al 2001). The levels of plastic particulates in the Pacific have at least tripled in the last ten years and a prediction of a tenfold increase in the next decade is considered to be reasonable, at that time there will be sixty times more plastic than plankton will float on the oceans surface (Moore 2002 & Thompson et al 2004). This level of plastic pollution has the potential to create significant socio-economic impacts additional to the current impacts of plastic debris.

³⁶ In 2003 oceanographer Curtis Ebbesmeyer (flotsam researcher) refers to the area as the "eastern garbage patch, and estimates the garbage patch to be roughly the size of Texas (Moore 2003, Greenpeace <http://oceans.greenpeace.org/en/our-oceans/pollution/trash-vortex>, Ebbesmeyer, 2004 Beachcombing Science from Bath Toys, www.beachcombers.org/RubberDuckies.html. Moore indicates that latest research from AMRF in the garbage patch shows it has grown rapidly over four years, and is now twice the size of Texas (Casey 2007).

³⁷ www.algalita.org/research_ffs.html Accessed 12/10/06.

Socio-Economic Implications of Environmental Impacts

The socio-economic impacts associated to the impacts of littered plastic bags are the impacts from floods caused by blocked drains and sewers, negative impacts on tourism, and the damage to property and infrastructure caused by plastic bags.

Littered plastic bags have had devastating effects in Bangladesh, and have resulted in non-negotiable plastic bag management by authorities. Bangladesh banned the distribution of plastic bags after plastic bags and other packaging blocked storm-water drains preventing drainage, and amplifying the massive floods in 2002. The aggravated floods increased the already immense damage, casualties, and fatalities caused by the floods. After floods there are well known concerns surrounding sanitation, drinking water and the spread of disease. Longer-term issues in post flood areas are the impacts to economic viability, especially where agricultural and farming land has been damaged, and the social/cultural well being of people.

Further socio economic impacts of littered PSB are the damage caused to property and infrastructure. Major infrastructure was damaged in the Bangladesh floods, and causing ongoing infrastructure and government pressure. In a context closer to home PSB have also been the cause in damage to property as a result of being littered. Littered plastic bags damage or ‘cook’ boat engines when wrapped around propellers and water intakes (Kearney 2007), causing engine failure, which can be potentially life threatening (National Research Council (USA) 1995 & MCS 2004). Littered bags can also damage cars, as demonstrated during the V8 Supercar 2002 “Bathurst 100” race. Two drivers were forced to stop when plastic bags blocked cooling mechanisms, overheating the cars.³⁸ These forced stops during a race had the potential cause a loss, which would have impacts on the racing team and economy based on the V8 Supercar series. Other potential industry loss from littered PSB exists in the tourism industry.

³⁸ Three bags got caught on Mark Skaife’s car, blocking the radiator cooling which required an unscheduled stop. Craig Lowndes was also stopped in the same race by plastic bags catching on his car (www.v8supercar.com.au/news/latestnews/newsdisplay).

The impact of littered plastic bags on tourism has been noted in Australia, Pacific and Ireland. Australian public awareness of littered plastic bags was gained by the damage to the environment leading to the loss of visual amenity and aquatic life (EPHC 2007). Specifically, the impacts on endangered Loggerhead and Leatherback turtles, and more recently impacts on coral and reef ecosystems (NOAA 2006). Both the loss of visual amenity and biodiversity due to marine litter would also have significant impacts on environmental tourism to the Great Barrier Reef and other environment-based attractions in Australia.

Pacific nations have been identified as being subject to international marine litter, and suffering the consequences of the impacts on fishing and tourism (Hay 1992, Gregory 1999 and Morishige et al 2007), moreover Pacific nations bear the brunt of impacts to tourism from marine debris and a loss of biodiversity (Gregory 1999). The arrival of marine litter on Pacific nations is unquestionably due to the islands geographic locations, and ocean currents delivering marine litter to coasts (Morishige et al 2007). Also unavoidable is the uneven cost distribution created by the clean up and disposal of foreign origin debris for Pacific nations (Gregory 1999).³⁹ The Pacific nations are in a predicament, as tourism is a major economic input to the Pacific, but it tourism is also intensifying the problems and costs of litter and waste management.⁴⁰

The impact of littered plastic bags on tourism was also noted in Ireland, and as a result the government introduced a €0.15 on plastic bags, commonly known as the “PlasTax”.⁴¹ Factors leading to intervention in these countries were the large number of bags that are littered each day to accumulate in trees, hedges, fences and drains around urban and rural areas,⁴² creating aesthetic and potential economic disturbance to tourism.

³⁹ The economic impacts from environmental damage relate to the cost of damage to society (infrastructure, well being and economic damage), the costs of clean up from flooding or litter, and long-term human impacts.

⁴⁰ Initially tourism was hailed as the economic development saviour of the Pacific in the face of limited resources (Hall 1987 KRTA 1992 and Hay 1992). Now in the face of waste disposal problems where land is scarce and the seashore close (Wendt 1992, Morrison 1991, Minerbi 1992 and UNEP/SPREP 1997 in Gregory 1999) tourism is in itself a threat to tourism due to increased waste and littering (Minerbi 1992 & Kortegast 1994).

⁴¹ For further information please see international case studies, Ireland’s PlasTax.

⁴² Ireland’s litter reports show that 5% of bags were being littered prior to the “PlasTax” (DEHLG 2004).

Further to the social and economic implications of environmental damage are legal implications of litter. The creation, administration and enforcement of littering legislation, needs to take into consideration the allocation of responsibility, cost, interaction with current law and international obligations (such as MARPOL 1973/1978 Protocol to the International Convention for the Prevention of Pollution from Ships),⁴³ as well as the social implications of legislation when assessing the impacts of littering, and the environmental damage from littered plastic bags.

There are potentially further social impacts as a result of the environmental impacts of littered plastic bags and plastic, such as the large-scale impact of plastic on ecosystem functions, reproductive capabilities of animals (including humans), and impacts of food webs. However these issues are at this stage hypothetical and beyond the framework of this thesis.

The aim of this chapter was to investigate the environmental impacts from PSB, and has found that the environmental impacts are attributed in the main to littered PSB.

Environmental impacts can be organised into three groups, aesthetic disturbance, ecological impacts and socio-economic impacts. The negative aesthetic impacts are caused by the visibility of plastic bags and the high numbers of bags littered. While there are uncertainties of whether plastic bags are as problematic as they are perceived, the fact that plastic bags have created such a degree of community concern has been considered to represent wider community concern about deeper environmental issues. These wider environmental and resource use concerns have come to be symbolised by the visible and pervasive PSB. For this reason, any actions and reactions from government will be representative of government's acknowledgement of public concerns, and could have a significant impact on public opinion and the uptake of any future measures for sustainability.

⁴³ MARPOL 1973/1978 is the international legislation, addressing marine pollution. Annex V of MARPOL restricts discharge, or at sea disposal of plastics and other synthetic materials (Pearce 1992). MARPOL applies to all watercraft, including small recreational boats (Nee 1990). Seventy-nine countries have ratified Annex V (Centre for Marine Conservation 2002).

The majority of ecological impacts of plastic bags are a result of the effects from PSB as litter and pollution. Environmental impacts are evident from bags as a whole item, and there are significant levels of ingestion and entanglement of PSB, littered raw plastic materials and from littered bags that have eroded in the environment releasing minute and microscopic plastic polymers. It is in this way PSB contribute to the larger issue of plastic pollution.⁴⁴ Plastic pollution is having serious implications on biological functions of animals, reproduction capabilities, toxicity, survival, ocean biodiversity, and ecosystem functioning. The cumulative and increasing levels of plastic debris in oceans so significant a tenfold increase in plastic marine debris is not unreasonable (Casey 2007).

The socio-economic implications from the environmental impacts of PSB are associated to the damage caused by littered plastic bags. Damage to property and infrastructure is as large as flooding and fatalities in Bangladesh, to localised damaged engines in boats and cars, which are also potentially fatal. Littered PSB are also identified as a threat to tourism, through both the environmental effects of plastic bags (such as the loss of biodiversity and damage to local environmental features) and the negative aesthetic impacts of littered PSB. The environmental impacts of plastic bags are the aesthetic disturbance of the environment, significant ecological and biological damage, potentially widespread ecosystem impairment, and socio-economic impacts of flooding, damage to infrastructure and property, and damage to tourism and environmental attractions.

⁴⁴ “My feeling is that plastic bags will almost certainly contribute to the micro-plastics we’re finding” in response to increases in plastic fragments in sea floor sediments (Thompson et al 2004)

4 New Zealand Use, Disposal and Current Management

New Zealand's Plastic Shopping Bag Consumption

Due to limitations in New Zealand's data on PSB, Australian data for PSB consumption is also presented. Prior to PSB reduction campaigns Australians used 6.9 billion bags annually (Nolan ITU 2002). This comprehensive Australian data was a result of government interest and investment following Ireland's tax on PSB in 2002. A PSB working party was created and initiated further Australian research. Of these, 6 billion were HDPE bags (86.9 percent), and 0.9 billion were LDPE bags (13 percent) (Nolan ITU 2002b). As a result of the PSB reduction campaigns Australian consumption of HDPE plastic bags has decreased to 3.2 billion annually (Hyder Consulting 2006). Over the four-year period plastic bag data was collected (2002-2006); there was a reduction of 2.03 billion bags, or 34 percent (Hyder Consulting 2006).

There is no comprehensive data for New Zealand's PSB use and life cycle. While partial data is available to inform estimates, until there is a full life cycle analysis of PSB we are unlikely to have a definitive estimate of New Zealand PSB consumption. The only available New Zealand data is from a study commissioned by the Christchurch City Council to investigate their kerbside recycling collection of PSB. While this data is not comprehensive it provides the only New Zealand specific information of use and life cycle estimates. Despite the lack of New Zealand data there are a number of ways to estimate the consumption of PSB using the limited New Zealand data and international use models. These estimates are presented below.

At the time of this research the only New Zealand data was from a study into Christchurch City Councils kerbside recycling of PSB (Field Connection 2005). This data provides for a calculation of an estimate of 244.74 million HDPE bags used annually in New Zealand (Authors Calculations 2007). As shown in Table 2 below, this consumption is just over one

bag a week per capita, or 61 bags a year per person (Authors Calculations 2007). This estimate is based on the assumption that there are no large demographic or consumer behaviour differences between Christchurch's population and New Zealand's population. However, it is noted that PSB consumption may be lower in Christchurch due to information and awareness campaigns run within the city, which to advertise kerbside recycling of PSB and alternatives to PSB. As a result it is possible that New Zealand's average consumption of PSB is higher than the estimates presented here.

Table 2: New Zealand Plastic Shopping Bag Consumption Estimates

Bag Use	Weekly Consumption Estimates	Annual Consumption Estimates
Per capita	1.17	61.19
New Zealand	4,706,560	244,741,120

(Source Data: Field Connection 2005)

International use patterns can also be used to estimate national consumption. New Zealand and Australia's use patterns are considered to be comparable due to similarities in our culture and lifestyles. Recent estimates suggest that Australians use 3.69 PSB a week, or 192 HDPE bags per person annually (Hyder Consulting 2005 Page 7). Based on Australian data, and adjusted for population size, it is estimated that New Zealand consumes over 14 million a week, 768 million PSB annually.⁴⁵ This estimate is similar to ZeroWaste New Zealand's (2006) PSB consumption estimate of 800 million bags a year.

Another approach used to estimate national PSB use is by way of information provided in the Packaging Council (NZPC 2005) one-year report on the New Zealand Packaging Accord (NZPA) (MFE 2004). This report states that retail signatories used 720 million plastic bags (NZPC 2005), and that the retail signatories of the NZPA 2004 represent 95 percent of supermarkets in New Zealand (NZPC 2005). Using Nolan ITU's (2002b) data that supermarkets use 53 percent of all HDPE plastic bags (please see Figure 6. Sources of Plastic Bags), it is possible to estimate that New Zealand's total plastic bag consumption is 1.29 billion PSB annually (Authors Calculations 2007). This estimate based on retail

⁴⁵ Australian estimate 3.69 bags a week per person, New Zealand population of 4 million, gives a weekly total use of 14.76 million, and an annual use of 767.52 million.

providers is closer to Plastics New Zealand's annual consumption estimate of 1 billion PSB (Plastics NZ 2002).

A fourth approach for a PSB use estimate can be calculated from the percentage of waste sent to landfill. The ACG (2006 Page 21) report suggests that PSB are 0.2 percent of the total amount of waste sent to landfill in Australia. According to the latest waste data from MFE (2002) New Zealand sends 3.4 million tonnes of solid waste to landfill.⁴⁶ Using these facts, and assuming this percentage applies to New Zealand, it is estimated that 6,800 tonnes or 1.13 billion PSB are sent to landfill annually (Authors Calculation 2007).⁴⁷

Nolan ITU (2002b) estimates that 95 percent of all PSB ends up in landfill. This fact combined with the previous calculation of PSB waste gives New Zealand an annual consumption of 1.192 billion PSB, or 299.2 per person PSB (Authors Calculation 2007). In contrast, fact(95 percent of PSB disposed of to landfill (Nolan ITU (2002b)) calculated with one estimate of New Zealand's annual use (244,741,120 Authors Calculations 2007) estimates that 232.5 million PSB are sent to landfill each year in New Zealand. This quantity equates to 1,395 tonnes of PSB sent to landfill, which is not the 0.2 percent (6,800 tonnes) of solid waste suggested by ACG (2006a), but 0.0004 percent of solid waste (Authors Calculation 2007).

Plastics NZ (2002) estimate PSB constitute 0.25 percent of the solid waste stream. This suggests that 8,500 tonnes of PSB are sent to landfill annually, adding two tonnes on the previous estimate. Plastics New Zealand's estimate equates to 1.4 billion PSB sent to landfill annually, significantly increasing the estimates of PSB use in New Zealand (estimations of PSB sent to landfill are presented in Table 4).

⁴⁶ The total waste includes an equal amount clean fill (3.2 million tonnes), and an unidentified quantity of liquid and sludge waste, resulting in total solid waste of 6.4 million tonnes. Clean-fill is material that does not undergo any physical, chemical or biological transformations that will cause adverse environmental effects once placed on or in a disposal area (PCE 2006). Clean fill includes materials such as construction and demolition waste products, concrete, bricks, mortar, Gibraltar board, panels and timber, and is often disposed in a separate location to solid waste landfills.

⁴⁷ Calculation is based New Zealand's solid waste to landfill of 3.4 million tonnes (MFE 2002). .0.2% of this results in 6,800 tonnes of or 1.13 billion PSB sent to landfill annually.

Table 3 Estimates of New Zealand's Plastic Shopping Bag Annual Use

Estimate Based On;	Plastic Shopping Bag Per Capita	New Zealand Consumption (Billions)
Field Connection (2005)	61.19	0.245
James and Grant (2005)	130	0.520
Hyder Consulting (2005)	192	0.768
ZeroWaste (2002)	200	0.800
Plastics NZ Data (2002)	250	1.00
ACG(2006) and Nolan ITU (2002b)	299	1.192
NZPC Estimate (2005)	322.5	1.29
Plastics NZ (2002) and Nolan ITU (2002) ⁴⁸	372	1.49

(Source: Authors Calculations)

Sources of Plastic Shopping Bags

Manufacture, Import and Distribution of Plastic Shopping Bags

Where no local supplies of oil or gas exist, plastics are imported: as pellets or sheeting used to make PSB. Or more commonly PSB are imported whole. International research estimates that a small percentage of local plastic manufacturers produce PSB and the majority of PSB are imported (Feily, Timoney and Company 1999, Nolan ITU 2002b & ACG 2006).⁴⁹ Plastics New Zealand confirms this is also the case for New Zealand plastics manufacturers, with 90 percent of “singlet” PSB imported for domestic use (Plastics New Zealand 2002).

⁴⁸ Plastics NZ (2002) estimates place plastic bag waste to landfill 0.25% of 3.2 million tonnes, 850,000 tonnes. Nolan ITU (2002b) estimates that 95% of plastic bags are sent to landfill, placing the total plastic bag use at 1,491,228,071 (Authors estimate).

⁴⁹ In comparison Australian import statistics for HDPE bags are 4 billion, and 2.25 billion for LDPE bags. Australian production statistics show that 0.2 billion HDPE bags and 0.675 LDPE bags were manufactured in Australia (Nolan ITU 2002 and ACG 2006). Ireland's research estimates that 79% plastic bags are imported, with 21% from local manufacturers (Fehily, Timoney and Company 1999).

Given the previous estimates using Australian data we could also assume that New Zealander's have similar shopping behaviours to Australians. Research suggests the majority of Australians, and therefore New Zealanders, carry out one major weekly supermarket trip, and a few minor trips between these (Nolan ITU 2002b, James and Grant 2005).

Australian research indicates that supermarkets are the leading source of PSB, providing 53 percent of total consumption (Nolan ITU 2002b) as shown Figure 6 below. "General Merchandise & Other Retail" and "Other Food and Liquor" are the next largest providers of PSB, at 14 and 13 percent respectively. The remainder of PSB providers are the "Fast Food & Convenience Stores" group, providing 5 percent of PSB (Nolan ITU 2002b).

As seen on Figure 6 below, supermarkets are the biggest provider of PSB, a distribution that is considerably disproportionate to the quantity of stores. New Zealand has 2,986 grocery stores and these represent 7.1 percent of all retail outlets (Albertson 2006).⁵⁰ However, the style of PSB distribution is determined by the nature of supermarket shopping. James and Grant (2005) have estimated that each weekly trip to the supermarket consists of 72 items is packed in ten PSB. Resulting in an average annual consumption of 520 PSB per household (assuming a household exists as four people), and an individual consumption of 130 PSB, and a New Zealand use of 520 million PSB a year from supermarket shopping alone.

⁵⁰ One study suggests the nine supermarket chains in England distribute 17.5 billion plastic shopping bags annually (Baker 2004 Page 8). If Australian retail distribution is applied, it is estimated English retailers distribute over 33 billion PSB (Authors Calculation 2007).

Figure 6. Sources of Plastic Shopping Bags, Australia 2002 (Nolan ITU 2002b)

Disposal of Plastic Shopping Bags

Plastics New Zealand (2002) estimate 80 percent of PSB are reused. Recent research confirms this: 81 percent of people reuse their PSB, 16 percent recycle PSB, and 2.3 percent send their PSB to landfill via their rubbish bins (Field Connection 2005). As shown in the diagram below, four of the six re-use activities in New Zealand are involved in waste disposal (Field Connection 2005).

Figure 7. Plastic Shopping Bag Reuse and Disposal New Zealand 2005

(Source Data Field Connection 2005)

Of the 81 percent of PSB re-used, 21 percent are reused for other purposes, and will most likely end up in landfill further down the track. Resulting in 55.76 percent, or 4,460,800 PSB (annually) sent to landfill after two or fewer uses (Authors calculation 2007).⁵¹ These New Zealand estimates are presented in table 4 below. In contrast Australian research suggests 95 percent of PSB end up in landfill, either through garbage (43.6 percent) or reuses (53.3 percent) (Nolan ITU 2002b).⁵²

⁵¹ Reused PSB are 81% or 6,480,000 of the national consumption. PSB that are reused for waste activities account for 66% of all PSB reused, while 2.33% of PSB are sent to landfill without subsequent uses (calculations are based on a national use estimate of 8 million bags annually (ZeroWaste 2002)).

⁵² As discussed in the previous chapter, the disposal option used by consumers is greatly affected by the destination of the plastic bag. Nolan ITU (2002b) indicates that plastic bags used in outdoor destinations such as picnics and sports events are more likely to be littered or thrown away before a subsequent use is possible. In comparison, plastic bags whose destination is 'home' are more likely to be re-used or recycled.

Table 4. Plastic Shopping Bag Disposal in New Zealand 2005

Disposal Option	Percentage	Bags Annually (Christchurch)	Bags Annually New Zealand ⁵³
Recycled	16	2,600,00	1,280,000
Reused	81	13,216,125	6,480,000
Waste	2	378,625	184,000
N/A (Reusable Bags)	0.33	53,625	26,400
TOTAL	100	16,248,375	8,000,000

(Data Source Field Connection 2005)

The total percentage of PSB sent to landfill has been quoted by many sources as an explanation of why PSB should not be considered a priority for waste minimisation initiatives (MFE 2006, NZRA 2005, Australian Retailers Association 2004, and Plastics New Zealand 2002). The reporting of statistics can create significant differences in understanding, and is currently fuelling the debate about PSB. The facts most commonly reported in the PSB debate are Australian estimates, that plastic bags represent 0.02percent of the total solid waste stream (ACG 2006 Page 21), shown in table 5 below. However, this statistic is significantly different to 36,700 tonnes of PSB sent to landfill in Australia annually (ACG 2006 Page 21). As illustrated, the differences in perceptions and values are a central aspect of this debate. James and Grant (2005) view this challenge as an exercise of perception versus reality. To demonstrate these differences further, the table below presents some different figures regarding the number and weights of PSB sent to landfill in New Zealand.

Table 5. Annual Plastic Shopping Bag Waste to Landfill, New Zealand.

Estimates of Plastic bags to landfill for New Zealand	Tonnes	Number Of Bags (Billions)
Nolan ITU 2002b 0.02% of Solid Waste	68	0.113
Nolan ITU (2002b) 95% of bags to landfill ⁵⁴	1,395	0.232
Plastics NZ (2002) 0.25% of solid waste	8,000	1.333

When plastic bags are sent to landfill they become incorporated into the waste mass within the landfill, contributing to the increasing size of the landfill and lying dormant until the landfill is disturbed. Alternatively, PSB are dispersed into the surrounding environment by

⁵³ Based on Zero Waste (2002) national use estimate of 8 million as this estimate was mid-range.

⁵⁴ Based on Field Connection's 2005 data.

wind and mechanical action at the landfill site, creating a common and irritating hazard for landfill operators and local residents. In an effort to address this problem Australia introduced national guidelines to manage PSB litter at landfills (EPHC and NEPC 2005)⁵⁵. While the management of PSB at landfills is not specifically mentioned in MFE's landfill management guidelines, many landfill operators have taken steps to minimise impacts from inadvertently littered PSB. Many of the littered PSB are put back into the landfill, however it is possible that some collected PSB are recycled.

Recycling Plastic Shopping Bags

While it is possible to recycle PSB in New Zealand there is no extensive collection of bags for recycling. A small number of retail outlets collect or reuse bags; however there is no advertised large-scale in-store collection of bags in New Zealand at this time. The responsibility for the collection of waste and recycling is given to territorial authorities under legislation. Each authority chooses how to manage waste as the New Zealand Solid Waste Strategy (NZSWS 2002) only provides a guideline to territorial authorities. Christchurch City Council is the only territorial authority with an advertised kerbside collection of PSB an initiative that began in 2004. It is estimated that 50,000 PSB are collected weekly for recycling from the Christchurch and Waimakariri populations (Field Connection 2005). Research commissioned by the Christchurch City Council revealed the collection of PSB for recycling was almost at full potential for this population, as larger numbers of people reused PSB than previously estimated (Field Connection 2005).

Waste Management in New Zealand

The Local Government Act (LGA) 1974 allocates responsibility of solid waste management to local government. The LGA 1974 remains is the key statute for waste, and it assigns primary responsibility for municipal waste management to local governments.⁵⁶

⁵⁵ "Guidelines for Management of Plastic Bag Litter at Landfill Sites" (EPHC and NEPC 2005) discusses the prevention and controls of litter at landfill sites and in the surrounding environment. To view this document please see http://www.ephc.gov.au/pdf/Plastic_Bags/Landfill_litter_guidelines_Jun05.pdf

⁵⁶ Part 31 of the LGA 1974 requires the "promotion of effective and efficient waste management, a waste management plan, collection reduction, reuse, recycling, recovery treatment and disposal of waste (Section

The 1996 amendment to the LGA (LGA 1996 Amendment Act) introduced the requirements of waste management strategies, a waste hierarchy, and provided for local government enactment of by-laws.

The 1996 amendment to the LGA has been criticised as demonstrating a lack of national coordination and leadership from central government (MFE 2002a and 2002b). The hierarchy of waste management introduced in the 1996 amendment does not specify a full life cycle approach to waste, and many approaches suggested in the amendment applies only to “end of pipe” waste reductions.⁵⁷ This criticism is extended to the most significant environmental legislation in New Zealand, the Resource Management Act (RMA) 1991, manages the effects of waste it does not “give sufficient weight to the prevention or minimisation of waste generation” (MFE 2002b Page 9). Waste minimisation and management measures in New Zealand generally have been described as ad hoc and poor instruments for waste minimisation (Brodnax and Milne 2002). Wakim (2004) explains that this is principally a result of the effects based RMA 1991. The RMA 1991 operates on avoidance and mitigation of the environmental impacts from waste, rather than regulating waste generation.

MFE recognises that the RMA is not adequate for minimisation or prevention of waste (MFE 2002b) and has previously considered alternative policy instruments. Such policy instruments were aimed at: reducing end generation; reducing barriers to using recovered materials; changing wasteful behaviour (for all wastes) of businesses and individuals, as well as at national regional and local government levels (MFE 2002b).⁵⁸ The lack of progress towards waste reduction has generated pressure to update the waste management policy. This pressure resulted in the NZSWS (2002), and the provision of goals and guidance for local government’s solid waste practices. With the major goal being to change

538 LGA1974).

⁵⁷ “End of pipe” refers to the end of a product or process, in this case the waste management activities such as recycling, reuse and recovery. In contrast to end of pipe management, a life cycle approach looks to address waste production from the collection of raw materials or “top of pipe” through to the “end of pipe”, including activities such as efficient resource use and efficient manufacturing techniques to reduce waste generation.

⁵⁸ Interestingly, this policy review mentions a goal for an online waste management data network to provide baseline data from solid waste analysis on four indicator sites, intended as a guide to waste management (MFE 2002b Page 10). As far as this research can conclude this is still not yet operational, despite several OECD reviews since highlighting the lack of access and existence of national waste data.

from landfill and incineration based waste disposal to a waste minimisation approach, and eventually zero waste (MFE 2002a).

As a result of the NZSWS (2002) there were a number of research papers and initiatives for waste management across the country.⁵⁹ However these initiatives were short lived and many of the targets on the NZWS still remain unattained. The OECD (2007) reports that: 20 percent of councils in New Zealand either missed the deadlines for waste strategies as outlined in the NZWS or did not produce plans; 25 percent of council plans did not incorporate the NZSWS; and that most council plans did not address liquid waste, hazardous waste, and wastewater. The OECD (2007) continues to report that the lack of a national waste database is a “serious constraint on effects based objective driven policy” (OECD 2007 Page 38). Waste management in New Zealand has a significant lack of data on waste generation and disposal⁶⁰, voluntary strategies for waste management and minimisation and a lack of regulatory or legislative guidance for waste management and minimisation by central government.⁶¹

Concerns about the clarity and lack of specific targeting of waste minimisation and management have been expressed in many forums, from the OECD (1996, 2007), the New Zealand Parliamentary Commissioner for the Environment (PCE) (2006), Non-government organisations (NGOs), and engineers involved in designing landfills (Trolove 2006). Additionally, MFE have acknowledged that New Zealand does not have comprehensive waste minimisation and management legislation (MFE 2002b).

The major criticism is the inability of New Zealand to decouple economic growth and consumption from waste production (OECD 1996, 2007), necessary for sustainable growth (PCE 2006). Such sustainable growth, which is presented as the leading goal of the current

⁵⁹ These include: MFE; Solid Waste Analysis Protocol 2002c, Landfill Review and Audit 2003, Review of the targets in the New Zealand Waste Strategy 2004, Waste Management in New Zealand, A Decade of progress 2005, and Issues on a Solid Waste Levies Paper (Ward 2006).

⁶⁰ The latest data for New Zealand waste is the 2003 estimates from the 2002 Landfill Review and Audit (MFE 2003)

⁶¹ The PCE have identified multiple legislative barriers in New Zealand to using economic instruments for waste management and waste minimisation in their report “Changing Behaviour: Economic Instruments in the Management of Waste” (PCE 2006).

Labour government (Clark 2007), has many difficulties in attainment, not the least being poor legislative provision for waste minimisation activities in New Zealand.

New Zealand's 1996 Environmental Performance Review (OECD) highlighted issues of inconsistent local government policies, a lack of incentives for waste management, a piecemeal approach to waste management, inadequate legislation, and lack of reliable and comprehensive information on magnitude and composition of our waste stream (OECD 1996). The OECD states New Zealand is one of four OECD countries not demonstrating the decoupling of waste to landfill and rate of consumption.

The OECD (2007) study report has two overriding goals for waste management in New Zealand. Firstly, it states there needs to be a full cost recovery of waste disposal. Secondly, improvements are required in the management of hazardous wastes (OECD 2007 Chapter 2). The OECD (2007) recognises the challenges of these recommendations and comments that fragmented legislation, lack of institutional framework, and voluntary life cycle management are significant issues for the improvement of waste management in New Zealand. Prior to the OECD 2007 report a bill was proposed to the New Zealand government, commenting on New Zealand's waste management and sought to address many issues raised in the previous OECD reports.

Waste Minimisation (Solids) Bill 2006

The Waste Minimisation (Solids) Bill was initiated by the Green Party of Aotearoa New Zealand⁶². This Bill sets in place a national Waste Minimisation Authority, more clearly specifies roles of territorial authorities, and provides local government more power to address waste minimisation and management. The proposed Bill also contains plans for phased bans of materials to landfills, application of levies on landfill waste, and also provides for extended producer responsibility (EPR) programs. The Bill also requires all

⁶² Mike Ward and Nandor Tanczos, Green Party Website www.greens.org.nz

organisations to adopt and implement waste minimisation plans, and ensures all public organisations have green procurement policies (Tanczos 2006).

It is possible the EPR programs within the Bill could be used to reduce PSB consumption. For example retailers could be encouraged to offer alternatives, impose in-store costs on PSB, and ultimately discourage the use of PSB. However, the Green Party have indicated that due to lack of political and industry support the EPR scheme is the most likely aspect of the bill to be dropped, (Private Communication 20th July 2006) leaving plastic bags disregarded in legislation.⁶³ In light of this, the Green Party suggests that if the Bill does not advance, the party will continue to push for a levy on PSB (Private Communication 17 August 2006).

New Zealand Packaging Accord 1996 and 2004

The NZPA is a voluntary product stewardship agreement that involves industry, central and local government, and recyclers. The current NZPA has been updated from a previous accord in 1996, and expires in 2009. The New Zealand Packaging Accord (NZPA) 2004 addresses packaging materials, and is the only government produced plan of action that specifically targets PSB. MFE concluded that the original NZPA needed harder targets and more significant participation from retailers and brand owners to be a success (Bradshaw 2004). These comments were taken into consideration for the creation of the second NZPA.

The NZPA 2004, has a wider range of signatories, and includes the principles of EPR and product stewardship. The NZPA 2004 sets national recycling targets, and sector specific targets. The NZPA clearly states that policies from central and local government must align

⁶³ Waste Minimisation (Solids) Bill 2006 passed it's first reading in parliament on June 30th 2006, and has moved to a Select Committee hearing (Local Government and Environment Committee). However due to "very good public submissions new insights have been gained for a complex bill" (Zero Waste 2007). The presentation of recommendations has been postponed from July 2007 to October 2007(<http://www.mfe.govt.nz/issues/waste/waste-bill.html>).

with existing policy and strategies,⁶⁴ and that the NZPA is not legally binding, instead, signatories are under a “strong moral obligation” to comply (MFE NZPA 2004). The NZPA also states that if voluntary approaches do not meet objectives “government is prepared to consider [...] regulation” (MFE 2004).⁶⁵

While acknowledging the significant role of packaging in our everyday lives the NZPA⁶⁶ the NZPA also acknowledges the high visibility of packaging in our waste stream, public support for the reduction of packaging waste and the industry’s role in the reduction of packaging waste (NZPA Foundation 2 2004). For this reason information, education, and community involvement are the key foundations of the NZPA 2004. Both the signatories of the NZPA 2004 and the Packaging Council are required to report annually, and a review of targets was undertaken in 2006. Foundation Nineteen of the NZPA 2004 states that reporting will include “rating progress against specific targets, generic measures and commitments” (MFE 2004).

The foundations of the NZPA 2004 specify that “a PSB reduction target, by quantity, will be identified in the *Brand Owners and Retailers Sector Action Plan 2*” (MFE 2004). This sector group which did not exist within the previous NZPA includes individual companies and companies represented by industry groups or professional bodies.⁶⁷

This Sector Action Plan works towards benchmarking activities and progress in years 1-2 (2004-2005), reducing consumption and improving packaging recovery in years 3-5 (2006-2008). Clause 24 (5) of this Sector Action plan, “Programmes to Achieve National Targets for Recycling”, includes a PSB Reduction Target (5.1).

⁶⁴ New Zealand Waste Strategy (2002), the National Energy Efficiency and Conservation Strategy (2001), the Growth and Innovation Strategy (2002), the Sustainable Development Programme of Action (2003) and the New Zealand Climate Change Programme

⁶⁵ Foundation 12: If a voluntary approach does not provide sufficient improvements in reducing packaging waste per New Zealander and encourage product stewardship, Government is prepared to consider doing so by regulation.

⁶⁶ Protecting the quality of food and goods, its role in health and safety, delaying spoilage of perishables, as well as providing a means for branding and marketing (Accord Foundation 1 NZPA 2004).

⁶⁷ For a full list of all signatories to the NZPA 2004 please refer to the PA document MFE, The New Zealand Packaging Accord 2004, or website, Packaging Council of New Zealand, The NZPA www.packaging.org.nz.

5.1 Plastic Shopping Bag Reduction Target

The PSB Reduction Target calls for retailers to “assist [with] promoting responsible disposal of PSB” (NZPA Sector Action Plan 2 2004 Page 12). Retailers are committed to the responsible use of PSB, reducing unnecessary use, providing reusable bag alternatives, and collaborating with other sectors to promote the recovery and recycling of PSB (ibid).⁶⁸

The Brand Owners and Retailers Sector Action Plan employs baseline data to establish “company reduction targets of a minimum 20 percent reduction by 2008 and adjusted for growth in sales”(NZPA Sector Action Plan 2 2004 Page 13). This data is to be collected over the 2003/2004 period. This baseline data is to include measures of the total units across bag types, mass, recycled content bags (percent recycled content of total mass), relativity to sales (kg HDPE per \$1million sales) and approximate mass of customer recycling. Individual signatories are to also promote these plans using company advertising media and in-store communications to engage consumer support for the initiatives.

Retail signatories are to “collaborate in non-commercially sensitive ways” (NZPA Sector Action Plan 2 Page 14) to achieve the reduction targets for plastic bag use. To do this signatories are to standardise New Zealand’s PSB, by introducing the use of the plastics codes for bags, and by printing appropriate responsible reuse and recycling messages, the recycled material content and degradability on PSB (over the 2004-2005 period). Secondly, signatories are to conduct a feasibility study on in store recycling of plastic bags, and the standardisation of such collection (MFE 2004).⁶⁹ Additionally cross-sector collaboration is to be accomplished through joint recycling initiative between recyclers and local government, kerbside recycling schemes (2004-2005), and through promoting trans-sector initiatives for the promotion of responsible use of PSB (2004-2008). The progress on these goals is to be reported annually to the NZPC, as was done in the 2004-2005 NZPA Annual Report (NZPC 2005).

⁶⁸ A full copy of the Sector Action Plan 2: 5.1 PSB Reduction Targets is in Appendix 1 or at <http://www.mfe.govt.nz/publications/waste/packaging-accord-action-plans-jul04/plan-brand-retailers.html>

⁶⁹ This is creating an industry standard for checkout recycling receptacles for large stores, malls and retail precincts (MFE 2004).

The NZPA Year One Annual Report (2005) reports on the progress of the Brand Owners and Retailers Sector Action Plan in a single page case study (NZPC 2005 Page 9). The case study opens, “plastic bags make up a small part of the waste stream but can be an important icon to encourage shoppers to think about waste reduction” (NZPC 2005 Page 9). The case study proceeds to mention Christchurch City Council’s kerbside plastic bag collection, the use of recycled bags, and repeats the commitments and the target of 20 percent reduction by 2008. The only data presented in the case study is the supermarket signatories and “The Warehouse’s” combined PSB use total of 720 million (MFE 2005 Page 9). The data is presented in a complicated manner and there is no clear indication of whether the targets have been achieved or not. The majority of the reporting structure does not appear to follow that which is outlined in the NZPA foundations. However, the information provided on individual signatories does go some way to address the NZPA Sector Action Plan (2004) goals.

The two major supermarket brand signatories, Foodstuffs NZ and Progressive Enterprises, are reported as implementing in-store programs. Progressive Enterprises’ program “Pack 7” is based on staff training to encourage a minimum of seven items per bag; question bag use for less than three items; and the sale of alternatives to PSB in the form of calico bags.⁷⁰ Foodstuffs NZ are reported to have continued development of in-house initiatives, such as charging for plastic bags, and staff training for efficient plastic bag packing.⁷¹ Overall the reporting of progress on sector goals is limited and is as unsatisfactory as signatory efforts to meet the NZPA (2004) goals.

From the time the NZPA annual report was published (2005) to early January 2007 there have been no publicised efforts from NZPA signatories promoting the reduction of PSB. While “The Warehouse” is visibly trying to achieve the targets, major supermarket brands have done little to achieve NZPA targets, and what has been attempted is marginal and ineffective.⁷² However, early 2007 saw a flurry of activities by Foodstuffs NZ and

⁷⁰ www.progressiveenterprises.co.nz/environment/plasticbags

⁷¹ <http://www.foodstuffs.co.nz/OurCompany/PolicyStatements/#c>

⁷² Additional to the progress outlined in the NZPA report, “Pack’N’Save” supermarkets charge ten cents per bag. This measure is seen as driven by cost cutting as part of a marketing strategy rather than an environmental responsibility (Zero Waste 2002). “Woolworths” and “Countdown” supermarkets claim to

Progressive Enterprises to promote reductions of PSB use, resulting in increased media attention on the PSB debate.

While it is possible to hypothesise about the impetus behind the bout of activity to achieve NZPA targets, the looming deadlines of the NZPA have proved too much and the target of 20percent minimisation has been extended by one year to 2009. The activity in 2007 saw the launch of the “Make a Difference Campaign” was in July 2007 as a joint effort of Foodstuffs NZ and Progressive Enterprises, and includes 646 supermarkets.⁷³ This campaign is advertised throughout supermarkets at checkouts, a national advertising campaign, and the publishing the results of a six-day survey as “detailed market research” (NZPC 2007).⁷⁴ While the results of this survey provide an indicator of consumer attitudes, it cannot provide a true picture of consumer behaviour due to the short time frame, sample size, weighting of results, and leading survey design which all effects the final conclusions. In addition, consumer attitudes are likely to be different from actual behaviour, and in this case could paint a more positive picture of behaviour than the reality. This is described as the “behaviour gap” that exists between individual’s attitudes and behaviours (Bazerman et al 1996).⁷⁵

Figure 8. New Zealand Packaging Accord “Make a Difference” Campaign Logo.

take back bags for recycling and reuse but this scheme is not advertised or clearly marked at checkouts (ZeroWaste 2002).

⁷³(www.packagingaccord.org.nz/sector_retailers.php Accessed July 2007).

⁷⁴ Key findings of the survey: 2/3 New Zealanders always accept free PSB, consumers receive and average of 6 free plastic bags a week or 312 bags a year; older couples use more bags (suggesting that pack sizes impacts on the number of bags used); people are slightly more likely to take plastic bags at the supermarket than at other shops (AC Nielsen 2007).

⁷⁵ Bazerman et al (1996) argued that a ‘attitude/behaviour gap’ exists in regard to environmental issues. Most people have pro-environmental attitudes yet engage in environmentally destructive behaviours.

Another difficulty in signatory reporting is seen in the reporting if the “Make a Difference” campaign. Investigation discerns “The Warehouse” as the only retailer in the campaign report that specifically mentions the commitments to the NZPA, reports in a clear manner and addresses individual targets within the sector plan. “The Warehouse” is the only NZPA Sector Action Plan 2 signatory demonstrating a real commitment achieving the NZPA 2004 goals. In an effort to reduce PSB consumption “The Warehouse” has implemented a reusable bag promotion (NZ\$0.20 discount for use), using 50 percent recycled content PSB, printing a NZPA logo and ‘reduce, reuse, recycle’ on bags, providing in-store collection for PSB recycling, and staff training initiatives (NZPC 2005). Moreover, “The Warehouse” is the only retailer that mentions exploring product design and talking to suppliers in an effort to minimise packaging waste. This action demonstrates a full incorporation of EPR of the NZPA into company policy and operations.

Three weeks after the implementation of the NZPA “Make a Difference” campaign troubles were unearthed its application, as goods brought at supermarkets were still being put in PSB despite program outlining all customers would be asked if a bag was needed, and other stores sold out of reusable bag alternatives (Easton 2007). Although potentially indicating good take up of the initiative, supermarkets suspended the campaign instead of addressing the shortfall. There was a lack of surprise at this outcome from the National Distribution Union (who represents supermarket workers in New Zealand) as supermarket workers face a variety of pressures and despite the high staff turnover there was no on-going training for supermarket employees (Easton 2007). Furthermore, Dave Chambers of Progressive enterprises was quoted saying the campaign was saving an estimated 50,000 bags a week, despite the “teething issues” (Easton 2007) demonstrating the token nature of the campaign, which was also pointed out by the National Distribution Union’s Maxine Gay, “they seem to want the kudos of a campaign without having a real campaign” (Easton 2007). The lack of application and therefore success of the “Make a Difference” under the NZPA 2004 suggests retailer driven voluntary campaigns will have very limited success in reducing impacts and consumption of PSB in New Zealand.

With regard to meeting requirements of EPR, the NZPA obliges participation in facilitating recycling, but does not extend to financial responsibility of collection or recovery (Duncalfe 2005 Page 63) such as an advanced disposal fees (ADF) or charges used to supplement local government kerbside recycling schemes. The NZPA is unsuccessful in actualising EPR, while the concept is embraced; it falls short because post-consumer responsibility still lies with councils and the consumer. As long as councils and ratepayers are paying for the collection and recovery of packaging waste the NZPA 2004 cannot be said to meet the requirements of EPR (Duncalfe 2005 Page 64). Moreover, the inability of NZPA 2004 signatories to meet target deadlines, or achieve targets has been demonstrated clearly in the Brand Owner and Retailer Sector Action Plan (NZPA 2004). It remains to be seen whether any government in New Zealand will make good on their word to engage in legislative action in the face of failed voluntary agreements (MFE 2004).

In comparison, Australia has made use of legislative measures in their actions to reduce packaging waste. The Australian equivalent to the NZPA 2004 is their National Packaging Covenant (NPC). In comparing these two policies the NZPA comes out as not only the weaker policy, but also containing weaker ineffectual goals. The NPC is backed up by legislative framework, the National Environmental Protection Measures (NEPM) 2005, which provides regulatory backup for those who choose not to meet the APC standards, and are requires non-signatories to meet NEPM 2005 regulatory standards. The stronger goal of the NPC is the total target of a 75percent reduction in plastic bag use (25 percent in 2004 and a further 50 percent in 2005). Moreover, the NPC also contains a specific target for kerbside recycling (increase of more than 30 percent by 2005), commitments to use domestic recycled content plastics, an exploration of alternatives to plastic bags, and to investigate the barriers to use of reusable bags, such as the packing frames in supermarkets. The NZPA's goal of a 20 percent reduction on PSB use over five years does not compare favourably to Australia's NPC goals of a 75 percent reduction over two years. Additionally the NZPA goals are weakened by the inclusion of an "adjustment for growth" (NZPA 2004). Moreover, the already desultory NZPA appears even more like a public relations exercise due to the late or non-existent responses of NZPA signatories, resulting in

unachieved targets and deadlines, not a consistent effort to truly address the impacts of packaging on the environment.

Environmental Agencies and Organisations Addressing Plastic Bags

Zero Waste New Zealand Trust

Zero Waste NZ Trust are a waste minimisation organisation who have been selling reusable bags through their website, as well as providing information about the impacts of PSB, international practise and alternatives to PSB, particularly bio-degradable plastics.⁷⁶ Zero Waste are advocates of bio plastics (compostable or biodegradable plastics), particularly starch based bags that can be assimilated into organic waste. Zero Waste notes that the introduction of starch-based bags would only be valuable if the appropriate infrastructure was in position to absorb them (Zero Waste 2006). Zero Waste have also released a “Plastic Shopping Bag Report” (2002) outlining the environmental issues, Ireland’s experience with the “PlasTax”, biodegradable alternatives and potential solutions for New Zealand. The solutions suggested are as follows: a PSB levy based on the Irish model; a minimum recycled content for PSB; promotion of long life sustainable alternatives; legislation for mandatory use of bio-plastics (ZeroWaste New Zealand Trust 2002).⁷⁷

Plastic Bag-Free Golden Bay

The small town of Collingwood in the Nelson region became the first plastic bag free town in New Zealand in 2000 when plastic bags were abolished by a group of local women, known as the “Bag Ladies”.⁷⁸ Plastic bag free status means Collinwood sells and provides an exchange system for reusable bags for locals and the large tourist numbers that visit the town each summer. This group have also initiated a national action group, Kiwi Plastic Bag

⁷⁶ www.zerowaste.co.nz

⁷⁷ For a copy of this report please see www.zerowaste.co.nz/assets/Reports/PlasticShoppingBagandbiodegradablepackaging.pdf

⁷⁸ www.plasticshoppingbagfree.org.nz

Concern, to create an alliance with other groups such as: Wanaka Waste Busters; Community Recycling Otago, Green Teens and Bags NOT.⁷⁹

Kiwi Plastic Bag Concern group commissioned research on New Zealander's use and views on plastic bags use (Ho & Kiwi Plastic Bag Concern (2007) New Zealand Supermarket Plastic Bag Usage Survey Report). The research identifies a general overuse of plastic bags in supermarkets across New Zealand, and that customers generally have no awareness of the overuse and environmental impacts of PSB. Customers participating in the survey identified that a levy of ten cents or more per bag would be effective in reducing the consumption of PSB (Ho & Kiwi Plastic Bag Concern 2007).⁸⁰

The Bag Ladies' website provides information about the problems caused by PSB, and tips for consumers and retailers to reduce PSB consumption. The Plastic Bag Free group petitioned the previous Minister for the Environment to "take an active role in reducing the numbers of PSB used in New Zealand" (ZeroWaste New Zealand Trust 2005).

Plastic Bag Free Mt Eden, Auckland

This is a community group of four women "The Village People" from Mt Eden who are working towards introducing alternative packaging to Mt Eden retailers and community (Judith Holtebrinck Personal Communication 2006).

Auckland Waste Managers Forum

This forum produced a design for cloth bags which have been supplied to shops, from Taupo to Northland. These bags are made from unbleached cotton and printed using vegetable inks (ZeroWaste New Zealand Trust 2002).

"Say No to Plastic Bags"

This local campaign is run by two women in Christchurch, who work with councils and supermarkets to raise awareness about the use of PSB and encourages use and supply of alternatives.

⁷⁹ www.plasticshoppingbagfree.org.nz

⁸⁰ For a full copy of this research please see www.plasticshoppingbagfree.org.nz/index.php?PageID=78

5 International Practice Case Studies

There are many tools available to control the consumption, use and disposal of PSB. This chapter seeks to investigate two international examples of the application of these tools. The examples presented are by no means an exhaustive account of international actions, but serve to represent two tools in use. Additional examples of international practise can be found in Appendix 6. It is the intention that these case studies will provide an understanding of the complexities and specific natures of different strategies for reducing the consumption and litter of PSB. Examining the two examples provides an understanding what elements are necessary to instigate behavioural changes in New Zealand's consumption of PSB. The first case study, of the Ireland's plastic bag levy, is structured to take into account the context prior to the levy, specifics of the levy (such as exemptions), implementation of the levy, and post implementation of the levy. The second case study, of Australia's voluntary campaigns, is structured around past and current actions to reduce PSB consumption, and the prolific Australian research. First I will look at the most renowned PSB management action, Ireland's PlasTax.

Case Study One: Ireland's PlasTax

Prior to the introduction of the PSB tax, known as the PlasTax, Ireland used approximately 1.2 billion PSB annually, or 325 PSB per capita annually (Dunne 2004b). Another source estimates that 2.3 billion PSB were annually consumed (Fehily, Timoney and Company 1999).⁸¹ Of the bags used 60 percent were estimated to be disposed as of litter. After introduction of the levy, coined the "PlasTax", PSB use fell 90 percent (Convery and McDonnell 2003). However, recent research demonstrates that PSB use has since increased, although not to the same levels as prior to the PlasTax. This increase initiated calls for the levy to be increased⁸² and resulted in plans for the levy to be increased to €0.22 from July 2007.

⁸¹ Calculated from, Supermarket bag average weight 6grams (Nolan ITU 2002b), 14,000 tonnes of PSB (Fehily, Timoney and Company 1999), equals 2.3 billion bags.

⁸² Irish Examiner August 28th 2006 "urged to double PSB levy to 30c"

The PlasTax was officially adopted by Ireland as a waste management exercise to curb increasing litter problems and their associated costs and consequences (Dunne 2004).⁸³ Litter is an ongoing problem for authorities in Ireland and PSB were estimated to constitute five percent of all litter (DEHLG 2004). Littered PSB are obvious as litter, this is made worse by frequent high winds and hedgerows that collect litter, particularly PSB. The deciduous nature of the hedgerows further exacerbates this aesthetic disturbance (Convery and McDonnell 2003).

Preceding the PlasTax legislative frameworks were set in place allowing Ireland's government to impose environmental levies, resulting in the Waste Management Act 1996 and the Waste Management Amendment Act 2001 (Convery and McDonnell 2003, Dunne 2004b).⁸⁴ A consultancy report on PSB (Fehily, Timoney and Company 1999) was commissioned, and recommended that a levy of €0.35 on the producers and importers of PSB.⁸⁵ However, the Environment Minister (Noel Dempsey) sought to send a strong message to consumers and insisted on a downstream levy to stimulate shoppers to refuse PSB and use reusable bags (Dunne 2004b).

The PSB tax was first discussed in Ireland in 1994, and was introduced in 2002 (Convery and McDonnell 2003, Dunne 2004b). Some saw the introduction of the levy as a “political response to these negative perceptions on part of the public surrounding the negative impacts of PSB and the environment” (Convery and McDonnell 2003 Page 2). Moreover,

⁸³ Evidence suggests littering behaviour increases when there is already litter present at a site (ACG 2006), and there are numerous social benefits of reducing and removing litter, including reduced crime rates (www.allentownrecycles.org/templates 2007).

⁸⁴ The Waste Management Act 1996 was amended as it was “deemed not strong enough to support such a levy” (Dunne 2004b).

⁸⁵ On consideration of compliance, administrative costs, secondary environmental impacts and employment effects the report recommends a supply based levy (upstream) as this presents the simpler administrative complexity, but would be less effective in reducing PSB consumption than a point of sale levy (suppliers may choose to absorb levy to maintain sales), and does not adhere to ‘polluter pays’ principle of targeting end consumption. Several types of policy instruments were also assessed and were dismissed due to the end-of-pipe nature and or cost. The recommended levy was 3pence per unit whatever the source and destination, separate identification of costs for Local Authorities Expenditure Estimates, and allocation of an annual “Cleanliness Rating” for towns and cities. In addition the levy was seen as complying with the European Union’s policy direction of market-based instruments for environmental protection (Fehily, Timoney and Company 1999).

Convery and McDonnell (2003 Page 2) call attention to the issue that there was “no study that estimates the total or marginal external costs of plastic bags ‘released’ into the environment [at the time the PlasTax was implemented], and the issue is not a priority for environmental scientists or organisations”. In contrast anecdotal evidence suggests that for many of the public PSB **are** seen as an issue (Dunne 2004b), and the plastic bag tax was viewed as a positive step towards reducing PSB litter considered to be impacting negatively on tourism, Ireland’s second largest industry (Collins, Thomas, Willis, and Wildson 2003). Interestingly, the consultancy study commissioned before the levy was implemented noted that “while efforts have been made over recent years by many retailers to encourage the use of alternatives [...] these have not been particularly successful to date—mainly due, it would seem, to consumer apathy” (Fehily, Timoney and Company 1999 Page 4), yet again demonstrating the gap between attitudes and behaviours (Bazerman et al 1996). With the reality of a levy looming, the plastics and packaging industry proposed a voluntary take-back recycling scheme. However, when it became clear the levy was taking place industry focussed their efforts on exemptions and practical reality of a plastic bag levy. Retailer’s were initially concerned consumers would blame retailers for profiteering from the levy (Convery and McDonnell 2003). As a result of this concern extensive consultation occurred with the Irish Business Employers Confederation, the main representative body, on the design and implementation of the levy scheme (ibid).

Introducing the Levy

Despite industry discord and consumer apathy the Irish cabinet agreed on the plastic bag levy in March 2000, and once support from the Minister of Finance and the Revenue Commissioners had been sealed, the tax of €0.15 per plastic bag was implemented on the 4th of March 2002. The Minister of Finance and the Revenue Commissioners manage collection and administration of the levy, and are to be paid annually from the funds of the levy. Local government and the Revenue Commissioners are also mandated to enforce retailers to charge customers for plastic bags, while public were encouraged to report retailers not abiding to the tax regulations (Convery and McDonnell 2003). The specific rules and regulations of the PlasTax are addressed next.

The PSB tax (as of January 2007) is a uniform charge of €0.15 to all plastic bags that are not specifically exempt from the charge as outlined in the statute, Statutory Instrument No. 605 of 2001, Waste Management (Environmental Levy)(PSB) Regulations 2001, Dublin.⁸⁶ Bags that are exempt from the levy are bags used to contain fresh fish, meat and poultry; and any fresh fish, meat and poultry products. These bags are exempt provided they are not larger than 225mm in width, by 345mm in depth, by 450mm in length (inclusive of any handles). Plastic bags that are the sole container for fruits, nuts, vegetables, confectionary, dairy products, cooked food (hot or cold), and ice are also exempt.⁸⁷ Additionally exempt bags are bags used to carry goods on ships and airplanes, in ports or airports and bags intended for reuse that are sold for more than €0.70.

Regulations contained in the levy specify: each bag sold is to be itemised separately on customer receipts; full accounting records are to be kept by retailers of both exempted and non-exempted bags purchased and subsequently sold to customers.⁸⁸ It is these supply and sale numbers that are to be submitted to the Revenue Commissioners as indication of the levy to be paid. Suppliers or distributors are also required to give reports when requested by the Revenue Commissioners on the numbers of exempt bags and non-exempt bags supplied. If the levy is not paid, or is underpaid, the levy is charged at an estimated rate and is deemed recoverable if no appeal to the levy is submitted. These details of the PlasTax were communicated to consumers and retailers through advertising campaigns from the Department of Environment, Heritage and Local Government (DEHLG).

Prior to, and during the implementation of the PlasTax an extensive publicity campaign was run to inform the public about why and how the levy was to be administered, and

⁸⁶ For the complete statute for the Irish PSB Levy, including plastic bags exempted please go to: Statutory Instrument No. 605 of 2001, Waste Management (Environmental Levy)(PSB) Regulations 2001, Dublin (www.irishstatutebook.ie/ZZSI605Y2001.html)

⁸⁷ Provided these bags do not exceed the size previously outlined (Statutory Instrument No.605 2001).

⁸⁸ Number of non-exempt bags in stock before 4th March 2002, number of exempt bags in stock before 4th March 2002, the number of non exempt bags purchased, and sold to customers in each accounting period, and the number of exempt bags purchased and supplied to customers in each accounting period.

11. 1 (a), (b), (c), (d), (e) www.irishstatutebook.ie/ZZSI605Y2001.html

included ways to avoid the levy.⁸⁹ A key feature highlighted in advertising was the establishment of an environmental fund from the revenue of the levy, to be administered through the DEHLG. The funds from the levy were first allocated to cover administration and enforcement costs, and additional revenue sent to the environmental fund to support community and business environmental activities.⁹⁰ Projections estimated an annual revenue collection from the levy to be approximately €10-11 million (Convery and McDonnell 2003).

Post Implementation

After the implementation of the PlasTax, annual PSB consumption dropped from 328 bags per capita to 21 (DEHLG 2007), a 90 percent reduction in consumption (DEHLG 2004, Dunne 2004b). However, more recent estimates place annual PSB consumption at 30 per capita (DEHLG 2007). The funds raised from the PlasTax totalled €75 million, with €18.8 million going to the Revenue Commissioners for administration (DEHLG 2007).

Additional funds were used to: support civic recycling facilities; enforce Waste Management Acts (1996 and 2001); finance product specific waste minimisation activities (fridges and freezers); funding waste awareness campaigns; and the successful “Green Schools” initiative (DEHLG 2007b).⁹¹ In addition to reduced consumption are impacts of the levy to litter quantity. PSB prior to the levy constituted five percent of litter in Ireland, and post implementation now represent 0.03 percent of Ireland’s litter (DEHLG 2004, 2007).

Convery and McDonnell’s research paper, “Applying Environmental Taxes and Levies- Lessons from the Experience with the Irish Plastic Bag Levy” (2003), analysed the PlasTax policy for economic efficiency, environmental effectiveness, and equity. The paper reports

⁸⁹ \$358,000 spent on advertising to launch the PSB levy campaign (Dunne 2004b and Convery and McDonnell 2003, Page 3).

⁹⁰ The allocation of “Education and awareness campaigns, waste reduction and minimisation programmes, research and development in waste, support the sale of less environmentally harmful alternative products, assist in cleaner production programs, assist environmental enforcement in general, facilitate partnerships with local authorities for local environment improvements, resource promotion of environmental awareness, and to aid local groups in environmental initiatives” (Dunne 2004b).

⁹¹

that the levy is more statically efficient than a ban, as it allows for flexibility of consumption for consumers. However, as there was no attempt to identify the total or marginal external costs of littered PSB in Ireland, the Plastax was implemented without knowledge of the optimum level of tax to set.⁹² This resulted in the application of the PlasTax not satisfying OECD requirements for equity and efficiency: that for fairness costs need to be adjusted for use, and people only billed for the production of waste (OECD 2004).⁹³

Although the PlasTax is not considered equitable according to economic theory, it is considered to be fair by the public, and due to the low costs of the PlasTax to business and consumers negative distributional effects were unlikely (Convery and McDonnell 2003). Anecdotal retail surveys reveal “retailers find the effects on their well being neutral or positive, with the additional costs of implementation (book keeping and VAT returns) being modest, and generally less than the savings resulting from not having to purchase bags” (ibid Page 5). In addition to retailers experiences householders also reported positive encounters of the levy.

Convery and McDonnell’s (2003 Page 6) household survey revealed that overall households interviewed in favour or neutral to the levy, and that checkout convenience and the general impact of the levy was an improvement at their expense. Respondents also indicated a noticeable reduction of “plastic bags in the environment” (ibid), though the research is quick to point out that there is no evidence to support this perception (ibid).⁹⁴ In addition to the positive perceptions and reductions in plastic bag consumption, there are also negative impacts and perceptions.

⁹² This is according to Pigou’s (1932) definition of optimum taxation levels for static efficiency. A tax set at the right level, achieves the desired level of abatement of pollution for the least cost, called static economic efficiency, achieving optimum at a minimum cost. Pigou also held that the constant nature of a tax stimulates a responding constant incentive to innovate to reduce the tax bill creating “dynamic efficiency”.

⁹³ OECD report indicates the arbitrary setting of levy is unacceptable and inequitable (OECD 2004).

⁹⁴ Table 2. Survey of Households, March 2003; Impact at checkout; 27 positive, 60 neutral and 13 negative; Convenience; 31 positive, 45 neutral and 24 negative; Expense; 14 positive, 60 neutral and 26 negative; Environmental impact; 90 positive, 8 neutral and 2 negative (Convery and McDonnell 2003 Page 6)

A reported negative impact of the PlasTax was an initial rise in shoplifting, but returned to pre-levy levels (ibid Page 5). There was also difficulty initially with the locally organised nature of the PlasTax, making implementation troublesome for larger retailers operating from centrally administrated structures. This administration difficulty created some reluctance to implement the PlasTax, but all participants in the study were reported as fully compliant (ibid). Additional impacts of the levy were the effects on the plastics and packaging industry.

The impact of the plastic bag levy to industry in Ireland has been widely publicised in the PSB debate. After the application of the PlasTax one plastics manufacturer closed (ibid). However, it is unclear whether this manufacturer would have had the same fate had no levy been implemented (ibid). Two of the three negative impacts of the levy (shoplifting and administrative difficulties) were over come with time. The effect of the PlasTax to industry is unclear, as it has not been confirmed there was a direct influence of the PlasTax to the manufacturer's closure. It has been suggested that issues of innovation, flexibility and impacts of other markets may have also played a role in the closure of plastics manufacturer (ibid).⁹⁵ The final comment on the application of the PlasTax is in relation to the way in which a levy works as an economic instrument.

As mentioned previously, Ireland experienced an increase in PSB consumption. The increase in consumption was monitored through the reporting system, and increased revenue from the PlasTax noted (DEHLG 2007). Increases in PSB consumption is driven by consumer desensitisation to the €0.15 charge, and an increase in the charge may remind consumers to curb PSB consumption ensure the impact of the PlasTax is not diminished (DEHLG 2007). In February 2007 plans were unveiled to increase the levy to €0.22, the maximum allowed by current legislation, in an attempt to halt increasing PSB use. The necessity of increasing a levy is noted as one downfall of economic instruments. However, with correct monitoring and legislation of an economic instrument, a labour intensive

⁹⁵ The impact of the PlasTax to industry was determined by the extent of alternative product investment and employment opportunities (Convery and McDonnell 2003).

process of updating a levy can be avoided, resulting in a successful long term application of a levy as in Ireland's case.

The PlasTax success was confirmed by a survey of public behaviour and attitudes to the environment that indicated 91 percent of those surveyed supported the initiative (Attitude and Action Survey 2003, DEHLG 2004). Additionally, success was aided by the implementation of the Irish National Litter Action Plan (2001), which was enabled before the PlasTax. This plan recognised 'rigorous enforcement' as a key element of successful campaigns, and called for local governments to have greater enforcement and called for a review of the Litter Pollution Act 1997 (DEHLG 2004). As a result of the PlasTax success the use of further product specific charges in Ireland has been suggested. Research into the application of further charges has suggested the targeted sectors first have an opportunity to enact voluntary initiatives to reduce their products contribution to litter before economic instruments (EI) are applied (DEHLG 2004).⁹⁶

Lessons from Ireland's PlasTax

- The existing revenue collection system in Ireland kept the implementation and ongoing costs of the PlasTax down.⁹⁷
- Consultation with industry resulted in the exemptions for some plastic bags (Convery and McDonnell 2003) and it is theorised, greater acceptance of the charge from industry and retailers.
- The PlasTax impacts on industry were determined by the extent of alternative product investment and employment opportunities (Convery and McDonnell 2003).
- The substantial reduction in PSB consumption was a result of widespread public acceptance and quick response to the PlasTax (Convery and McDonnell 2003).

However PSB use has increased over time due to desensitisation to the levy,

⁹⁶ Additional product specific levies have been proposed (with significant public support) for Automatic Teller Machine (ATM) receipts, chewing gum, plastic water bottles and polystyrene fast food packaging (Collins et al 2003 and DEHLG 2004), in addition to household waste levies (Collins et al 2003).

⁹⁷ The PlasTax was estimated to have a set up of €1.2 million, plus €350,000 annually for administration, and a one off cost of 358,000 Euros for the initial advertising campaign (Convery and McDonnell 2003 Page 6). Convery and McDonnell (2003 Page 6) also demonstrate "For retail firms revenue collection and administration costs are readily integrated into VAT collection systems [...] and are more than counterbalanced by the savings on plastic bags".

leading to an increase in the PlasTax and additional awareness campaigns to deter further increases in PSB consumption.

- While the use of paper bags has increased they have not replaced PSB. The majority of PSB have been replaced with reusable alternatives (Dunne 2004b).
- PSB constitute 0.3 percent of Ireland's national litter, a decrease from the 5 percent prior to the PlasTax (DEHLG 2004).
- The action of replacing PSB with reusable alternatives has led to heightened public awareness of the environment. This suggests the Environment Minister's broader aim of the PlasTax of increasing environmental awareness was achieved at low cost (Convery and McDonnell 2003). The collaboration of crucial government sectors and a robust legislative base of the PlasTax facilitated the achievement of specific and broader goals (Convery and McDonnell 2003).

The success of Ireland's PlasTax created significant international interest in the management of PSB. Specific contextual factors such as the previously established revenue collection system, and public irritation from littered PSB, in conjunction with the design and application of this product specific tax has contributed to the significant reduction in PSB consumption, and reduced littering of PSB in Ireland.

Case Study Two: Australia's Voluntary Campaigns

In contrast to Ireland's legislated economic instrument Australia's experience thus far is with the use of voluntary measures. Australia has had various local, state and national voluntary campaigns to increase awareness to reduce PSB consumption and littering. Although there is no national legislation, heightened public awareness and the multitude of voluntary actions has presented the unique situation of a serious investigation of PSB consumption, use and disposal by the Australian government.

Single use PSB came into public awareness in Australia due to the environmental impacts of marine and terrestrial litter. Public interest was raised specifically due to the impacts on endangered Loggerhead and Leatherback Turtles, and more recently the impacts on coral and reef ecosystems (EPHC 2007). News that Ireland's PlasTax reduced PSB consumption

by 90 percent (Convery and McDonnell 2003) provided impetus for government investigation of reducing environmental impacts of PSB in Australia (PBWG 2002), and resulted in the establishment of the “Plastic Bag Working Group” (PBWG). Ireland addressed PSB as part of a waste management campaign due to the detrimental effects of litter on the tourism industry.⁹⁸

The negative impacts of littered PSB to tourism are a reality in Australia also. Australian litter research indicates that PSB are approximately two percent of all litter in Australia, approximately 21,540 tonnes (Clean Up Australia 2002 and 2005)⁹⁹. Although litter in Australia is at lower proportion than experienced in Ireland (five percent of litter DEHLG 2004), many sources note while it is the impacts of littered PSB identified as the key community concern, it is in reality the wasteful and careless consumption of resources that PSB represent so accurately that is the origin of this concern (Byars 1995, Nolan ITU 2002b, ACG 2006, EPHC 2007). The sensitive marine environment that is the core of Australian tourism compounds this concern, as it is susceptible to damage from litter, especially littered PSB (coral damage, reductions in biodiversity, marine life ingestion or entanglement, particularly endangered turtle species).¹⁰⁰ The damage caused by marine litter has lead to community concern and actions to reduce the consumption and littering of PSB in Australia.

Current Actions to Reduce Plastic Shopping Bag Consumption and Littering in Australia

There are many groups contributing to efforts to reduce the impacts of littered PSB in Australia. Voluntary campaigns have been implemented at city, state and nation wide levels.¹⁰¹ There have also been endeavours to employ regulatory or economic instruments.

⁹⁸ Ireland estimated that PSB constituted 5% of the total litter stream (Scottish Parliament 2006), and as a result PSB were the first item in a list of products to be targeted with levies (other products identified include Automatic Teller Machine (ATM) receipts, chewing gum, plastic water bottles and polystyrene fast food packaging Collins et al 2003 and DEHLG 2004).

⁹⁹ Litter surveys, Clean Up Australia Rubbish Report 2002 and 2005, Keep Australia Beautiful National Litter Index 2005 and 2006 estimates PSB are less than 1% of the total litter amount.

¹⁰⁰ For more information on environmental impacts of littered PSB please refer to chapter 3

¹⁰¹ 2001 Bag Yourself a Better Environment Campaign Clean Up Australia 2002; Clean Up Australia’s “Say NO to PSB” Campaign, the National Packaging Covenant with the National Environmental Protection Measure (Used Packaging Material), and the Australian Retailers Association Code of Practise 2003-2005.

Accompanying these campaigns has been vigorous debate concerning government intervention and the publishing of numerous reports and analyses on the potential impacts of government intervention to reduce PSB consumption and littering. I am now going to cover the legislative, economic, and voluntary measures in use or suggested in Australia as presented in literature.

Legislation

As yet Australia has no state or national legislation specifically addressing PSB. However in light of raised awareness and community concerns about litter and PSB some states have increased litter penalties.¹⁰² This community concern has also led to the Victoria State Government to include actions addressing PSB in their sustainability strategy.

In July 2006 the state of Victoria released their “Sustainability Action Statement”, including plans to ban lightweight PSB by the end of 2008. The ban applies to all retail stores unless there is a minimum charge of AUS\$0.10, an exemption applies, or an accredited phase out plan is in use (Victorian Government, Department of Sustainability and Environment July 2006).¹⁰³ There have been several attempts to introduce charges for PSB around Australia

Economic Instruments

In 1999 Australian Capital Territory (ACT) introduced a Private Members Bill proposing a mandatory charge for PSB at retail outlets. The Bill did not proceed as it was perceived there would be a negative effect on business, and would not effectively address the PSB problem (PBWG 2002). The next Bill proposed an Australian wide PSB charge, and was introduced by Senator Bob Brown in 2002.

¹⁰² Existing PSB Management Practices, Regulatory Measures: New South Wales amended the Protection for the Environment Operation Act 1997, allowing for stronger, more flexible, and enforceable anti-litter provisions” Queensland, South Australia and Victoria (PBWG 2002, Page 14).

¹⁰³Phase out plans are accredited by the approval of the Australian Environmental Protection Agency (Victorian Government, Department of Sustainability and Environment July 2006).

The senatorial bill introduced a regulated levy of AUS\$0.25 on PSB at the point of sale, and a national environmental fund be established with the money raised by the charges (PBWG 2002 Page 15). The levy proposed in this Bill also applied to biodegradable plastic bags, providing some interesting foresight to the issues of biodegradable plastics (biodegradable plastic bags are discussed in depth in the following chapter, 6). Also in 2002 the Council for the Encouragement of Philanthropy Trust proposed a four-tiered levy system for PSB at the point of sale, also with an environmental fund. Under this system levies ranged from AUS\$0.05-\$0.20, the level was dictated by the type of bag. The levy system was not implemented but was presented to a number of agencies (PBWG 2002). In contrast to these three examples of efforts to implement economic instruments, voluntary actions have been implemented throughout Australia.

Voluntary Actions and Agreements: State

In an effort to reduce PSB consumption there have been a number of alternative bag trials have been held in Tasmania, ACT, and Queensland. Tasmania conducted a calico bag trial in 2002 that rewarded customers with an AUS\$0.02 discount per bag when customers used calico bags. ACT ran “ReBag”, a calico bag trial in 1999, during which support for the initiative outweighed the supply of calico bags.

It is interesting to note, Queensland ran several trials and was negotiating a voluntary agreement to replace polyethylene plastic bait bags with biodegradable bags. Sea World and the Great Barrier Reef Marine Park Authority supported this initiative to reduce the impact of this widespread mariner litter on marine mammals and endangered Loggerhead and Leatherback turtles. Further research on the impacts of biodegradable bags to turtles is being conducted (PBWG 2002 Page 17). While this was a localised trial, the impact of such an agreement would be national wide across Australia.

The National Packaging Covenant 2005

The largest voluntary action at a national level is the Australian National Packaging Covenant (NPC) 1999 and 2005. Industry and all levels of government signed the first NPC 1999. The NPC is based on the principals of shared responsibility through product

stewardship, which is applied through all links in the packaging chain. The NPC is a self-regulatory agreement and is backed up by legislation, National Environmental Protection (Used Packaging Materials) Measure (NEPM) 2005, to ensure signatories are not disadvantaged in the market place, as well as providing a safety net for non-signatories (PBWG 2002 and NPC 1999). The NPC legislative framework provides regulatory backup by requiring those who are not signatories to meet NEPM (2005) regulatory standards.

The second NPC was signed in 2005 and works with the NEPM (2005) in a co-regulatory manner to ensure non-signatories do not benefit from actions undertaken by members of the NPC 2005. Sector Seven of the NPC 2005 incorporates the Australian Retailers Association (ARA) Code of Practise for the Management of Plastic Bags (2003).¹⁰⁴ This code of practise for plastic bags was implemented nationally through the ARA and the NPC, and operates in conjunction with the goals of the NPC (2005) Sector Seven. The original code of practise for PSB was launched in Victoria in December 1997 by a supermarket institute and an environmental group, but is now administered by the Australian Retailers Association (PBWG 2002).

The Australian NPC (2005) has a total target of a 75 percent reduction in PSB use over two years (25 percent in 2004 and further 50 percent in 2005). Moreover, the NPC (2005) also contained a specific target for kerbside recycling of an increase of more than 30 percent by 2005, commitments to use domestic recycled content plastics, an investigation of the alternatives for PSB, and to investigate the barriers to use of reusable alternatives, such as the packing frames in supermarkets (NPC 2005).

In comparison to the NZPA (2004), which as a goal of a 20 percent reduction over five years, and is adjusted for growth, the NPC (2005) emerges as having stronger goals and wiser approach to voluntary agreements. Moreover, New Zealand Brand Owner and Retailer signatories' responses are late in the piece of the NZPA (2004); many will not meet target deadlines, and the entire NZPA (2004) looks like a public relations exercise

¹⁰⁴ The original ARA Code of Practise for PSB was launched in 1997. The 2003 version was updated, expanded and strengthened (PBWG 2002). The ARA Code of Practise for PSB can be seen at <http://www.ara.com.au/136.html>

when compared to the stronger and more public efforts of signatories of the NPC (2005) in Australia.

Non-Government Voluntary Actions

Additional to the efforts of the NPC (2005) and ARA Plastic Bag Code of Practise (1997, 2003 and 2006) is a national campaign run by Clean Up Australia, “Bag Yourself a Better Environment” and “Say No To Plastic Bags”. The initial campaign “Bag Yourself a Better Environment” had a weeklong program in 2001 and a month long campaign in 2003. These short-term campaigns resulted in short term increases in the use of alternatives to PSB and recycling (Collins et al 2003, Nolan ITU 2002b, and PBWG 2002).

The current national Clean Up Australia campaign, “Say No to Plastic Bags”, provides information for retailers and consumers on how to reduce PSB use, and provides a kit for retailers to reduce PSB consumption, increase recycling and reusable bag use, staff training materials and in-store promotional materials (Clean Up Australia 2006).

Figure 9. Australian Voluntary Campaign “Say No to Plastic Bags” Posters.

(Source: Clean Up Australia 2006)

A second national voluntary, “Bag Smart”, is also offering information and assistance to shoppers and retailers to reduce their PSB use by encouraging the use of alternatives, and recycling of PSB.¹⁰⁵ Over recent history consumer and industry interest has been held with the publication of documents investigating PSB, and has provided extensive literature on PSB in Australia; PBWG 2002; Nolan ITU 2002; 2002b; ARA 2003; Nolan ITU 2005; NEPM 2005; NPC 2005; Productivity Commission 2005; EPHC 2005; ARA 2005; ACG

¹⁰⁵ www.bagsmart.com.au

2006; Hyder Consulting 2006; ARA 2006; ACG 2006b; Victoria State Government 2006; and EPCH 2007.

Australian Research

There are numerous documents and reports from Australia about PSB use, production, and impacts of proposed government interventions. The research findings presented below are collated from Australian research making statements or suggestions for the best course of action. Additional themes of Australian research have been explored in the appropriate chapters.

The PSB Working Group Report (PBWG 2002) was commissioned to investigate the current actions and activities around Australia at the time, and to provide recommendations for future directions for the PSB in Australia. The PBWG (2002) identified four areas for attention: consumer behaviour; resource efficiency; plastic degradability; and social issues of community education, awareness and consumer perception. Action resulting from the PBWG (2002) was separated into high, medium and low priority actions. High propriety actions addressed: PSB education and awareness activities; expansion and reporting of the Plastic Bag Code of Practise (ARA 1997); assistance to PSB recycling; clarification of issues associated to degradable plastics; and further research into legislative options. Medium priority actions are: to investigate waste management actions in an effort to provide best practise guides to reduce litter; and further research identified as required to close knowledge gaps.¹⁰⁶ Low priority recommendations from the PBWG are: to provide reusable bag information and encouragement on the Internet; an investigation of food hygiene standards for fresh food and goods; and to conduct a review of the effectiveness of agreed measures to address PSB (PBWG 2002).

Also in December 2002 Nolan ITU published “PSB-Analysis of Levies and Environmental Impacts, Final Report” (Nolan ITU 2002b). After discussing the context of PSB in the

¹⁰⁶ Knowledge gaps identified were: consumer data on PSB recycling, geographic distribution, overseas experience with degradable plastics, further data on lifecycles of alternatives to PSBs, the effectiveness of other Australian information and education campaigns, data on the demand for PSBs, and data on the impacts of reducing PSBs in the litter stream (PBWG 2002 Page 36).

packaging mix and plastic as a material, and international examples of PSB management, this research outlines nine potential options for management. These nine options range from the status quo, recycling, use of alternatives, to a mandatory ban on PSB. From these potential options, only four scenarios are analysed using triple bottom line reporting.¹⁰⁷

The scenarios are as follows: 1A) AUS\$0.15 legislated levy and an expanded PSB code of practice; 1B) AUS\$0.25 legislated levy and an expanded code of practice; 2) voluntary levy as part of the code of practice; 3) Expanded code of practise; and 4) current code of practice (status quo) (Nolan ITU 2002b). This report concludes that scenario 1B) an AUS\$0.25 legislated levy and an expanded code of practice, presents the best option for management. This levy provides AUS\$358 million in revenue; has similar cost to households as current PSB consumption;¹⁰⁸ results in an 85 percent reduction in PSB use; a 65 percent reduction in global warming impacts; and 63 percent reduction in primary energy use (Nolan ITU 2002b).

In addition to suggesting a course of action, Nolan ITU (2002b) presents the first calculations of Australian import, manufacture, consumption, use and disposal of PSB. Nolan ITU (2002b) also presents estimations of quantities of PSB from different sources, and littering behaviour. These initial consumption patterns and life cycle flows are followed by consumption pattern after the implementation of voluntary actions (Nolan ITU 2005, Hyder Consulting 2006). Research shows voluntary campaigns in first six months reduced PSB consumption by 29 percent (Waste and Resources Action Program 2004). In the first year (2002-2003) achieved a reduction of 11.9 percent (0.71 billion PSB) (Nolan ITU 2005). In the second year (2004) reductions of 9.7 percent (0.51 billion PSB) were achieved (ibid). A further reduction of 17 percent, or 0.81 billion PSB was attained in 2005 (Hyder Consulting 2006). These reductions, as shown in the figure below, cumulate as a total reduction of 2.03 billion PSB, or 34.2 percent from the baseline consumption in 2002

¹⁰⁷ The Nolan report assessed these options according to the cost of set up implementation and ongoing costs, revenue gained from levies, environmental impacts of reduced littering, reductions in global warming potential and energy use, as well as the social impacts of management, such as health and safety implications, and the cost to those on a low income.

¹⁰⁸ Nolan ITU (2002b) suggest that the AUS\$0.25 levy would cost households AUS\$14 annually, whereas current PSB consumption is costing households AUS\$10-15 annually.

(Hyder Consulting 2006 Page 12). Although voluntary campaigns achieved reductions the campaign have not achieved the NPC 2005 goals of a 75 percent reduction in PSB consumption by 2005 (voluntary campaigns attained a 34 percent reduction (Hyder Consulting 2006).

Table 6: Australian Plastic Shopping Bag Consumption 2002-2005

Year	Number of PSB used in Australia (billion)	Number of PSB Per Capita	Percent Reduction
2002	5.95	303	-
2003	5.24	264	11.9
2004	4.73	235	9.7
2005	3.92	192	17
Total	-2.03	-111	34.2

After the publication of data demonstrating the reductions achieved by voluntary campaigns, a document titled “Draft Agreement to Phase Out Single Use Plastic Carry Bags” was published by the EPHC (2005). This document suggested PSB be phased out by January 2008, and introduction of regulation in January 2009 prohibiting retailers supplying single use PSB. This sparked further debate about the PSB issue, and the publishing of an updated Code of Practise for Plastic Bags from the ARA, “Carry Bags: Working Towards Continuous Environmental Improvement” (ARA 2006).

The proposed updated ARA code of practise for PSB would still operate within the NPC (2005), has objectives of: a further ten percent reduction in PSB consumption by December 2006; an investigation of options for biodegradable bags; a twelve month review of alternatives, reuse and recycling of bags; the minimisation of litter; and optimising the use of reusable alternatives (ARA 2006 Page 3). As a result, the extension of the ARA code of practise for plastic bags is presented as one of fifteen options for management in the EPHC “Consultation Regulatory Impact Statement (RIS): Investigation of Options to Reduce the Environmental Impact of Plastic Bags” (EPHC 2007). However, prior to the publication of the consultation document (EPHC 2007) additional research and comments were published in Australia.

The Productivity Commission draft report “Waste Management” (2006) states that there has been no cost benefit analysis (CBA) of the consequences of banning PSB. However, subsequently the ACG (2006) CBA of alternative management approaches has since been published, providing data and estimations on the costs and externalities of PSB management options. The Productivity Commission (2006) also points out that PSB management action must take into account consumer impacts, as PSB provide a valuable service. Finally the Productivity Commission suggests a PSB ban would be inconvenient for consumers, especially in light of their suggested high percentage of PSB reused, 75 percent (Productivity Commission 2006). In reality Australian research suggests plastic bag reuse is closer to 52 percent of the total consumption, taking into consideration that this reuse still results in bags sent to landfill in waste activities as discussed in Chapter 5, New Zealand use (Authors Calculation 2007, source data ACG 2006, Nolan ITU 2002b).¹⁰⁹

Following productivity commissions report the Allen Consulting Group (ACG 2006) published a report for the EPHC called “Phasing Out Light-Weight Plastic Bags: Costs and Benefits of Alternative Approaches”. This report provided CBA of nine key policy options for a post 2008 period using a multi regional economic modelling program. The analysis concludes that all options for PSB management result in a situation where the “economic and environmental costs exceeds the benefits by substantial margins” (ACG 2006 Page 48). ACG (2006) points out management options are calculated using actions that address all PSB, when it is two percent of PSB creating environmental and social problems through litter. Therefore it is not the consumption of PSB that is the aim of management, but the number of PSB littered, and the value placed on the reduction of PSB in the environment (ACG2006 Page 34). ACG emphasises economic costs are likely to be insensitive to changes in estimated environmental damages from discarded PSB (ACG 2006 Page 51), and that net present values must outweigh AUS\$2.50-3.00 before any elimination policy options “breaks even” (ACH 2006 Page 49). ACG (2006 Page 33) also indicates “environmental benefits rise in line with costs. It is the more expensive policy options that are the most effective at reducing the number of light weight plastic bags (PSB)

¹⁰⁹ Total plastic bag consumption is 6.9 billion, it is estimated 3674million plastic bags are reused (ACG 2006 Page vi), resulting in a calculation of approximately 52 percent being reused, before being disposed in a landfill.

consumed”. It is meaningful that policy makers are responding to strong public sentiment as well as economic factors. However, it remains to be seen whether these non-quantified benefits are sufficient to offset costs of actions addressing PSB (ACG 2006).

Scenario 3 in the ACG report, an extended plastic bag code of best practice, is estimated as the lowest cost management option, and requires a smaller measurement of social benefit to balance the economic costs of this action (ACG 2006 Page 49). Another low cost option presented is Scenario 7, an Advanced Disposal Fee (ADF). This option, like in scenario three, does not eliminate PSB providing flexibility for consumer use, but also recovers costs of litter clean up and disposal, and increases awareness of litter and waste issues.

Following the ACG (2006) CBA report the ARA published an updated code of practice for plastic bags (Carry Bags: Working Towards Continuous Environmental Improvement 2006). This led to publishing of a supplementary report to the CBA to include the ARA proposal and an expanded code as additional policy options (“The ANRA Proposal on Plastic Bag Management: Supplementary Economic Analysis to the EPHC Report” ACG 2006b). The management options presented in both ACG reports (2006, 2006b) were included in the EPHC consultation document released in 2007.

The Environmental Protection and Heritage Council’s consultation document (EPHC 2007) provides the most comprehensive suite of management options, and includes economic, environmental and social comparisons of management options. The EPHC document investigates the issue of PSB from the objective of “whether additional government action is required to reduce the environmental impact of single use, light weight, plastic carry bags through possible future voluntary, co-regulatory and regulatory actions” (EPHC 2007 Page 34). The consultation document presents fifteen options for intervention from no further action, to a government-imposed ban in 2009. The focus of the consultation document is to reduce the environmental impacts of lightweight plastic carrier bags: litter; aesthetic value reduction; and wildlife entanglement and ingestion. While the EPHC document addresses social and economic impacts, the long-term environmental impact of PSB is limited to the cumulative effects of PSB as litter, and does not elaborate

on this cumulative nature resulting in minute plastic pollution, as discussed in chapter three. The EPHC document does encompass some un-quantified social benefits of addressing PSB, and does not seek to quantify these but asks for public, industry, retailers submissions to understand the level and specific concerns about PSB. This consultation document was open for submissions until February 2007, with submission feedback expected late 2007 or early 2008. The EPHC document does recommend actions of either a PSB levy or a ban on PSB in Australia.

The EPHC (2007) recommends if “social benefit of phasing out plastic bags is determined to be sufficient to justify regulatory action, **a mandatory charge or ban on plastic bags** at state level in a nationally consistent manner appears to be the regulatory options that are most appropriate” (EPHC 2007 Page 87). The EPHC suggests such a charge would need to be set at the point of sale, paid by customer and presented in a transparent per bag manner (itemised on a receipt and subject to GST). EPHC also suggest management actions would be best implemented on January 2009.¹¹⁰ The EPHC also acknowledges that the fee may have to be revised over time, to accommodate for the conditioning of consumers (EPHC 2007 Page 88), such as occurred in Ireland. Such a ban would also require: exemptions for plastic reusable bags, consistent regulatory terms; requirements of bags; clear identification of the legislation enforcing the ban; as well as strong monitoring and enforcement. Both options of a charge or a ban of PSB would require comprehensive local government involvement and need extensive consultation for successful implementation (EPHC 2007 Page 89).

Lessons from Australia

Australian research has provided insights into behaviour and consumption patterns PSB, information about litter behaviour and consumption are particularly significant, as well as source figures, such as that 53 percent of PSB are from supermarkets (Nolan ITU 2002b).

¹¹⁰ Start date recommended to be January 2009 for natural justice and phase out of stock (EPHC 2007).

The raised awareness in Australia from voluntary campaigns resulted in a reduction in PSB consumption of 34 percent (2.03 million PSB) since 2002 (Hyder Consulting 2006).¹¹¹ The reduction has been attributed to a “coordinated effort by governments, some major retailers, and community and environmental organisations” (Hyder Consulting 2006 Page 12). However, the reductions have **not** met NPC (2005 Page 91) goals of a 75 percent reduction in PSB issued by 2005.

Despite the 34 percent drop in consumption of PSB (Hyder Consulting 2006) there has been no corresponding reduction in the levels of PSB in the litter stream. PSB have remained between 2.0 and 2.2 percent of litter (Clean Up Australia 2002-2006). This demonstrates current litter abatement and further litter enforcements are unlikely to sufficiently address PSB litter (EPHC 2007). However this has not deterred the ARA resisting government intervention, even despite reluctance of retailers for further voluntary measures (EPHC 2007 Page 39). Government intervention is considered essential in Australia, as voluntary measures are unlikely to change litter levels or provide a level playing field for retailers. Competition in the retail sector is likely to be affected by motivation, investment and sector interest, and result in an unequal distribution of cost further impacting on competition (EPHC 2007).

In addition to retailer’s reluctance for additional voluntary measures, there is strong public support for action to reduce the impacts of PSB. A public surveys have found eight out of ten Australians supported a levy on PSB (Collins et al 2003), and 93 percent of Australians are concerned about the environmental impact of littered PSB (EPHC 2007).

All options proposed to this point have been more costly than the quantified benefits presented (Collins et al 2003, ACG 2006, and EPHC 2007). Despite costs the preferred options are a PSB levy or ban, this is considered due to the high levels of local government involvement and extensive consultation for successful implementation but this is supported through public pressure for government intervention.

¹¹¹ This is a reduction of 2.03 million bags, from 6.9 billion bags in 2002 to 3.92 billion bags in 2005 (Nolan ITU 2002b, and Hyder Consulting 2006).

Research suggests that despite the costs, a mandatory charge or ban on PSB is the best course of action (EPHC 2007) due to environmental benefit and social impacts behind the strong public pressure for government intervention. Both suggested management options require exemptions for reusable bags and strong monitoring and enforcement (EPCH 2007).

Having looked into two international examples of PSB management, I will examine the range of policy options available to address the management of PSB, their applications and how they could be used in New Zealand. However, prior to this, I investigate the alternatives to PSB, as any management action presenting alternatives to PSB needs to ensure alternatives do not have significant environmental impacts, and are practical for policy and implementation suggested.

6. Alternatives to Plastic Shopping Bags

In this chapter I examine three of the commonly suggested alternatives to PSB: degradable bags, paper bags and reusable bags. Commonly paper bags are recommended as an environmentally friendly alternative to PSB. It is suggested the natural fibres of paper and its “recyclability” creates a positive image of paper bags (PBWG 2002). However, the impacts of milling trees and processes used to make, and recycle, paper are often not taken into consideration. Currently the most popular alternative to traditional PSB is biodegradable or “bio-plastic” bags. Biodegradable bags or bio-plastic bags have the same positive image of natural fibres and degradability as paper. However, there are many types of degradable and biodegradable plastics and not all are without environmental impact. The same can be said about reusable alternative to PSB. As a result of these perceptions, many alternatives to PSB suggested have equal if not more damaging environmental impacts than PSB. Therefore alternatives to PSB have to be assessed for environmental and social impacts across their potential life cycles, or a life cycle analysis (LCA) before they can be recommended.

I will conduct a limited exploration of the life cycle impacts of paper, biodegradable PSB, and reusable bags. The definition of the studied system for items subject to a LCA, system boundary, is ideally set in a transparent manner, but is often determined by the data available (SCION 2007, Ciambrone 1997). The system boundary can include: raw materials and their extraction to finished product, (cradle to gate); from raw materials to the disposal or recycling of materials (cradle to cradle); from raw materials to disposal (cradle to grave); or can focus on one aspect of an objects life, such as the manufacture of a product (gate to gate) (SCION 2007, Ciambrone 1997). Below (figure 10) is the system boundary for a LCA of degradable bags conducted by James and Grant (2005). This system boundary provides a representation of the life cycle and processes used to make PSB and biodegradable PSB.

Figure 10. LCA System Boundaries used by James and Grant (2005).

The limited assessment I am conducting of each bags life cycle impacts will be informed by international research, as limitations and scope of this research do not allow a full life cycle analysis. It is noted the international use patterns and modelling used in international research may not apply to New Zealand's use systems, alternatives available, energy production mix (renewable versus non-renewable), emissions, and data available. The limited life cycle impacts assessment conducted here has a system boundary of raw material extraction, to the end of life disposal or recycling (cradle to grave/cradle). I have chosen to use a life cycle approach to the alternatives to PSB to demonstrate different impacts across a products life.

The recommendation of **the** alternative to PSB will have a significant impact on consumer behaviour, environmental impacts and societal impacts of reductions in PSB.

“Alternatives to plastic bags exist in an important space. As impulse purchases are critical to the reduction in plastic bag use” (PBWG 2002 Page 21).

Demonstrating impulse or last minute shopping generates significant contributions to the numbers of PSB consumed. Moreover, impulse purchases are characteristic to the non-supermarket retail sector (Planet Ark Environmental Foundation 2005), where reusable bags are less common and reduction campaigns have had limited success (Hyder Consulting 2006). With no reusable bag already at hand, and no environmentally friendly alternative available, consumers are overwhelmed with convenience and accept or even request PSB. Thus, impulse purchases have a significant role in the reduction of PSB consumption and littering, and alternatives provided by retailers are a critical factor of the success of actions for reduction in plastic bag use (ACG 2006).

It is recognised that alternatives provide an “opportunity for retailers to consider the most appropriate bags” (PBWG 2002 Page 21). Furthermore, it is crucial that the bag proclaimed as “the” alternative to PSB is convenient and environmentally friendly. Any alternative suggested needs to be less damaging than the current situation, otherwise there would be no benefit in changing behaviours and replacing PSB with an equally damaging alternative, especially when “environmentally benign bag options are available” (ACG 2006 Page 41). This is even more significant as “natural” alternatives have the potential for

greater detrimental impacts than the traditional PSB. The natural fibre alternatives in currently popular are paper bags and biodegradable or bio-plastics, in conjunction with non-renewable alternatives such as heavier plastic (LDPE) bags, woven plastic bags and renewable calico, jute or cloth bags.

While numerous alternatives to PSB exist, the currently favoured alternatives can be categorised in three main groups, paper, biodegradable and reusable bags. The category of biodegradable bags incorporates many classes of natural starch based plastics, synthetic degradable plastics and blended synthetic and natural plastics, with different environmental impacts from each type. In contrast, paper is made with one format, although different grades, colours and thickness and alter the environmental impacts of production and use. Finally, reusable bags can be made from both renewable and non-renewable sources, including different types and applications of plastics and cloth. A complete assessment of each type of alternative bag within each of these categories is an immense undertaking and will not be attempted in this research, although international LCA and environmental impact assessment research will inform this limited study of alternatives to PSB.¹¹² International research demonstrates that the environmental impacts of all bags in LCA are: energy use; water use; water pollution; air pollution¹¹³; solid waste production; littering (Cadman et al 2005b, Ecobilan 2004).

It is already noted that the use patterns and sources of PSB determines the end of life disposal and length of life for PSB (Nolan ITU 2002b) and therefore also influences the environmental impacts of PSB. The traditional use patterns is the majority of the “singlet” style HDPE PSB are sourced from supermarkets and convenience stores, with the remaining PSB the thicker LDPE bags more often used in clothing, general merchandise,

¹¹² Nolan ITU in their 2002(b) study presented 50% recycled HDPE, LDPE, calico (cloth), woven HDPE, woven polypropylene (PP), paper, solid plastic box, reusable LDPE, biodegradable starch based, biodegradable PE in a LCA: James and Grant’s (2005) LCA presents an analysis of numerous types of degradable and biodegradable bags; Palmisano and Pettigrew (1992) “Biodegradability of Plastics”; Cadman et al (2005b) review of LCA used in their initial research; Zero Waste New Zealand (2002, 2005 & 2006) “Biodegradable Plastics”; Bradshaw (2006) “Bio-based and Degradable Plastics”; Plastics New Zealand (2002 & 2003). As well as gauging public perception: www.greenfeet.net/newsletter/debate.shtml; McLaughlin (2007); www.greenbiz.com/news.

¹¹³ Air pollution indicators are: green house gases, nitrogen dioxides, photo chemicals, ground level ozone creation potential (smog), and atmosphere acidification (Cadman et al 2005, Ecobilan 2004).

boutique and department stores (Nolan ITU 2002b). The alternative of biodegradable plastic bags would have similar use patterns to traditional PSB as they are also supplied as single use disposable shopping bags.

Biodegradable Plastic Bags

The new generation biodegradable plastics have been touted as the most environmentally alternative to traditional HDPE bags, and are endorsed using the same positive image of natural fibres and degradability that paper holds. Furthermore the increasing public awareness of climate change issues and environmental impacts of consumption has lead biodegradable plastic manufactures to identify that international pressures of environmental politics, the desire to stop using plastic bags, pressures on oil reserves and the “plastic war” are encouraging the development and use of biodegradable plastics and threatening the widespread use of traditional plastics, and increasing the marketing potential for the new generation products (BIOCOM Naft Asia Biodegradable Plastics Corporation and JSP, Jia Shing Plastic Industries Pte. Ltd.2006). However, the use patterns of PSB are a point of contention when biodegradable PSB are advocated as an environmentally friendly alternative to traditional polythene bags. Biodegradable PSB use patterns are identical to traditional PSB; disposable, often single use and high volume packaging; and unknown environmental impacts from the use of biodegradable PSB. Therefore although biodegradable plastics are marketed as an environmentally friendly option, they may cause further environment complications such as soil pollution, contamination of recycling streams, social impacts of increased litter,¹¹⁴ and reduced environmental functioning (Nolan ITU and ExcelPlas 2002a, Ecobilan 2004, Cadman et al 2005, Gluckman 2006, and Zero Waste 2006).

Despite these pressures to move away from traditional oil based plastics, and biodegradables being heralded as the saviour of plastics, there are many types of

¹¹⁴ The range of un-quantified social benefits of PSB reductions presented in the EPHC (2007) document include: feelings associated with a plastic bag free environment; positive feeling of clean local environment (civic or national pride); predisposing general environmental awareness and action; sense of well being and contributing to cleaner and healthier environment; encouraging more outdoor activity; healthier lifestyle; positive impacts on tourism; extended impact of reduced litter due to the correlations between crime behaviour in littered environments (www.allentownrecycles.org/template.jsp?id=47).

degradable and biodegradable plastics, and not all are environmentally friendly. Moreover the definition of ‘biodegradable’ is varied and often overlooked by consumers, many who consider biodegradable goods and natural or non-harming. Moreover, there are both intentional and unintentionally misleading claims of product performance that is increasing negative consumer experiences and leading to claims of “greenwashing” (Bradshaw 2006). These misleading claims will have significant impacts on understanding and use of biodegradable plastics. The term biodegradable has become a ‘buzz word’ in product marketing, and it does not necessarily mean the ingredients are natural or non-harming. The term biodegradable has a dictionary definition of; “capable of being decomposed by bacteria or other biological means (Collins English Dictionary and Thesaurus 2000).¹¹⁵ Therefore biodegradable items can also include synthetic plastics or blends of starch based and synthetic plastics that can be broken down, degraded or corroded by biological processes. it does not necessarily mean that all products of this degradation are absorbed into natural processes and environmental cycles. Plastics degraded by biological agents can still leave synthetic materials in small forms such as particles and polymers in the environment where the degradation has occurred, just as traditional polyethylene PSB leave when they erode as litter in the environment.¹¹⁶ Additionally the products of degradation differ between different types of biodegradable plastics.

Degradable and biodegradable plastics are classified in three ways; by the material properties, their chemical structure or the breakdown mechanisms as shown in table 7 below. The classification of plastics due to their material properties includes, natural biodegradable, synthetic biodegradable and blended biodegradable (synthetic and natural).¹¹⁷ The final classification is by the breakdown mechanisms, such as

¹¹⁵ Also known as primary biodegradation, ultimate biodegradation is the mineralisation or incorporation of materials in biomass (Palmisano and Pettigrew 1992).

¹¹⁶ Polyethylene plastic bags are environmentally erodeable as they degrade or erode to the point of small polymer sized pieces when exposed to natural environmental forces such as ultra violet light, rays, wind, erosion. It is possible to program polythene bags with a time to start breaking down, this is done by additives that reduce or enhance the degradation process. Additive such as ultra-violet light absorber makes plastic degrade when plastic is exposed to sunlight, producing photodegradable plastic (Lajeunesse 2004). Oxo-degradable plastic can start to degrade from the moment of creation due to the oxygen in the air. Degradation additives work by breaking carbon-to-carbon bonds, weakening the plastic, while stabilisers ensure the timekeeping to provide a useful life span for each application (www.degradable.co.nz and www.ecopal.co.nz).

¹¹⁷ The range of biodegradable plastics available include: Starch based products including thermoplastic starch, starch and synthetic aliphatic polyester blends, and starch and PVOH blends. Naturally produced

environmentally degradable and biodegradable. Environmentally degradable plastics degrade by the force natural elements such as, water (hydro-degradable), ultra-violet light from sunlight (photo-degradable), biological organisms (biodegradable), oxygen (oxo-degradable) and compostable (Zero Waste New Zealand 2006, Plastics New Zealand 2005, James and Grant 2005).

Raw Materials of Biodegradable Plastics

As the classification types suggests biodegradable plastics can be made from both renewable and non-renewable materials. The first recorded instance of plastics was by Alexander Parkes in 1862 when he created cellulose based, organic plastic that was able to be moulded and retained shapes when cooled (Lajeunesse 2004).¹¹⁸ Today natural based biodegradable plastics can be made from organic resources such as corn, potato, tapioca or wheat starches (polysaccharides) (Nolan ITU 2002b), also known as starch-based polymers (James and Grant 2005). Synthetic biodegradable plastics can also be made from renewable resources in addition to traditional hydrocarbons.¹¹⁹ Alternatively plastics can be made from renewable resources to create polyester such as polylactic acid (PCL), and polyhydroxy-butyrates-valerate (PHB/V) or controlled degradation of traditional polyesters from the introduction of additives and enzymes that degrade the plastics (James and Grant 2005). Additionally blends of synthetic and naturally based plastics such as PHB and PCL can be created (Nolan ITU 2002a and James and Grant 2005). The many source materials and environmental interactions of materials and additives create many specific environmental impacts in addition to the broader impacts of biodegradable plastics.

polyesters including PVB, PHB and PHBH. Renewable resource polyesters such as PLA. Synthetic aliphatic polyesters including PCL and PBS. Aliphatic-aromatic (AAC) co-polyesters. Hydro-biodegradable polyester such as modified PET. Water-soluble polymer such as polyvinyl alcohol and ethylene vinyl alcohol. Photo-biodegradable plastics. Controlled degradation additive master batches. (Nolan ITU 2002b).

¹¹⁸ The term plastic was coined later by Leo H Baekeland in 1909 when describing a class of materials created from coal tar. Leo H Baekeland created a plastic called Bakelite, which was used to make items such as telephones and cameras. Although it was used for these items plastic did not become popular until after WWI when petroleum became readily available (<http://www.time.com/time/time100/scientist/profile/baekeland.html>)

¹¹⁹ Non-renewable materials that can be used to create biodegradable polyester plastics include polybutylene, polybutylene succinate-co-adipate (PBSA), polybutylene adipate terephthalate (PBAT), adipic acid aliphatic/aromatic copolyesters (AAC), polycaprolactone (PCL), or modified polyethylene hydrocarbon based plastics (James and Grant 2005 Page 4).

Table 7. Classification of Biodegradable Plastics (NZPC 2006 and Nolan ITU 2002a)

Degradation Type	Material	Degradation mechanism
Environmentally Degradable	Traditional hydrocarbon based plastics	Breaks down into polymers due to natural forces such as water, light, and oxygen
Natural Biodegradable	Plastics made from starches and renewable sources.	Breaks down via biological organisms to only naturally occurring molecules (water carbon dioxide and methane).
Synthetic Biodegradable	Plastics made from non-renewable source, oil, and are biodegradable	Breaks down via biological organisms to plastic particles
Blended Biodegradable:	Plastic blend of natural and synthetic biodegradable resin	Breaks down via biological organisms to naturally occurring molecules and plastic particles

Environmental Impacts of Biodegradable Plastic Bags

The environmental impacts of biodegradable PSB at a broad level are: effects to waste disposal, such as effects to composting, landfill and recycling; the risk of increased littering; and the environmental impacts from further additions of plastics to the environment. In addition there is industry, consumer and NGO concern that the lack of labelling and standards required for biodegradable plastics will amplify the environmental and recycled material impacts. The main concerns about biodegradable plastics can be identified as the impacts from disposal and plastics recycling. Disposal and processing of biodegradable plastics is a key issue for the successful uptake of biodegradable plastics (MFE 2006, ZeroWaste New Zealand 2006). The potential disposal environments for biodegradable plastics have been identified as: composting or soil burial; anaerobic digestion; wastewater treatment facilities; plastics reprocessing facilities; landfill; marine or fresh water; and general open environment as litter (Nolan ITU 2002a).

Biodegradable plastics have been thought to hold the key to addressing PSB littering and the subsequent environmental impacts. However, recent research suggests that biodegradable plastics have similar environmental impacts as traditional polythene plastics (Nolan ITU and ExcelPlas 2002a). Moreover, there is concern that the widespread use of

biodegradable plastics will increase incidences of PSB littering due to the assumption that bags will disappear quickly and therefore reasonable to litter, potentially increasing environmental impacts from plastic. This includes incidences of marine and terrestrial entanglement and ingestion, as to an average turtle a biodegradable bag looks just like a polyethylene plastic bag (Williams 2004). Furthermore, it has been established that biodegradable bags can last up to six months as litter, and are estimated to take between one day to six months to sink in a marine environment depending on the material, while traditional PSB float for six months in a marine environment (James and Grant 2005). Therefore biodegradable PSB offer no benefits in a reduction in visible PSB litter, marine entanglement or ingestion, and exist as litter as long as traditional PSB. The consequence of increased littering from the widespread use of biodegradable PSB is even more likely without sufficient labelling and public education about the properties and characteristics of biodegradable plastics, one such characteristic is the assimilation of biodegradable plastics into compost.

Both natural and synthetic biodegradable plastics have been advocated as safe to assimilate into the organic waste stream (Nolan ITU 2002a). Biodegradable plastics have been said to help create high quality compost due to the slow release of carbon; increase the soil organic content; help water and nutrient retention; and reduce chemical inputs by suppressing plant disease (Nolan ITU 2002a). In contrast it has been suggested biodegradable plastics are unlikely to decompose in windrow composts common in domestic backyard situations, unless they are strictly maintained (Beston 2006, Bradshaw 2006), but in-vessel composting is ideal for biodegradable plastics due to the higher temperatures (Beston 2006).¹²⁰ It has been identified that biodegradable plastics need certain conditions for degradation and these conditions may be difficult to achieve without municipal collection (Bradshaw 2006). A municipal collection of organic and biodegradable plastic wastes would be an ideal situation for waste minimisation and the assimilation of biodegradable plastics in New Zealand. Unfortunately, The New Zealand's

¹²⁰ Commercial composting usually provides a regular 65 degrees Celsius (NZPC 2006). Windrow composting is open air composting, similar to domestic compost heaps, rather than an enclosed composting unit. Windrow composting can be difficult to achieve higher temperatures. An in-vessel composting unit is enclosed, and often has a higher temperature than windrow composting. In vessel composting can also include the use of bio-agents that allow for decomposition of waste, by-products and meat tissue.

infrastructure is not prepared to accommodate municipal collection and composting of organic waste and biodegradable plastics, leaving the responsibility of appropriate disposal with consumers.

Additional to concerns about biodegradable plastics ability to biodegrade in domestic compost, are issues of remnant materials or the by-products of biodegradable plastics degradation. The New Zealand plastics industry has expressed concerns about the lack of research and understanding of the residues and degradation of degradable plastics (MFE 2006). Research suggests biodegradable plastics have the same environmental impacts as traditional polythene bags (Nolan ITU and ExcelPlas 2002a). Therefore we can reasonably expect that synthetic and blended biodegradable plastics leave minute pieces of plastic and additives in the environment as the natural connections biodegrade leaving stabilisers inks and other chemicals behind (Palmisano and Pettigrew 1992). As discussed in a previous chapter, such microscopic pollution leads to extensive contamination of the environment (Palmisano and Pettigrew 1992). Moreover, the remnants and by products of biodegradable plastic degradation have identified environmental risks of polluting waterways with chemicals,¹²¹ widespread pollution from by-products,¹²² and soil and crop degradation from compost containing blended or synthetic biodegradable plastics (Nolan ITU and ExcelPlas Australia 2002a).¹²³ Further environmental impacts of pollution from the production of biodegradable plastics have also been identified (James and Grant 2005, Nolan ITU 2002b).¹²⁴ Social impacts from the widespread use of biodegradable plastics extend further than effects from environmental impacts. The contamination of traditional plastics recycling with biodegradable plastics would result in significant industry and socio-economic impacts.

¹²¹ Pollution due to the high the BOD concentrations resulting from the breakdown of starch-based biodegradable plastic (Nolan ITU and ExcelPlas Australia 2002a).

¹²² Migration of plastic degradation by-products such as residual pigments, catalyst residues and isocyanate via run-off and leachate from landfills and composting facilities to groundwater and surface water bodies (Nolan ITU and ExcelPlas Australia 2002a).

¹²³ Degradation resulting from the use of compost that may have unacceptably high organic and or metal contaminants derived from biodegradable plastic residuals, additives and modifiers such as coupling agents, plasticisers, fillers, catalysts, dyes and pigments (Nolan ITU and ExcelPlas 2002a).

¹²⁴ Carbon dioxide, phosphates, nitrates emissions (James and Grant 2005), negative impacts for soil and biodiversity, as well as eutrophication (Nolan ITU 2002b).

Insufficient labelling, lack of or inadequate standards for biodegradable plastics and consumer apathy towards plastics recycling and biodegradable plastics could result in biodegradable plastics entering the hydrocarbon plastics recycling stream. The contamination of the recycling stream would result in materials produced from recycled plastics to be weaker, have faults, and ultimately result in product failure and a loss of market confidence in recycling and manufacturing from recycled materials (PBWG 2002). New Zealand recyclers echo this sentiment;

“At present bio-plastics can easily be mistakenly put into other plastic product, degrading the value” (Recycler 2006).

The contamination of plastics could cause chaos with our already limited recycled materials markets in New Zealand. Addressing the contamination of plastics recycling with education and labelling programs is problematic as information campaigns rarely achieve behaviour change (McKenzie-Mohr 2000, Kollmuss and Agyeman 2002).¹²⁵

With a lack of municipal infrastructure, consumer apathy, a lack of product standards and unknown calculations of environmental impacts there are many hurdles to cross before biodegradable plastics can be reasonably introduced to New Zealand. Despite this there are also potential benefits of using biodegradable plastics, benefits that are presented across the full life cycle of biodegradable plastics. One aspect of this is energy use, the majority of biodegradable plastics require less energy to manufacture than non-biodegradable plastics (Nolan ITU 2002a).¹²⁶ In addition, biodegradable plastics would increase organic matter in a landfill, increasing methane emissions, which can be harvested for energy. This also has further implications of extending a landfill’s lifespan from increased space in a landfill (Nolan ITU 2002a). In New Zealand the use of methane from landfills as energy production is limited and would require current landfills to be changed, at a significant cost.¹²⁷ A further benefit of biodegradable plastics is the use of a renewable resource and

¹²⁵ An example of the lack of action even when provided with information can be seen in New Zealand’s current kerbside recycling programs. Even when information is provided the kerbside collections receive large amounts of materials that cannot be processed or sold at the local recycling facility. The contamination of recycling is an ongoing problem as people fail to check plastic identification codes on items, or unaware that not all plastics are collected for recycling in New Zealand.

¹²⁶ Except for PHA biopolymers, which require similar amounts of energy as polythene (Nolan ITU 2002a).

¹²⁷ Methane is generated from the anaerobic decomposition of organic matter in landfills. Many territorial authorities around New Zealand divert organic waste from landfill, limiting methane emissions from landfill (MFE 2002d). While some larger landfills in New Zealand capture methane emissions for renewable energy

reduced greenhouse gas emissions (Nolan ITU 2002a). On the other hand, biodegradable plastics would create resource competition for the same raw materials required for the production of bio fuels, and are also important food crops for a majority of the world's population (corn, maize, tapioca, wheat and potato).

Industry research of the application of biodegradable plastics has identified that the issues of disposal routes; appropriate recovery systems; processing infrastructure; and an understanding of the types and residues from degradation needs to inform the agreed standards and specifications for biodegradable plastics (MFE 2006 and Nolan ITU 2002a). Such standards would ensure the disposal route is appropriate and that biodegradable plastics are environmentally sustainable for widespread application. The Australian (and New Zealand) production and labelling standards for biodegradable plastics are currently under debate (MFE 2006).¹²⁸ Anxiety about biodegradable plastics has been documented throughout the industry forums. In addition to concerns above, of applications and disposability,¹²⁹ there are also concerns about ensuring the correct pathways for materials; with appropriate systems and infrastructure for processing; minimising the cross-stream contamination; certainty and verifiable claims of degradability, performance and environmental impact; and concerns about reducing consumer confusion by avoiding misleading and conflicting labelling (Gluckman 2006).

While initially there appears to be great potential for biodegradable PSB to replace polythene PSB the threats of increased littering, contamination of recycling streams, detrimental environmental impacts, and resource competition reduces any environmental benefits offered by degradable plastics. Further opposition is in view of the fact changing

production, the reduction of methane emissions from landfills is incorporated into the NZSWS (2002), and is relied on by the governments Preferred Policy Package on Climate Change for methane reductions (methane has twenty-one times more global warming potential than carbon dioxide) (MFE 2002d Page 12). Moreover the MFE sees the use of methane from landfills for energy productions as an "inefficient way recover energy potential from organics [as] typical capture rates are 30% to 50% of the [total] methane produced" (MFE 2002d Page 12).

¹²⁸ Concerns about degradable plastics have begun to be discussed in a series of meetings with collaboration from the Ministry for the Environment, Plastics New Zealand and Recycling Operators of New Zealand (RONZ) (NZPC website, http://www.packaging.org.nz/newsletter/newsletter_spring_2006.html , or <http://www.mfe.govt.nz/withyou/talkenvironment/roadshow-2006/waikato/publicmeeting-hamilton.html>

¹²⁹ For example, uses for which there is an appropriate and viable closed loop, and the level of degradability matches this (Gluckman 2006).

to biodegradable PSB will not affect consumer behaviour, and is “supporting the throwaway mind set and the use of landfills as an acceptable disposal method” (ZeroWaste 2006). The Carrier Bag Consortium (United Kingdom), the United Kingdom’s Packaging and Films Association, and Friends of the Earth’s Claire Winton, although on opposite sides of the PSB debate all agree that biodegradable bags are not the answer (Williams 2004). The debate of whether paper bags are the best alternative to PSB has reached a consensus in academic and scientific research, however the public and stakeholder views have yet to reach this conclusion.

Paper Bags

Paper bags have traditionally been presented as the environmentally friendlier option when compared to PSB. Prior to the introduction of biodegradable PSB paper bags were the most common alternative suggested. The natural fibres of paper, and the renewable resource used has a positive image, and this is increased by the small number of paper bags likely to be sent to landfill as recycling options for paper are firmly established (PBWG 2002). Despite these positive associations to paper bags there is evidence that paper bags are equally, if not more damaging to the environment than plastic bags (Fenton 1991, 1992, Ciambrone 1997, Nolan ITU 2002b, Ecobilan 2004, James and Grant 2005, Cadman et al 2005, and ACG 2006).

Despite these significant statistics, the majority of people do not consider chemicals and energy used to make and recycle paper bags (Ciambrone 1997) and still see paper bags as the best alternative to plastic. Scottish research has demonstrated that a levy on PSB can result in an increase of paper bag consumption, not a sustainable choice (WRAP 2004a, and Cadman et al 2005); making a levy on paper AND plastic shopping bags the policy choice for environmental improvements (Cadman et al 2005). This is due to the significant impact of the milling and production processes to make paper (these processes are shown in appendix 7. It is necessary to grow, mill and process trees for pulping to make paper. In between each of these processes is additional energy expenditure and transportation, each with their own additional impacts.

Environmental Impacts of Paper Bags

The growth of trees for paper production includes the impacts of land control, fertiliser and water use. On the other hand, the growing of trees is renewable resource and provides a carbon sink, in some cases providing a tool for off setting carbon use, gaining carbon credits in emissions trading systems.

However the subsequent milling of trees to make pulp and paper removes a carbon sink and contributes to land degradation, ecosystem damage (Nolan ITU 2002b), fuel use, and carbon emissions from transportation and machinery.¹³⁰ Once transported to the processing plant, logs are stripped of bark and broken into chips, using energy and producing wood waste and emissions. The resulting wood chips are then pulped and washed, using limestone, sulphurous acid steam (typically vented to the atmosphere), large amounts clean water, and in some cases dirty water is expelled heated and untreated into waterways creating significant environmental impacts. The wood pulp is dried and rolled, creating large industrial rolls of paper. The drying and rolling of paper consumes significant amounts of energy if drying is aided by heat, as well as energy use from factory machines. Finally the paper is printed, folded and glued into bags, requiring mechanical energy use, chemicals, and waste materials, before being packaged for transport to suppliers, distributors or retailers (see appendix 7).

The second phase of the life cycle of a paper bag is the transportation of paper bags to suppliers who provide bags to consumers to use. Again the transportation of paper bags uses energy and produces carbon emissions; however assembled paper bags are heavier and take up more room than plastic shopping bag, leading to increased carbon emissions and petrochemical use (Ciambrone 1997, Plastics New Zealand 2002). The third and final stage for a paper bag is disposal.

Paper bags are disposed of as litter, as solid waste to landfill, some are composted, and a number of bags are recycled. Litter, land filling, and composting paper bags produce methane, a greenhouse gas (Ciambrone 1997, Nolan ITU 2002b, Ecobilan 2004, James and

¹³⁰ It is suggested when a helicopter is also used for milling and monitoring of forests far greater emissions result (Green Feet 2006).

Grant 2005, Cadman et al 2005) emissions that are trying to be reduced by many people. Many people already recycle paper at work and at home in New Zealand, and the infrastructure for municipal recycling already exists in many regions. However, many people are unaware of the energy and resources used to recycle paper. Paper is reintroduced to the paper making process at the pulping and washing stage. Re-pulping paper uses sodium hydroxide, hydrogen peroxide and sodium silicate, energy to heat the pulp, large amounts of water for rinsing¹³¹, and any energy used to dry the pulp (GreenFeet 2006, Cadman et al 2005).

The production and use of paper bags have an energy use of 1,344 kilojoules, compares to polythene PSB energy consumption of 1,047 kilojoules and a reusable bag's 120 kilojoules (Fenton 1991). More recent studies suggest paper bags consume similar amounts of energy as traditional plastic shopping bags (Ecobilan 2004). However the total production, use and disposal of paper bags is estimated to: use three times the amount of water; produce ninety-percent more green house gases; eighty-percent more nitrogen oxides and sulphur dioxides emissions; twelve times the nitrate and phosphate pollution to water; and produce eighty-percent more solid waste, than traditional PSB (Ecobilan 2004).¹³² The energy, fuel, and chemical used to produce paper produces annual greenhouse gas emissions are estimated to be 30.2 kilograms of carbon dioxide equivalent per annum, the highest producer of greenhouse gases in the comparison of alternatives conducted by ACG (2006 Page 21). Phosphate eutrophication from paper bags is estimated at 26.6 grams phosphate PO₄ per annum (ACG 2006 Page 21). These significant environmental impacts are not well known and the common assumption is that paper bags are better than PSB.

A number stores in New Zealand use or offer paper bags as an alternative to PSB. However it appears that many stores using paper bags have made the choice for branding and marketing reasons rather than resource efficiency. Additionally paper bags are also more

¹³¹ Most recycling plants screen and clean the water used and remove contaminants. Another method is 'sludge handling' removes particles of inks and waste, this sludge can be used in bricks fertilisers and other products.

¹³² Earlier studies (Franklin 1990) suggested paper bags were far worse than demonstrated here, however this research was not quoted due to the age of research, changes to modelling data and technology available at the time of research, and subsequent changes to the USA emissions standards (Cadman et al 2005).

expensive than plastic bags, making them a costly alternative, AUS\$0.15 each compared to AUS\$0.03 for plastic bags (ACG 2006 and EPCH 2007). The incentive to change to paper bags as an alternative to PSB does not exist currently, despite the resources available. New Zealand has a significant forestry industry, and possesses onshore capabilities for paper bag production and recycling, putting paper bags as an alternative in a favorable light. Additionally the infrastructure required to produce recycled paper bags already exists in New Zealand and would require minimal capital (Personal Communication MFE 2006). Moreover the carbon sink of sustainable grown forests provide a useful resource on the quest for carbon neutrality professed by the current government (Clark 2007). However due to the forestry industry, milling, and paper making New Zealand is particularly vulnerable to the negative environmental impacts of paper bag use. I now move on to the last alternative in this thesis, reusable bags.

Reusable Bags

It is estimated that 33 percent (Field Connection 2005), or 1,320,000 of New Zealanders used reusable bags (Authors Calculation 2007, 2005 data). Although there may have been increases in this number due to public interest and recent campaigns encouraging the use of reusable bags both in New Zealand and Australia. The types of bags commonly used in New Zealand currently include thicker LDPE bags (such as the Pams Brand bag below in Figure 11), woven polypropylene (PP) bags (such as the Zero Waste Bag in figure 11 below), and cloth or sacking bags from various sources. These bags are a snapshot of bags being used, and there are many different types of reusable alternatives to PSB. These include: rigid plastic boxes and baskets; thick plastic bags (usually LDPE); woven plastic bag (polypropylene or HDPE),¹³³ cloth bags; and the oldest market containers, cane woven baskets.¹³⁴ The use of these alternatives depends on a range of factors such as socio economic status, country, age, price, availability and other numerous social and cultural factors. Recently in New Zealand there has been a notable shift towards reusable bag,

¹³³ The woven plastic bags have similar qualities to cloth bags and are often HDPE or PP, and appear to be gauze like hardwearing cloth.

¹³⁴ Nolan ITU (2002b) presents reusable bags as calico (cloth), woven HDPE, woven polypropylene (PP), solid plastic box, and reusable LDPE. Additional alternatives include jute, other cloth bags, and other types of reusable plastic bags.

possibly driven by both consumer impetus and marketing of reusable bags, however there is also likely to be a spill over from actions to reduce plastic bag consumption in Australian stores, as we share many of the same franchise stores.

Figure 11. Zero Waste New Zealand (Polypropylene), and Pams (LDPE) Reusable Bags

These alternatives are sold at most supermarkets as part of the NZPA 2005 plastic bag strategy and a number of larger retailers also sell and encourage the use of reusable bags. The price of reusable bags varies according to size, material, and whether profit is made from bags. Reusable bag prices in Australia and New Zealand range from AUS\$1 to \$1.80 (ACG 2006 Page 15). In some cases reusable bags have been given away as promotional activities, or profits are donated to charity or environmental groups (ACG 2006, Retailer Personal Communication 2006).

In addition to the sale of reusable bags a number of stores are providing woven PP bags in place of PSB.¹³⁵ Although, these are used in a similar manner to traditional plastic bags, provided ‘free of charge’ with every transaction, do little to encourage reuse and appear to be more as a marketing strategy than a result of environmental consciousness.

The fact that reusable bags can be sold at a profit by retailers, causing them to be seen by consumers as an expensive alternative when compared to the “free” plastic bags supplied by the majority of retailers. Moreover, there is limited benefit to retailers to reduce PSB

¹³⁵ The trend in providing woven PP bags is mostly in “apparel” and “other merchandise” stores using the woven PP (Nolan ITU 2002b)

use as costs are assimilated into overheads across all products sold and consumers already pay for the use of PSB (ACG 2006 Page 9). The ACG (2006 Page 10) suggest that it is likely retailers could profit from the sales of providing alternatives “however, it is equally likely that current retailer policy on bags reflects a set decision designed to service customer needs and maximize retailer profits” and the extent of profit depends on retailers knowledge of costs, benefits and alternatives to PSB. One group openly profiting from the sale of reusable bags are designers around the world. Designers such as Prada, Stella McCartney, Hermes, Louis Vuitton, and Anya Hindmarch have released reusable shopping bags, below in figure 12, with prices from US\$15-\$1,720 (McLaughlin 2007). The Hindmarsh canvas-shopping tote pictured below is dramatically cheaper than Hindmarsh’s handbags at US\$15 (ibid). However, the reusable bag was a limited release and was selling for more than US\$400 on eBay, created riots in Hong Kong, during which bags sold were triple wrapped in PSB to prevent damage and theft of bags (McLaughlin 2007).

Figure 12. Designer Reusable Bag from Anya Hindmarsh

Although designer reusable bags are not accessible for the majority of New Zealanders, the increasing use of reusable bags can be seen in supermarkets and is even shown on local television programs and advertising. Research suggests that one reusable bag replaces 125.3 traditional PSB (ACG 2006 Page 17), and reusable bags have an estimated life span of 12-104 trips (Nolan ITU 2002b Page 35).¹³⁶ Moreover, reusable bags present the best economic choice compared to traditional PSB as a reusable bag as a rate of return of 130 percent per annum as an investment, furthermore reusable bags would still present the best

¹³⁶ Following such awareness raising campaigns Australian consumers have replaced approximately 2 billion PSB with 10 million reusable bags. The replacement estimates for this change is that every ONE reusable bag replaces 125.3 HDPE PSB annually, and 1.2 HDPE shopping bags a week (ACG 2006 Page 15).

choice if they cost AUS\$4.00 (ACG 2006 Page 15). The ACG (2006 Page 15) also suggest that in the face of an explicit charge for PSB reusable bags consumers would be financially advantaged in reducing their PSB use and using reusable alternatives.¹³⁷

Environmental Impacts from Reusable Bags

With the range of reusable bags the environmental impacts vary according to the material type, production processes and disposal route. Overall all reusable bags have major benefits including the reduction of materials consumed, due to the extended life of reusable bags when compared to traditional PSB, and reduced litter (Nolan ITU 2002b, ExcelPlas Australia, RMIT and Nolan ITU 2003, Ecobilan 2004).¹³⁸ The ACG research demonstrates that the lowest greenhouse gas emissions are from the use of reusable bags, with 2.0 kilograms of CO₂ equivalent per annum being released (ACG 2006 Annual Emissions Table Page 21).¹³⁹ Therefore the use of reusable bags counts towards the fight for sustainability and reducing green house gases contributing to climate change.

The majority of reusable bags available in New Zealand are made from non-renewable sources, oil based plastic materials, which is extracted and manufactured offshore. The impacts of extraction, refinement and manufacture are experienced in other countries, and emissions from transportation effecting air quality results in an uneven distribution of environmental impacts. Reusable alternatives are almost completely imported to Australia (Nolan ITU 2002b), and it is anticipated that Australian manufacturers would not be able to compete with import prices, and therefore will not produce a significant quantity to impact supply (ACG 2006). As New Zealand is close to Australia, and the suppliers of reusable bags, it is proposed that the import of reusable bags is the most likely situation for New

¹³⁷ If the purchase of a reusable bag is looked at as an investment, a reusable bag that is used once a week for a year-given that a reusable bag has an expected life span of two years-provides a rate of return of 130 percent per annum (ACG 2006 Page15). The ACG (2006) report also indicates that consumers with a similar use pattern will receive financial benefits of replacing HDPE shopping bags with a reusable bag, but only if there is an explicit charge for HDPE shopping bags to provide the cost savings associated to using reusable bags and not using HDPE shopping bags.

¹³⁸ A reduction in litter is due to the lowered chance of the heavier reusable bags entering the litter stream (Nolan ITU 2002b).

¹³⁹ Lower green house emission from reusable bags with 2.0kg of greenhouse gas emissions (kg CO₂ equivalent per annum), biodegradable bags released 2.5kg, HDPE shopping bags were estimated at 6.1kg, calico bags at 6.4kg, and paper bags were the highest producer with 30.2kg of greenhouse gas emissions (ACG 2006 Annual Emissions Table Page 21).

Zealand. However, as reusable bags have a longer life span and multiple uses the impacts from the manufacture and transport are reduced as more services are gained from the same impacts of producing disposable single use PSB (Fenton 1991, Ecobilan 2004). Each of the reusable bags made from traditional oil based plastics have different environmental impacts resulting from different levels of energy use, resource consumption, greenhouse gas and other emissions, solid waste production and litter impacts.

The best overall choice in reusable bag from research appears to be the woven PP bags due to their lower ratings across all categories (Nolan ITU 2002b Page 35-38) although not all LCA studies assess this type of reusable bag, and suggest that any reusable bag is better than any single use option (Fenton 1991, Ecobilan 2004, Cadman et al 2005). While the likelihood of littering of the woven PP bags are reduced, when the woven PP bags are littered they are estimated to last in the environment for five years, and in a marine environment will float for six months (James and Grant 2005). However, these bags are often coloured, and are a heavier material, sixty grams heavier in weight (Nolan ITU 2002b Page 35), and less likely to be consumed by livestock or wildlife as they are thicker and are less likely to resemble jellyfish in a marine environment. The issue of PP recycling will have to be addressed with widespread use of PP cloth, currently Australia does not have recycling options for PP either (Nolan ITU 2002b).

Reusable bags made from cloth and sacking are made from renewable resources such as jute, linen and cotton. The environmental impacts from producing the raw materials for fabrics are the spraying, harvesting and processing of material. The cotton industry, as total industry not just cotton used for reusable bags, is the major consumer of synthetic fertilizer and pesticides.¹⁴⁰ Moreover the labour conditions and impacts on developing nations would be an issue warranting careful consideration if cloth bags were to be used in broad scale. Environmental impacts from the use of cloth bags are associated to the washing of cloth bags, water use, detergent use, waste produced and energy used. There are also difficulties in the disposal of cloth bags as there are limited recycling schemes (Nolan ITU 2002b) and cloth bags are most likely to be sent to landfill. Despite these issues there are still reduced

¹⁴⁰www.ecomall.com/greenshopping/mpick.htm

littering and reduced consumption of oil, plastic materials and resources (Nolan ITU 2002b, Ecobilan 2004).

The above investigation of LCA of alternatives to traditional PSB has recommended that reusable bags are the best option to replace PSB. It is of note that the production of base materials used to make shopping bags, primarily paper and plastic, which generates the greatest environmental impact for all types of bags (Ecobilan 2004). Research has demonstrated that reusable bags present the best replacement of single use PSB due to their overall lower environmental impact, and bags that can combine “low resource use, longevity and recycling” are the best options (Nolan ITU 2002b Page 71, Ecobilan 2004, Cadman et al 2005). James and Grant (2005 Page 15) also conclude that “polymer based reusable bags have lower environmental impacts than all of the single use bags”. However, changing consumer behaviour is not always swayed by reduced environmental impacts.

Changing consumer behavior towards more environmentally benign and resource efficient alternative requires the ongoing cooperation of retailers in limiting the bags offered, so consumers are directed to a more ‘environmentally friendly’ set, or conversely an explicit price on PSB would shift economics and consumers towards reusable bags (ACG 2006). Consumers have always had choices to address their consumption of plastic bags, have always been able to bring their own bag, use reusable bags, refuse PSB offered by retailers and if PSB are accepted consumers have been able to ask for more efficient packing of bags (ACG 2006). Despite this, few consumers have taken steps to reduce PSB consumption. The ACG (2006) suggests that this is owing to consumers not being explicitly charged for PSB, consumers are unaware of the costs of using PSB, economically and environmentally, and consumers are not regularly offered the cost motivations to reduce PSB consumption. The policy options available to motivate consumers to reduce single use PSB consumption and littering are discussed in the next chapter.

7. Policy Analysis and Discussion of Options to Address

Plastic Shopping Bag Use

This chapter is going to examine look at the policy options to reduce the consumption and impacts of PSB. I am first going to consider why PSB require policy action, objectives, definitions and scope of policy addressing PSB. Secondly I am going to analyse three policy options for application in New Zealand. I will examine how these policy tools would work in application in New Zealand. While the major categories and full range of policy options were initially examined (see appendix 8), due to the scope and restrictions on this research a full policy analysis cannot be conducted here, so three policy options only are analysed against the criteria presented in the framework for analysis.¹⁴¹ These three policy options are: a levy or tax on PSB; the elimination or ban of PSB; and voluntary measures to address PSB. These policy tools have been identified from international practice (Ireland's PlasTax and Australia's voluntary schemes), and international research of policy options to address PSB (Convery and McDonnell 2003, Dunne 2004, ACG 2006, 2006b, EPHC 2007). Analysis of these three options also draws on policy research, policy theory, and the political and practical reality of New Zealand's environmental policy application.

Policy

Political principle suggests that government exists to further the happiness, and by association the well-being, of its citizens (Robinson 1990). Governments also have an important role in determining what the social good is, and guide individuals to become compatible with that goal (Bentham 1789). Moreover, governments allocate value and prioritise these values through the policy cycle (Wallace 2007). The application of policies seeks to correct market failures, correct government failures, provide public goods, correct asymmetries, address cultural and ethnic concerns, redistribute powers, and create new

¹⁴¹ These three policy options are assessed using the following measures: economic, environmental, legal, political, implementation practicalities, and socio-cultural impacts. These measures are informed by the previous chapters in this research: environmental impacts of PSB use; consumption and disposal patterns; and the life cycle impact analysis of alternatives. Please refer to table 8.

institutions and incentives (Wallace 2007).¹⁴² These issues can be redefined as situations that could justify government intervention; public concern and outcry, significant amount of financial, social or environmental effects, and the establishment of international agreements and protocols.

Policy is used to create a system of controls for individuals, business and government activities or behaviour. Fundamentally policies operate by influencing behaviour by providing an incentive, remaining neutral, or punishing a given behaviour. Each type of policy instrument has a set of tools and methods used to impact on behaviours. These techniques operate on a continuum from fully compulsory techniques, to truly voluntary instruments that have no government involvement (Howlett and Ramesh 1995). This perspective allows policy tools to be understood as overlapping and merging entities, within the broader definitions of policy instruments. One such example of this is the applications of extended producer responsibility (EPR), which works through regulation, EI, and voluntary measures.

Policy instruments are grouped into four main categories: regulation, economic instruments (EI), voluntary measures, and information and education. Regulatory methods operate by providing specifications of aspects of behaviours or actions; while EI providing a financial incentive to carry out or stop a given activity. Voluntary measures are often based on a socially desirable outcome, and are often used in New Zealand with the “threat” of regulation if outcomes are not achieved; the NZPA 2004 is an example of this. Finally, information and education programs operate on the assumption that awareness and information leads to behaviour change. Before advancing with a discussion about policy options it is first necessary to clarify and identify a few aspects of policy analysis, such as the problem or issue being addressed, policy objective/s, and the assessment criteria used.

¹⁴² Policies are used to: correct market failures; internalise externalities; provide public goods; control open access situations; correct asymmetries (information, uncompetitive situations, perverse incentives); to address missing markets, cultural and ethnic concerns; redistribute decision making, entitlements, obligations, property rights, wealth and income; to create new institutions and incentives; and to correct government failures (Wallace 2007).

The Policy Cycle

As suggested by policy analysis frameworks (Hogwood and Lewis 1984, Quade and Carter 1989, Bridgman and Davis 2000), I have identified why PSB have emerged as an issue requiring policy attention (issue searching or agenda setting), and discuss this further below. Following this examination I will discuss the objectives and scope of the three policy options to be presented, before concluding with an assessment the three policy options for application in New Zealand. As discussed in the methodology of this research, a mixed comparative approach is used: economic, environmental, social/cultural, legal, political, and implementation measures, and this will again be used to discuss the policies presented in this limited policy analysis, with additional commentary on the appropriateness of this analysis for policy.

Issue and Value Identification

First I am going to examine why PSB have become an issue requiring government attention and intervention. The debate about the problems of PSB has captured public interest and is an emotive topic for many. The core of public interest and concern about PSB is difficult to isolate, as there are many interrelating factors involved. While concerns about the environmental impacts of PSB are at the forefront of campaigns to reduce consumption, the fact remains that compared to the amount of PSB consumed, only a small amount are littered.¹⁴³ This is also commented on in the ACG's (2006) CBA, and is asserted as the reason why all management options costs outweigh benefits of action; any actions taken to reduce the environmental impacts of PSB are targeting the whole population of PSB not the 6-9 percent that are littered (ACG 2006). As mentioned earlier, the perception of information is key to the PSB issue. While 6-9 percent of PSB are littered, this equates to 40-60 million bags littered in Australia, and depending on the estimates used, between 14.7 million and 134.1 million PSB are littered in New Zealand every year (Authors Calculation 2007).¹⁴⁴

¹⁴³ Estimates are that 6-9 percent of all PSB end up as litter, 40-60 million PSB (ACG 2006), and that PSB constitute two percent of all litter (Clean Up Australia 2002-2005).

¹⁴⁴ Calculated from New Zealand Use Estimates Table 2: Annual PSB Use of 0.245 billion (Field Connection 2005), 14.7-22.05 million littered; annual use of 1 billion (Plastics NZ 2002), 60-90 million littered; annual use of 1.49 billion (Nolan ITU and Plastics NZ 2002), 89.4-134.1 million PSB littered.

However the high visibility of littered PSB and public sensitivity to littered PSB results in escalating public concern. Furthermore, concerns about the environmental impacts of PSB does not solely rest on the littering of PSB, but is also inclusive of the resources used to make the large numbers of PSB consumed around the world. It is this aspect that has led researchers and commentators to say that public concern over PSB is symbolic of concerns about wider environmental issues, such as “throw-away” (Denne, Livesey and McNeil 1989), and “wasteful” society (PBWG 2002). This has caused PSB to “become a politically incorrect symbol of the threat to the environment” (Byars 1995). While PSB themselves may not be a large environmental threat, they are symbolic of broader environmental and resource use concerns (Nolan ITU 2002b). Nolan ITU (2002b Page 2) identifies that these concerns need to be addressed, with respect and specific attention required to these social and cultural issues.

PSB have been identified by many as an unnecessary use of limited resources, as well as resulting in environmental impacts discussed in this thesis, such as litter, microscopic plastic pollution, air and water emissions. This suggests that the environmental impacts many people are concerned about are realistic. Suggesting there is increasing environmental awareness of sustainability, climate change and resource use. Additionally, personal experience and proximity to PSB has lead to increased personal relevancy of the PSB issue (Rochefort and Cobb 1995). Making the concerns about PSB tangible, and enhancing public acceptance that PSB are an issue. New Zealanders acquire PSB every day, this interaction and the high volume of PSB in our lives is testament to their use, and therefore their tangibility.

PSB status as a “politically incorrect symbol” (Byars 1995) means government’s and institution’s reaction to public concerns is critical. Governments need to take these public concerns about PSB seriously and address them appropriately. As PSB are tangible (as opposed to issues such as climate change) and public concern already exists, governments could harness this concern to begin an exemplar or pilot sustainability initiative. Such an initiative could provide the basis for future climate change and sustainability programmes. If governments do not react appropriately, and ignore public concerns about PSB the

possibility exists that many people will not respond well to government driven environmental programmes, and changes will be even more difficult or impossible.

The internal and external pressures on government, such as minister agendas and public pressure effects the stance taken by government, as ministers respond to mass appeal (Wallace 2007). Early in 2006 I contacted MFE to gauge the approach taken to the PSB issue. I was told that PSB are not a priority for waste minimisation efforts. However on interviewing MFE I was told PSB are seen as a minor waste issue, and the issue of PSB is “more about social consumption and sustainability but needs attention due to public interest” (MFE Personal Communication 2006). MFE (2006 Personal Communication) also noted “voluntary options will be used first through the NZPA, [before] look[ing] at legislation”. This reality of environmental policy in New Zealand means softer policy options such as voluntary schemes will be implemented, and regulatory and economic instruments will be ignored as there “lack[s] of political will to go through with it” (MFE 2006 Personal Communication).

Policy Scope and Objectives

Clarity in objective of policy and actions is essential in this issue. Determining the objective is determined by the ‘problem’, and there is speculation about whether PSB are a problem at all. The exploration of factors driving the debate is essential to inform an appropriate policy response.

The level of public concern in conjunction with international actions has in many cases instigated government investigation of PSB littering and consumption. International attention was drawn to the PSB issue in 2002 when Ireland implemented a tax on plastic bags, commonly referred to as the “PlasTax”, as discussed in the international case studies. Following Ireland’s action, Bangladesh, Scotland, Kenya, Australia and other countries have assessed or implemented actions to address PSB. Policy options to address the consumption of PSB range from a complete bans of all PSB; regulation of micron thickness; charges; voluntary reductions; to information or education campaigns. Each

approach to the reduction of PSB is a response to particular environmental, economic and social conditions.

It is these particular circumstances that also determine the scope and rules of action. Two important aspects are first the definition of “plastic bag”, and secondly the exceptions to the policy actions. The definition of “plastic bag” needs to include those bags for which the policy is aimed, but exclude those bags with no detrimental effects (EPHC 2007). The differentiation, inclusion and exclusion of supermarket style ‘singlet’ plastic shopping bags, heavier LDPE bags, produce bags, bags that are the sole container for goods (primary packaging), packaging for distribution, and all types of reusable bags needs to be addressed, as do exemptions for health and safety of food and other goods.

Research has demonstrated “that the thickness and weight of a plastic bag does not impact on the ease with which it may become litter if placed in a waste receptacle and dispersed by the wind” (Verghese 2006). Suggesting such specifications will have little implication on littering of PSB. Accordingly, as recommended at the beginning of this research, it is less problematic to define plastic bags by their function or use rather than material type, size, or shape for research and policy, as specifications such as these are easily avoided (EPHC 2007 Page14), a function based definition may avoid such “definitional loopholes” (ACG 2006 Page 41).

Therefore policies used to address public concerns about PSB employs the following definition: A plastic bag is a plastic shopping bag, used to transport goods by the customer away from the point of sale (also known as carrier bags, singlet bags, supermarket bags), that is not used as the sole container of food or goods, and provided by a retailer. Exemptions based on Ireland’s PlasTax could be appropriate for New Zealand for practicality.¹⁴⁵ However the application of policy and prescriptive exemptions would be

¹⁴⁵ Bags that are exempt from the levy are: bags used to contain fresh fish, meat and poultry; and any fresh fish, meat and poultry products; provided they are not larger than 225x345x450mm; the sole container for fruits, nuts, vegetables, confectionary, dairy products, cooked food (hot or cold), and ice; and bags used to carry goods on ships and airplanes, in ports or airports and bags intended for reuse that are sold for more than €0.70 (Statutory Instrument No. 605 of 2001, Waste Management (Environmental Levy)(Plastic Bags) Regulations 2001, Dublin).

best decided through consultation with industry, public and retailers, to ensure public participation and to encourage industry acceptance that was pivotal in Ireland's application of the levy on PSB (Convery and McDonnell 2003). Extensive consultation with all stakeholders assists both the acceptance and the 'fine-tuning' of a levy to each specific context, but care must be taken to ensure all stakeholder groups are included in participation¹⁴⁶.

New Zealand industry stakeholders expressed concerns that actions addressing PSB are reacting to

“emotive responses [that are] not very scientific, [and responses] should (truly) look into the problem first before trying to find solutions to a problem they don't really understand” (Industry stakeholder 2006).

Such responses suggest there exists a disbelief in the negative environmental impacts from PSB, as well as mistrust in environmental policy makers. Moreover, the supporters of actions addressing PSB are seen as a threat to the plastics industry;

“the people that propose these actions do not truly understand the environmental effects of plastic/paper..... [and] often these people are very passionate about what they do and really don't know the facts. This is a very real problem facing the plastics industry and is not easy to address” (Manufacturer 2006).

The impacts of PSB production and use have been demonstrated from a number of sources throughout this paper. Previous research has estimated that between 6-9 percent of all PSB are littered (ACG 2006a). This research has established that in New Zealand alone that depending on the estimates used, between 14.7 million and 134.1 million PSB are littered in New Zealand every year (Authors Calculation 2007), and that littered PSB contribute to significant environmental, wildlife, ecosystem impacts, as well as effecting human activities and use of natural areas (see chapter three). Moreover the use of a limited resource and promotion of oil economies, and oil extraction needed to support the use of PSB is unreported and often not taken into account when considering the environmental impacts of PSB. While wildlife impact research is often criticised due to research techniques and its emotive nature, the more recent and prolific research of the minute and

¹⁴⁶ “Some smaller operators feel that consultation was biased in favour of the 'big boys' (larger retailers) (Convery and McDonnell 2003 Page 6).

widespread plastic pollution impacts and the data based LCA conclusions are more robust to such criticism. This research sought to understand the environmental impacts of PSB, and present the facts of these impacts. There is no denying that the wildlife impacts of littered PSB evoke an emotional response, however the public concerns about the use and litter of PSB are justified by PSB contribution to global plastic pollution that will have significant marine impacts, as well as the gratuitous use of a non-renewable resource that is necessary for other life supporting products.

Objectives

Policy to address PSB ought to be in agreement with the EPHC's (2007 Page 8) directive to internalise externalities from the use of plastic bags: impacts of littered plastic bags to amenity; impacts to wildlife; and costs of waste management created by plastic bags. However in opposition to the EPHC (2007) objective of addressing the negative impacts of PSB,¹⁴⁷ I suggest the objectives of policy action addressing PSB should be to first reduce PSB consumption; and secondly to reduce the impacts of littered PSB.

The choice of the wider policy objectives target PSB externalities is driven by the level of public concern about the consumption of PSB, additional to the concerns about their environmental impacts. One problem with any policy actions to address PSB is working out at what point actions reduce consumption, and at what point reductions in consumption reduces PSB litter. The ACG (2006a) CAB suggests that PSB policy objective should be to create behaviour change, as the issue is the symbolic nature of PSB as opposed to the more definitive and measurable reduction objectives. Furthermore, the objective of reducing unnecessary consumption aligns with the current New Zealand government's objective of sustainability (Clark 2007), and provides an opportunity for an archetype initiative of sustainable behaviour that is tangible for all New Zealanders.¹⁴⁸ To ensure the government reaction to the PSB issue is accepted by the public, industry and retailers is it essential that

¹⁴⁷ "The objective of government regulation, if deemed necessary, is to address the negative impact of plastic bag litter on the community and the Australian environment" (EPHC 2007 Page 34).

¹⁴⁸ Any action to address PSB will reduce the amount of plastics available for recycling or reuse. This is not a significant issue for New Zealand considering our poor local market for recycled materials. However there is a case for the use plastics as fuel in high temperature incineration energy production in New Zealand. While this does not fit with the waste minimisation hierarchy that prioritises reduction, reuse, recycling over the recovery of embodied energy, the onshore processing of waste is likely to have significant environmental and social benefits compared with the transportation of recycled goods to other countries.

these groups participate in the decision making process, and that a detailed evaluation of policy options is undertaken, beyond to the limited analysis conducted here.

The exploration of the full scope of policy tools available is presented in Appendix 8 and is summarised in Table 7 below. While I could address all of the options in a full policy analysis, in the interest of brevity I have opted to discuss the three most likely policy options used to address PSB in New Zealand. Justification for these choices is discussed in depth below, however international research, international practice, and the political and the history of New Zealand's environmental policy are major themes influencing these choices.

Table 8: All Policy Options to Address Plastic Shopping Bags in New Zealand

Policy Type	Tools
Regulation	<p>Specifications:</p> <ul style="list-style-type: none"> Best practise for the manufacture or sale of PSB; Minimum/maximum PSB thickness; Minimum recycled content; Minimum sale price for PSB; Mandatory recycling; Biodegradable PSB only;¹⁴⁹ Reusable Bags only; <p>Limits and Quotas:</p> <ul style="list-style-type: none"> Minimum recycled content; Ban all plastic bags (with exemptions); <p>Extended Producer Responsibility/Product Responsibility:</p> <ul style="list-style-type: none"> Providing information of the economic and environmental costs of PSB; Encouraging the use of and providing reusable bags for sale; Charging for PSB; Providing in-store PSB recycling; Funding litter clean up initiatives; Supporting kerbside recycling of PSB; <p>Deposit/Refund Scheme</p>
Co-regulatory	<ul style="list-style-type: none"> Minimum Charge Escalating charge (EPHC 2007) Industry led phase out, followed by regulated ban (EPCH 2007)
Economic Instruments	<p>Product Tax</p> <ul style="list-style-type: none"> Static charge on PSB; Static charge on PSB and paper bags; Escalating charge on PSB; Escalating charge on PSB and paper bags; <p>Advanced Disposal Fee:</p> <ul style="list-style-type: none"> At least five times greater than the cost of PSB; <p>User Charges:</p> <ul style="list-style-type: none"> At least five times greater than the cost of PSB; <p>Subsidies:</p> <ul style="list-style-type: none"> When purchasing Reusable Bags
Voluntary Measures	<p>Plastic Bag Code of Best Practise:</p> <ul style="list-style-type: none"> Provision of alternatives to PSB; Requirement of 50% recycled content; Minimum charge for PSB; Reductions toward voluntary elimination; National rewards for reductions <p>Environmental Labelling/National Standards</p> <ul style="list-style-type: none"> Specified recycled content, and disposal instructions Standards for degradable bags Labelling of degradable bags, including disposal instructions <p>Extended Producer Responsibility/Product Responsibility:</p> <ul style="list-style-type: none"> Providing information of the economic and environmental costs of PSB; Encouraging the use of and providing reusable bags for sale; charging for PSB; Providing in-store PSB recycling; Funding litter clean up initiatives; Supporting kerbside recycling of PSB;
Information/Education	<ul style="list-style-type: none"> Providing information of the economic and environmental costs of PSB; Demonstrating the environmental impacts of paper and PSB Promoting the use of reusable alternatives

¹⁴⁹ Definitions and conditions of the word biodegradable are essential to the correct application of this management tool. Paris plans to ban all but biodegradable bags by 2010.

Assessment of Policy Options

The assessment of the three identified policy options is done using a mixed comparative approach, based on principles of triple bottom line reporting, sustainable development (WECD 1987, Turner 1997, and Young 1992) and specific environmental measures as discussed in the exploration of environmental impacts of PSB and the LCA of alternatives. Also informing the assessment in this research is international practice, stakeholder and community views, and New Zealand's Ministry for the Environment's policy selection framework (MFE 2002).

Stakeholder views, plastics manufacturers, distributors and retailers, were to be represented by the primary research of this thesis. Unfortunately due to the poor response rate from stakeholders in New Zealand, despite rigorous encouragement, limited representation of these groups from New Zealand. Stakeholder concerns, views and input have been supplemented by international practice, and international submissions towards PSB policy actions (Scottish Carrier Bag Consortium 2006, British Plastic Federation 2006, Australian Retailers Association 2003-2007, Plastics NZ 2002, 2006, Zero Waste Trust NZ 2002, 2006, 2007, Nolan ITU 2002b, ACG 2006, 2006b, EPHC 2007). International practice and research, in conjunction with policy analysis, has also provided grounds for the selection of three policy options for further analysis for implementation in New Zealand (discussed in Appendix 8). The three policy options for analysis are: a levy or a tax on PSB; the elimination of or a ban on PSB; and voluntary measures to address the consumption and litter of PSB; I now move on to the analysis of these policy options.

Tax or Levy on Plastic Shopping Bags

Both the terms tax and levy are used to indicate a mandatory payment to government or government departments from the sale of PSB. New Zealand courts have understood that "a tax is: a compulsory exaction of money by a public authority, enforceable by law, and is not a payment for services" (PCE 2006 Page 48). The terms 'tax' and 'levy' have the same meaning in this research, but as Dunne (2004a Page 10) points out their meaning can be

understood differently, and often the word tax has a negative connotation for the public and “should be avoided at all costs”. However there may be historic and cultural reasons for the public reaction in Ireland, reasons that are not applicable to the New Zealand context. Although, the perception of a levy or a tax can still be misconstrued, particularly when media and political spins influence public perception. The need for participation and transparency in implementation of PSB policy is demonstrated by Convery and McDonnell’s (2003) research that it was an important factor to the PlasTax’s acceptance. Furthermore Dunne’s (2004a) findings that waivers for disadvantaged socio-economic groups ease suspicion of use of tax revenue from environmental funds (Dunne 2004a).¹⁵⁰ Such waivers and subsidies address some equity and distributional impacts associated to EI.

The revenue from levies can be used as other tax incomes or if specified, as in the PlasTax, for particular purposes. The environmental fund supported by revenues from the PlasTax and other environmental policies in Ireland is reported to have public support, and most likely has increased public acceptance of a tax as it does not directly fund governments (Dunne 2004a).

Product specific levies such as the PlasTax are a government reaction to address a market failure, to correct the externalities of PSB littering and environmental impacts (Ferrara and Plourde 2003).¹⁵¹ This government intervention is further justified by non-compliance and the presence of ‘free riders’; individuals or groups benefiting from others positive actions, without taking a share of the costs (ACG 2006a).¹⁵²

¹⁵⁰ Revenues from taxes have been used to fund environmental protection activities, capacity building measures, introduce incentives for environmentally benign behaviours, and provide revenue for reductions in other less efficient taxes (PCE 2006).

¹⁵¹ Product charges are used by Ireland on plastic bags, Denmark on packaging materials, batteries in Italy, and fertilisers and pesticides in Holland (DEHLG 2004).

¹⁵² Free-riding can be described as the situation where individuals are not willing to contribute towards the cost of something when he hopes that someone else will bear the cost instead Bannock et al (2003). Free-riding undermines collective benefits, as those who choose not to participate in the voluntary actions are enjoying benefits of actions, without paying their share (Daly and Farley 2004).

Effectiveness

The level of taxation is critical to EI effectiveness, but it is “difficult to anticipate exactly how much pollution reduction will result from any given tax” (Stavins and Whitehead 1997). The OECD (2004) indicates that the arbitrary setting of levy is not satisfactory. Costs need to be adjusted for use, and only billed for production of waste, as this is the fairest setting of charges.

Convery and McDonnell (2003) state that the PlasTax was set without estimation of the total or marginal external costs of PSB released into the environment for the PlasTax. Therefore the PlasTax was applied without identification of the marginal external cost required to set the optimum level of tax. Moreover, Convery and McDonnell (2003) also point out that the PSB tax internalises “embedded” external costs incurred from a subjective standpoint of ‘too many plastic bags in the Irish environment’.

However, subsequent research from Australia has endeavoured to identify the marginal external costs of PSB (Nolan ITU 2002b, ACG 2006). The ACG (2006a) CAB sets the environmental benefit of PSB removed or prevented from entering the environment at AUS\$1.00 per bag. As with many environmental cost exercises it is difficult to quantify values, such as the value of a litter free environment that create the marginal benefits of abatement. The ACG (2006a, b) analysis reports that all management options cost more than the estimated benefits from reducing plastic bag consumption. This CAB verifies the claims of Convery and McDonnell (2003) about the Irish “PlasTax” as not being explicitly set at an optimum level (Pigou 1960) (see Appendix 9 for discussion about the setting of tax levels).

Despite not overtly being set at the optimum level, the PlasTax has still had a significant affect for PSB use in Ireland, as well as sparking worldwide interest. The Irish levy was deemed a success due to the quick and enthusiastic reaction of public acceptance and behaviour change¹⁵³ in Ireland to the PlasTax (Convery and McDonnell 2003). The success of the PlasTax has demonstrated that taxes represent influences of politics as much as

¹⁵³ A survey of the Irish public into behaviour and attitudes to the environment in 2003 demonstrated 91% of people surveyed supported the initiative (DEHLG 2004).

market forces (Hatch 2005). Moreover politics responds to social values as much as economics. If social value, concern and demand outweigh perceived costs, government interventions could still be likely.

The OECD's principles for success are to; tax the behaviour to be influenced as directly as possible, the more direct the greater opportunity for success; level of taxation should relate to the cost of dealing with pollution; appropriate point of taxation, consumption taxes ensure consumers face the price signal.¹⁵⁴ This is supported by the observation made by Daley and Farley (2004) that economic efficiency should not be the sole criteria for making policy decisions, and the experience of Ireland's PlasTax. Dunne (2004) point out that the success of taxes and charges is based on there being good alternatives to the taxed behaviour; justification of the tax; correct or understandable terminology of tax; a trust in government, administrative simplicity; gradual introduction; willingness to fine-tune and adapt; community support and professional marketing and advertising schemes (Dunne 2004).

While price based incentives have been successful in Ireland, ACG (2006) indicates that "there is a hard core of consumers insensitive to price" when services provided are valued. The services of a PSB can be convenience, transportation or reuse values. According to ACG (2006) the cost explicitly charged for within a levy is litter clean up. In contrast, using a mixed framework, the cost of using PSB also includes: the use of a non-renewable resource use with more important applications such as medical supplies (Cadman et al 2004); cost of landfill disposal; the contribution to global plastic pollution; the impacts of plastic pollution; environmental impacts from the production and transportation of oil, plastic and PSB (air, and water) emissions; social and cultural impacts of oil economies (Carmichael 2006); and the social and cultural implications of the above environmental effects. While the reduction in oil and oil product consumption should have flow on effects on the social and cultural impacts of oil economies (Carmichael 2006), the reality is that another will absorb oil and hydrocarbon products forgone, and PSB represent a small consumption of the worlds consumption of oil (Scottish Carrier Bag Consortium 2005).

¹⁵⁴ Evaluation criteria of OECD 2001; "environmental effectiveness, economic efficiency, political acceptability, 'administratability', innovative advancement and directness".

The cost of not taking action would result in the exacerbation of the above environmental impacts and would result in the as yet unknown full effect of global plastic marine pollution. This has widespread negative impacts on biodiversity, ecological sustainability, habitats, and on ecosystem processes; as well impacting social amenity value; and damage to property caused by PSB (boats, cars and floods from blockages). The very concerning levels of plastic in the Pacific Ocean demonstrates the extent of the plastic pollution that PSB are contributing; over six times more plastic than plankton was found in sea water samples (Moore et al 2001, AMRF 2002). The levels of microscopic pollution is alarming as the majority of marine life starts as plankton, and the pervasive microscopic plastic pollution that is effecting marine ecosystem processes (Goldberg 1994,1997, Gregory 1996 & EPHC 2007) ¹⁵⁵ will also have impacts on the plankton that is the start of much marine life. Moreover the full extent of these environmental impacts may not be seen for years due to the lag time for effects to take place. The widespread and un-quantifiable nature of these effects of PSB use means that a traditional CBA is unlikely to reach a satisfactory outcome as not all factors can be compared (Bridgman and Davis 2000).

The inability to compare factors means that individual values and choices can come into conflict with the social costs of such impacts, and may provide additional incentives for behaviour changes to reduce PSB use. These alternative incentives may have an explanatory role in behaviour change (Aberg 2000)¹⁵⁶ that may be harnessed with additional policy types in addition to taxes (Dunne 2004). However, Dunne (2004a) also notes that it is difficult to apply an instrument mix to the general public, and as a result taxes, charges, and levies are the most common public policy instruments (Dunne 2004).

¹⁵⁵ Plastic pollution at this level inhibits the gas exchange with water and sediment, anoxia or hypoxia in the benthos effects this ecosystem function and biota (Goldberg 1994).

¹⁵⁶ “Aberg (2000) questions the common belief that economic incentives are a simple way of achieving a change towards more sustainable behaviours, showing that in addition to purchasing and waste behaviours, habits, knowledge and physical opportunity have an explanatory value” (Dunne 2004a Page 5).

Application

EI allow local authorities and central governments to use direct or indirect price signals to consumers and producers of polluting products (OECD 2001). The point of application of an EI affects the EI message outcomes. An upstream application of levy, on producers/distributors, would move costs away from consumers who control PSB consumption levels and therefore act as an indirect signal. While a direct charge, such as is proposed, places the cost of PSB value and services in the hands of consumers and is a more efficient instrument (OECD 2001). Moreover imposing costs on consumers allows for unrestrained market competition (Convery and McDonnell 2003) as well as innovation and entrepreneurship (MFE 2002, Hatch 2002). Therefore, to achieve this market support it is suggested that the levy is applied at the point of sale in retail outlets, on the consumer of PSB to place a direct economic incentive for consumers to change behaviours, and achieve the policy objectives.

Dunne (2004a) states that the success of EI is conditional on the good alternatives available; the justification; terminology; trust in government; administrative simplicity; gradual introduction; willingness to fine-tune and adapt; community support and professional marketing and advertising schemes; in short transparency, communication and justification.

The ACG (2006a) cost benefit analysis for a government-imposed levy of AU\$0.10 is estimated to be AU\$711.0 million, and the second best option for policy action when assessed against the: administration costs; training and staff costs; theft;¹⁵⁷ replacement bag sales; and capital costs and benefits to retailers, households, government, and for the environment. While it is possible to reduce the administration costs by applying an EI upstream and indirectly affecting price signals (Young, et al 1996), Ireland's experience suggests that by employing existing agencies the costs of an EI are modest.¹⁵⁸ Moreover,

¹⁵⁷ Theft refers to the theft of baskets, trolleys and goods hidden in reusable bags (Nolan ITU 2002b, PBWG 2002).

¹⁵⁸ €1.2 million set up, plus € 350,000 for administration annually, plus a €358,000 advertising campaign, administration costs amount to €1.908 million . (Convery and McDonnell 2003 Page 6). Australian estimates

the reduced effectiveness of an EI with an indirect price signal is inadvisable to achieve behaviour changes in consumers. Therefore despite intensive implementation and administration, it is suggested that in some circumstances EI may achieve goals faster and at a lower cost than most prescriptive measures (Sharp 2002, Sinner and Salmon 2003).

Costs of a levy of PSB are a result of the planning, implementation, administration, monitoring and enforcement of the levy, as well as any additional institutional infrastructure required. The application of a levy in New Zealand could be applied through Inland Revenue Department's (IRD) involvement with retailers, under the application of the Waste Minimisation (Solids) Bill 2006, or regionally through territorial authorities.¹⁵⁹

The legal implications of a regionally applied levy have been considered in the PCE (2006) report on economic instruments for waste. The PCE discuss that for the regional application of a charge or tax that may be treated in law as a tax, it must have statutory authorisation. Whether it is treated as a tax is determined by the design and definition. Additionally the legal implications of a regionally based levy on PSB in relation to the Local Government Acts (LGA) 1974 and 2002 acts must be considered.

Under the Local Government Act 1974 and 2002 (LGA) territorial authorities can allocate costs of waste management services.¹⁶⁰ Allocation of costs can include EI, but the territorial authority's power is constrained as they can only recover costs, not increase EI beyond costs to influence behaviour changes (PCE 2006). Anything above cost recovery is a tax and is not authorised by LGA 1974 or LGA 2002.¹⁶¹ Moreover, the regional application of product specific levies is not cost-effective, and levies are more effectively applied at a national level (PCE 2006, ACG 2006, and EPHC 2007).

that government impacts from increased administration of a levy, and reduced litter clean up costs results in an initial cost of AUS\$12.9 million (ACG 2006).

¹⁵⁹ In the Irish "PlasTax" the tax collection, and administration costs for retailers were readily integrated into VAT collection systems", and the additional costs are offset by the savings on plastic bags (Convery and McDonnell 2003).

¹⁶⁰ The allocation of costs of waste services is in accordance with section 544, both practical application of policies and facility provision (PCE 2006 Page 46)

¹⁶¹ As seen in the court case between Carter Holt Harvey paper forestry and paper manufacture, and the North Shore City Council Carter Holt Harvey Ltd. versus North Shore City Council 31/3/2006, Asherj, HC Auckland, CIV 2005-404-4412 (PCE 2006 Page 34).

The implementation of a PSB levy would be assisted by the passing of the Waste Minimisation (Solid) Bill 2006, particularly in reference to the waste minimisation authority's powers to implement product levies (Tanzcos 2005). Moreover, the application and planning of PSB levy requires powers to increase the levy in response to reduced incentives, as with the PlasTax (DEHLG 2004).

For a successful implementation of a PSB tax, a strong legislative and regulatory base is necessary (Convery and McDonnell 2003). As discussed above there are legislative challenges to the application of user charges in New Zealand as previously attempted solid waste levies have been challenged and questioned the authority of local governments to impose charges (PCE 2006).

Currently in New Zealand national environmental taxes are not used for waste management (PCE 2006)¹⁶² despite their international application to reduce waste to landfill and encourage improved waste management (PCE 2006).¹⁶³ However the use of a levy on PSB would meet the PCE (2006) recommendation that New Zealand adopt EI, particularly taxes, for waste management. Moreover, the OECD and Agenda 21 recommendations also support the application of EI (PCE 2006). Although the use of economic instruments is outlined in the NZSWS (2002) as a “key action” the MFE has up to this point directed activities towards voluntary measures (PCE 2006). Although, levels of public interest and the potential for public pressure for action addressing PSB may influence the governments use of EI policies in New Zealand.¹⁶⁴

Acceptance

Convery and McDonnell (2003) suggest the use of market signals such as a PSB levy is favourable when compared to the stricter ‘command and control’ techniques. However the

¹⁶² New Zealand does have ‘environmentally related levies’ as identified by the OECD; excise taxes on petroleum fuels, motor vehicle licence fees, and road user charges (PCE 2006 Endnote 35 Page 61)

¹⁶³ UK landfill tax 1996 and Denmark’s differentiated waste tax system 1999 (PCE 2006).

¹⁶⁴ EU called for polluter pays to all waste, in US 10% of the population has pay-as-you-throw programs, PAYT (US Environmental Protection Agency 2000 in Dunne 2004).

communication of principles can be troublesome, as Dunne (2004a) notes that householders do not relate to the ‘polluter pays’ principle, as they see themselves as recipients of waste from retailers and brand owners.¹⁶⁵

Public acceptance of the PlasTax was gained through communication campaigns, stakeholder consultation, advertising and “ways to avoid the PlasTax” (Convery and McDonnell 2003, Dunne 2004a), as well as public support, political acceptance, and commitment from ministers was crucial for the collaboration and successful implementation of the PlasTax (Convery and McDonnell 2003).

The implications for retailers who are the front line of a PSB levy are of concern to industry associations (ARA 2005). The ACG (2006) estimates the costs to retailers from PSB levy are due to increased implementation, and ongoing administrative costs (amounting to AUS\$511.2 million). However these costs can be offset by savings from reduced use of disposal of PSB and increased sales of reusable bags (ACG 2006).

There has been evidence of losses in the plastics industry from the PlasTax in Ireland. However, the extent of this is dependant on strong alternative investments and employment opportunities (Convery and McDonnell 2003). In addition, New Zealand imports the majority of PSB (Plastics NZ 2002) and the nature of this source means that there will be a reduced or nil impact on the plastics industry in New Zealand from the implementation of a PSB levy.

A PSB tax would impact current recycling rates of PSB, and recyclers would lose a source of product, as reported by participants;

“[a plastic shopping bag tax] would reduce our recycled product due to reduced use of bags, therefore reducing our income. Bigger picture for us however is that reduce is better than recycle.” (Recycler 2006).

Although not all recycling operators are likely to respond in accordance with waste minimisation hierarchy, such a response indicates that there are wider goals and paths to

¹⁶⁵ Moreover, pollution is understood as coming from large-scale industry and factories, and not recognised at an individual level (Dunne 2004a).

acceptance of policy addressing PSB, given there is adequate information, consultation and input to policy actions.

The target group of a PSB levy is the consumers who currently use PSB. The impacts of a levy of PSB will result in reduced consumption of PSB, and increased consumption of alternatives (ACG 2006, DELGH 2004, Convery and McDonnell 2003). The ACG cost benefit analysis (2006) estimates the costs of these behaviours on households of AUS\$262.8 million. While there is a distributional change in shopping bag costs, there is no increase of economic costs to consumers switching to reusable bags.¹⁶⁶ Furthermore, the purchase of reusable bags is a sensible investment considering the cost, life-span, and services received (ACG 2006), and results in savings over time for consumers. However these savings can only be received if there is an explicit charge for the use of disposable PSB (Nolan ITU 2002b, ACG 2006a).

The uptake by retailers of the alternative ‘paper bag’ option would have detrimental economic and environmental consequences. Scottish research (Cadman et al 2005a) suggested a levy on both PSB and paper to discourage the uptake of paper bags. However the application of an individual product levy will encounter significant barriers in New Zealand, suggesting a two-fold levy would be even harder to implement, or gain acceptance if public favours paper bag alternatives. One resolution would be to address the down falls and environmental impacts of the paper bag alternative in marketing and advertising campaigns for a PSB levy. While paper bag consumption increased as a result of the PlasTax, paper bags did not replace PSB, the majority of PSB have been replaced with reusable alternatives (Dunne 2004b).

Reductions in PSB consumption in Ireland has been interpreted by many as fewer PSB in the environment (Convery and McDonnell 2003). Convery and McDonnell (2003) indicated there had been no focussed field survey to validate this. However, subsequent research suggests there has been a reduction of littered PSB (DEHLG 2004). Furthermore, Australian research suggests that a levy on PSB would result in a reduction of 312.5

¹⁶⁶ Consumers indirectly spend AUS\$10-\$15 annually on PSB (Nolan ITU 2002b), while the average cost of reusable bags is estimated to be AUS\$14.32 annually (Authors Calculation 2007) as discussed on page 10.

million littered PSB (ACG 2006), substantiating the environmental benefits of a PSB levy. The reduction in litter as a result of a PSB levy will have positive consequences for territorial authorities litter management in New Zealand, and specific positive implications for windblown litter at landfill site, for whom PSB are a significant litter problem (NEPM 2005, Stakeholder Communication 2006).

With significant potential to reduce both the consumption and littering of PSB, the application of a PSB levy would meet policy objectives. Although there are costs and challenges of a PSB levy this EI presents one of the most appropriate policy options according to the ACG (2006a) CBA of policies (EPHC 2007). A price based approach is especially appropriate at what time the social benefits of reducing PSB are sufficiently high to justify government intervention (EPHC 2007). The ACG report (ACG 2006 Page 54) concludes “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”. The key factors contributing this decision as outlined by ACG (2006a) CBA and supported by this research are: the current status of PSB has no incentive for consumers to reduce consumption; an EI provides for market flexibility, consumer demand, innovation; reusable bags are no more expensive than PSB and their use has environmental benefits; international experience has shown that the application of a price incentive, even if applied inefficiently, will have an impact on consumption and littering.

Regulatory Elimination or Ban on Plastic Shopping Bags

Regulatory policy employs the targeting of methods, technologies, specifications, prohibitions, controls and applications. Examples of regulatory policy could be a mandatory ‘Code of Best Practice’ for PSB, mandatory participation in an extended producer or product responsibility program (EPR), requirement that retailers charge consumers directly for PSB (co-regulatory) and the application of specifications, such as bag thickness, or recycled content for PSB. As with EI the justification for government intervention rests on the correction of a market failure, specifically the failure to internalise

the costs of using PSB. Prior to examining the regulatory options for New Zealand first let us look at what regulatory policy is, how the regulatory tools work.

Cohen (1997 Page3) defines regulation as “any attempt by the government to influence behaviour of citizens, corporations or sub-government”. Regulatory actions are classified as mandatory, and regulations typically present limited options for action, has legal sanctions and the ability to abolish some practices; in contrast voluntary actions are non-binding and discretionary (Hatch 2005).

Regulatory actions are often described as ‘command and control’ techniques, which are frequently based on technology or performance indicators. Technology based regulatory options require specific equipments, procedures or processes. In contrast, performance based regulations specify levels of pollution permitted (Stavins 1998). Porter (2002 Page 35) describes the process of packaging regulation of activity “by quantitative mechanism, such as regulating size, quantity shape or composition of packaging”.

Elliot (1997) points out that regulatory policy was originally created for large industry polluters and today’s environmental problems are smaller and more diverse and cannot be addressed through command and control techniques that are inflexible to individual situations. Hatch (2005) notes that regulatory techniques are inflexible by their nature as they impose uniformity irrespective of individual contexts and conditions. Moreover individual firms have to address the “inefficiencies and costs generated by such conditions” (Hatch 2005 Page 3).

The inflexible nature and cost distributions of regulation has impacts on innovation. Mandated technology can be seen as actively discouraging innovation through prescription, and provides no incentive for further reductions (Golub 1998 and Cohen 1997). To provide greater flexibility regulations could specify the “best available technology” (Hatch 2005)¹⁶⁷, or alternatively employ performance-based regulations, which are seen as more

¹⁶⁷ In relation to the application of PSB policies the best practise could analyse measures in terms of: stakeholder consultation; practical alternatives; environmental impact from policy; environmental benefits (such as waste minimisation, recycling, and litter reduction); and the quantification of the economic impacts, revenues, pressures resulting from employment implications and social effects (DEHLG 2004).

flexible than prescribed methods or processes (Stavins 1998). Porter (2002) suggests “quantitative regulation of packaging would mean administrative complexity”, as communicating to each manufacturer what kind and the amount of packaging approved is a resource, labour and time intensive process.¹⁶⁸ This approach of regulatory policy is criticised as being costly and burdensome, undermining public support, resulting in the need for further enforcement and administration, and using even more resources (Hatch 2005).

Effectiveness

Environmental regulation is often associated with economic inefficiencies within traditional economic wisdom, particularly in relation to global competitiveness, economic growth and employment (Hatch 2005). However there is little evidence that regulations will force business offshore (OECD 1993,1997 and Atkinson 1996), and Porters “win-win” theory suggests the right regulatory application may enhance competition by triggering innovation, encouraging technical upgrades and operational changes leading to increased productivity with lower costs (Hatch 2005 Page 4).¹⁶⁹ Despite the lack of evidence, the view that regulation is ineffective and has negative implications for industry, continues to inform business and industry attitudes towards environmental regulation, leading to consistent opposition to regulatory standards and the preference for voluntary and market based approaches (Hatch 2005).

While regulatory mechanisms by their nature are inflexible and have the potential to stifle innovation, there are benefits of legal sanctions (Porter 2002). The benefits of regulatory action banning PSB resulting in reduced environmental impacts, as mentioned on page 114, are reduced litter clean up costs, particularly at landfills; freeing a non-renewable resource for alternative applications; reduced impacts of resource use and emissions; more space in landfills; and reduced contributions to the global plastic pollution problem. These

¹⁶⁸ To regulate by quantity each product would need study/assessment of optimum packaging for transportation type (Porter 2002)

¹⁶⁹ Hatch (2005) suggests that a regulation aimed at outcomes, not methods and specific technologies, stimulates innovation.

outcomes can be achieved a number of ways using regulatory methods, which have been analysed in the CBA by ACG (2006a, b).

The ACG 2006 analysis estimates the costs and benefits of a number of regulatory options. The options modelled and analysed were the mandatory phase out of PSB, the elimination of PSB, and a mandatory charge for PSB. The ACG (2006a, b) CBA recognised that a ban on PSB represents one of the best policy options to address PSB. The ACG (2006) suggests the elimination of PSB results in costs to retailers from implementation,¹⁷⁰ potentially reduced revenue from longer transaction times, in-store education and communication, at a total of AUS\$432.9 million. Household impacts are estimated to be a reduced consumption of PSB; increased consumption of alternatives; with a net benefit of AUS\$109.8 million. Government impacts from elimination are increased administration expenses and reduced litter clean up expenses, with a net benefit of AUS\$19.0 million. Environmental impacts from a ban are estimated solely as reduced litter of 360 million fewer PSB littered.

Application

An important consideration for any policy is that the distribution of costs does not fall unfairly on particular groups (PCE 2006). If the costs, responsibilities and accountability of a ban on PSB fall to a particular group without provision or justification there will be both a lack of acceptance and the need for stronger enforcements. The distribution of responsibility has real implications of the application of policy as demonstrated in Australia. In 1999 the Australian Local Government refused to sign the NPC because of the allocation of shared responsibility, not industry responsibility. This situation developed as local government who fund and manage waste and litter, view waste and litter as being created by products, not people (Lewis and Sonneveld 2005).

In addition to responsibility the practicalities of enforcement are an important aspect of compliance costs. In New Zealand the majority of monitoring trade wastes and emissions

¹⁷⁰ Implementation includes equipment modification, staff training, and increased theft (ACG 2006)

falls to local governments under the RMA 1991, and waste management under LGA 1974.¹⁷¹ A ban on PSB requires legislation containing specifications of responsibility and enabling enforcement by the designated authority. However, the ACG (2006a) recommends that actions to address PSB be implemented in a nationally consistent manner. National application of a policy would enhance efficiency and enforcement of actions (PCE 2006).

The application of a national ban on PSB in New Zealand is somewhat problematic and is difficult to address fully in this limited analysis. It is likely a ban on PSB would require additional legislation, or amendments to existing laws. Existing laws in Australia only applies to incorporated retailers, excluding many retailers from legislation. There is a possibility of the application of a ban on PSB via the Waste Minimisation (Solids) Bill 2006, or alternatively in response to the failure to achieve goals of the NZPA 2004 as outlined in its foundations.¹⁷²

Additional factors to consider in the application of a ban on PSB are: the phase out period before implementation of the ban; punishments for non-compliance; enforcement; monitoring and administration responsibilities; as well as the implications of public and industry acceptance to future environmental campaigns.¹⁷³

Acceptance

Within governments and industry there exists a “general disaffection for command and control instruments” stemming from the adversarial and legalistic manner of regulatory measures which slows formulation, and impedes on effective implementation and

¹⁷¹ RMA 1991 Part 4 Functions Powers and Duties of Central and Local Government; Section 30 Functions of Regional councils under this act; 1 every regional council shall have the following functions for the purpose of giving effect to this act in its region (f) the control of discharges of contaminants into or onto land, air, or water and discharges of water into water:

¹⁷² Foundation 12: If a voluntary approach does not provide sufficient improvements in reducing packaging waste per New Zealander and encourage product stewardship, Government is prepared to consider doing so by regulation (MFE 2004).

¹⁷³ Recycler response (2006) if there was a ban on PSB in New Zealand “Our kerbside recyclers would have nothing to put their paper and card in!”

enforcement (Hatch 2005 Page 2).¹⁷⁴ While regulatory instruments were effective when first implemented and aimed at large industry polluters (Elliot 1997), Chertow and Esty (1997) conclude regulatory policies are now ineffective and new policy techniques are needed. Co-regulatory and voluntary agreements are being favoured in the environmental policy arena, and in New Zealand's approach to environmental policy (PCE 2006).¹⁷⁵

The use of regulatory tools such as a ban on PSB does not allow for individuals who value the use of PSB to have the option of paying for this service. The elimination of PSB has particular implications for elderly and differently-abled as mobility is an issue. Moreover, the banning of PSB would also have implications for impulse purchaser when consumers are most likely to have forgotten a reusable bag (EPHC 2007).

While the application of a regulatory ban on PSB has the potential to achieve the policy goals of reducing consumption and the impacts of littered PSB, the ACG (2006) CAB concludes "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" (ACG 2006 Page 54). Moreover, the lack of political will for regulatory methods for environmental policy, and the favouring of voluntary instruments by the MFE means that despite the potential benefits of a ban on PSB, this approach is less likely than a levy of PSB.

¹⁷⁴ In addition enforcement mechanisms, and non-compliance is problematic when administrative capabilities are diminished" (Golub 1998 and Chertow and Esty 1997).

¹⁷⁵ The Agenda 21 (UN 1992) conference provided plans for market based incentives, environmental labelling, self-regulation, and eco-auditing instruments in policies for sustainable development (Hatch 2005). However of these policy tools, environmental labelling, eco audits and the associated agreements are all voluntary measures.

Voluntary Measures to Address Plastic Shopping Bags

A voluntary agreement is an arrangement between government and industry to facilitate voluntary action with a desirable social outcome, which is encouraged by government to be undertaken by the participant based on the participant's self interest (Storey 1997). The European Environmental Agency's definition is only those commitments undertaken by firms and sector associations, which are the result of negotiations with public authorities and/ or explicitly recognised by authorities (Jurdon, Wurzel and Zito 2003). The OECD (1999) defines voluntary agreements as schemes where organizations agree to improve their environmental performance beyond legal requirements.

There has been a global trend for the use of voluntary agreements, particularly for environmental policy sector (Grepperud 2003), as can be seen in the MFE approach to environmental policy in New Zealand. While some of this affection for voluntary measures can be attributed to Agenda 21 (1992) and the Bruntland commission (1987), governments and industry have customarily favoured voluntary mechanisms for environmental policy due to the disaffection towards regulatory controls (Hatch 2005).¹⁷⁶

Voluntary measures used to address PSB could include the existing NZPA Brand Owners and Retailers Sector action plan with additional enforcement and penalties if the extended reduction targets are not met. Voluntary measures could be applied to PSB in New Zealand within the existing NZPA Sector Action Plan 2 Brand Owners and Retailers, Plastic Shopping Bag reduction Target, with the inclusion of a Plastic Shopping Bag Code of Best Practise that would include: the Provision of alternatives to PSB; Requirement of 50 percent recycled content PSB; minimum charge for PSB; reductions toward voluntary elimination; national rewards for reductions. The PSB code of practise could also include voluntary labelling or national standards related to the recycled content of PSB.

¹⁷⁶ Agenda 21 (1992) provided the blueprint for sustainable development using market based incentives, environmental labelling, self-regulation and eco-auditing instruments in policies for sustainable development (Hatch 2005). Of these policy tools the majority are voluntary measures, therefore it would be fair to say co-regulatory and voluntary agreements are being favoured in the environmental policy arena.

Additionally or separate to the NZPA plan could be a retailer led EPR programme to address the use of PSB. This programme could include: providing information of the economic and environmental costs of PSB; encouraging the use of and providing reusable bags for sale; minimum charge for PSB; providing in-store PSB recycling; and funding litter clean up initiatives; supporting kerbside recycling of PSB.

Effectiveness

Voluntary instruments are often seen as being easier to implement and administer, having increased compliance, as well as having a “non-binding, flexible, and discretionary nature” due to the negotiated less adversarial goals or guidelines (Hatch 2005 Page 6). Negotiated voluntary measures are criticised as being open to manipulation by signatories of agreements, manipulation to suit circumstances and timing (Golub 1998). This flexibility and autonomy is suggested to lead to increased compliance (ibid). However, this flexibility and discretionary nature can be a negative aspect when used to mould goals and guidelines to suit individual objectives (ibid).

Voluntary measures have difficulties with compliance and monitoring as enforcement and mandatory compliance is contrasting to the philosophy of discretion and flexibility behind negotiated self governing agreements (Duncalfe 2005). In addition, many individual businesses refuse to recognise declarations made by their associations as binding (Duncalfe 2005). Additionally many signatories, or those under voluntary agreements, do not achieve goals, drop out, or do not participate, and it is virtually impossible to impose sanctions following non-compliance of the agreements (Rennings et al 1997).

Therefore the possibility of free-riding and cheating still exists within voluntary actions (Hatch 2005), undermining collective benefits (Daly and Farley 2004). The possibility of free riding is enhanced by the lack of enforcement and penalties for non-commitment or fulfilment, which distributes the costs of actions to others within the programme or scheme (Rennings et al 1997). Firms who do not participate, or drop out of schemes, do not often

face penalties for non-compliance, making non-participation easy (Palmer and Walls 2002).

Despite the short falls of compliance and enforcement in voluntary agreements, the risk of government intervention provides limited pressure for compliance. The effectiveness of the threat of regulatory control is dependant on the veracity of political will to follow through with the threat (Sergeson and Miceli 1998), political will that is not demonstrated in New Zealand's environmental policy (MFE 2006).¹⁷⁷

The Australian NPC (National Packaging Covenant) addresses voluntary back up with the use of the National Environmental Protection Measure (NEPM 2005). The NEPM provides legislative provision that non-signatories of the covenant are subject to conditions of a regulatory authority.

Methods of limiting non-compliance are to ensure all members of an industry are signatories, or the provision of legal prosecution, creating a statutory basis for agreements and liability rules (as with the NEPM 2005). Additional consequences for non-compliance in voluntary agreements could be; negative recognition of failures (name and shame), expulsion from industry associations, financial penalties, withdrawal of financial support and incentives (Hatch 2005). Cabuguiera (2001) points out that the means to deter non-compliance must be enough to ensure costs of non-compliance are more than the costs of compliance. Making compliance less costly than non-compliance is difficult to achieve without the enforcement or penalties options offered by alternative policy tools.

The convenience of voluntary measures resulting from negotiated goals leads to a lack of meaningful targets or guidelines across voluntary agreements (Hatch 2005). The negotiated targets are frequently held responsible for the weakened goals of voluntary measures (Hatch 2005).¹⁷⁸ Industry does have strong incentives to lobby for modest, and the least

¹⁷⁷ "Voluntary options will be used first through the NZPA, and then will look at legislation. However there is a lack of political will to go through with it" (MFE 2006)

¹⁷⁸ The extent of compromise depends on many contextual factors of negotiation; balance of power between negotiators, presence of stakeholders, and the degree of political commitment to environmental protection (Sullivan 2005).

costly, changes which produces unchallenging targets (Carraro and Leveque 1999). The lack of ambitious goals results in outcomes that would have resulted anyway, business as usual, from the application of technology and practices towards efficiency (Carraro and Leveque 1999, OECD 2003, Renning et al 1997, and Storey et al 1999). Therefore any environmental gains from such voluntary actions are no different than environmental benefits that would have resulted anyway (Carraro and Leveque (1999). An OECD study (2003) found that voluntary agreements of the EU were successful in meeting targets, but there were only a few cases where environmental improvements were above what would have happened regardless of voluntary actions.

On the other hand, it is possible in some instances that voluntary agreements result in higher targets from competition (Cabuguiera 2001), and the negotiated approach could allow government the leverage to seek higher commitments than through regulatory approaches (Moffet and Breggha 1999).

The trade-off and acceptance of reduced environmental gains from voluntary mechanisms can be seen as an exchange for the cost and administrative savings, compared to regulation (Rennings et al 1997). As well as the lower targets, non-compliance or non-participation also results in reduced levels of environmental benefits. Moreover, there is a lack of incentives for real benefits, due to the lack of enforcement and challenging goals. This trade-off is suggested to be more likely when environmental and social costs or values are incomparable and un-quantified.

While voluntary programs have reduced environmental benefits when compared to regulation, it is suggested there are still positive impacts from voluntary measures. These can be termed as the “soft effects” such as education and awareness, which can lower costs of future programs and policies (Palmers and Wells 2002) and increase acceptance resulting from understanding. However the effects of education and awareness voluntary campaigns is questioned, and research suggests that education or awareness has no

implications of attitudes and behaviours (Bazerman et al 1996, Kaplan 1999, 2000, McKenzie-Mohr 1999, 2000).¹⁷⁹

Voluntary agreements are unlikely to have significant environmental benefits, and neither can these measures be labelled as efficient as they have been bargained for, and are not a price signal (Hatch 2005). Moreover, current voluntary programs do not provide incentives for consumers to do their part (Palmer and Wells 2002), having limited impact of consumption levels of PSB. The free-riding and non-compliance with voluntary actions could justify government intervention (ACG 2006). However government intervention in voluntary measures again negates the discretionary nature of this policy that industry and business finds appealing.

Application and Acceptance

ACG (2006a) presents estimates for two voluntary actions addressing PSB; an extended ARA Code of Best Practise, and a voluntary phase out of PSB. The extended code of practise for PSB extends the goal of a reduction in PSB use to 50 percent of 2002 levels. Retail implementation and on-going costs of this action are estimated at AUS\$663.4 million. The cost to households, from the increased use of alternatives, and reduced PSB consumption is estimated at AUS\$82.9 million. Costs to governments from voluntary actions are the result of increased administration, reduced litter clean up expenses, and are estimated at AUS\$12.7 million. Finally the environmental impacts of an extended code of practice are reduced litter of PSB by 245.3 million fewer bags (ACG 2006).

The second option presented by the ACG (2006a) is a voluntary phase out of PSB becoming mandatory after 2009. The costs of this action are estimated at: retail costs from increased implementation and ingoing AUS\$563.9; costs to households AUS\$136.5 million; costs to governments AUS\$23.9 million; and the environmental benefit of reduced PSB litter by 422.4 million bags.

¹⁷⁹ Bazerman et al (1996) argued that a 'attitude/behaviour gap' exists in regard to environmental issues. Most people have pro-environmental attitudes yet engage in environmentally destructive behaviours.

The level of environmental benefits, accountability and public involvement may affect public acceptance of voluntary agreements. Public accountability of signatories and public involvement in setting of goals and guidelines allows public participation. Participation results in outcomes from voluntary actions viewed as having greater levels of legitimacy, appropriate targets, and guarding against industry having total control of negotiations (Sullivan 2005). Public participation in the setting of targets increases receptiveness to voluntary actions as it avoids asking the private sector to police itself, which can also be interpreted as government “ceding responsibility” to the private sector” (European Environmental Agency 1996). In addition, there are motivating factors of public awareness, for industry compliance, as well as leading to greater political acceptance of the instruments (Sullivan 2005). Public consultation and involvement is often neglected in negotiations for voluntary agreements, and Rennings et al (1997) points out that the public’s right to be heard should not be excluded from negotiation procedure. Voluntary programs are not likely to achieve a socially desirable outcome for the same reasons that laissez-faire private markets do not achieve the socially desirable levels of waste reduction and recycling: the firms bear the costs of their activities but do not capture all the benefits (Hatch 2005). Moreover, the application of NZPA PSB programs are seen as a public relations stunt and supermarkets are anecdotally being accused of “greenwashing”.¹⁸⁰

Voluntary mechanisms have been criticised as not having demanding requirements, rigorous enough to achieve significant behaviour changes, and strengthened policy approach with stricter targets and internalisation of costs is needed (Duncalfe 2005). In a recent report the PCE (2006) has labelled voluntary measures as ‘stopgap’ method that will not be sufficient to achieve desired outcomes in waste management. Currently voluntary programs inform future policy decisions and complement other policy instruments, but if they are to do more, and address policy objectives they need to overcome the problem that firms can easily opt out of agreements at any time (Palmer and Walls 2002).

¹⁸⁰ Greenwashing is a name given to token efforts of organisations to be seen as being “green”, or being environmentally considerate. Organisations accused of greenwashing appear to spend more money on advertising and marketing their “green” products and services rather than actually being environmentally conscientious,

Australia's experiences with voluntary campaigns addressing PSB have had some impacts, reducing PSB consumption by 34 percent (Hyder Consulting 2006), and increasing the use of reusable bags. But, the campaigns have not achieved the NPC 2005 goals of a 75 percent reduction in PSB consumption by 2005, or reduced PSB litter.¹⁸¹ The lack of application and therefore impact of voluntary campaigns has already been witnessed in New Zealand's application of the "Make a Difference" under the NZPA 2004 (see page 57/58). Voluntary campaigns can only have an impact to a point, and further intervention is required to achieve significant reductions in PSB use (ACG 2006a).

The lack achievement of voluntary PSB measures demonstrates downfalls of voluntary approaches. Despite these well known issues co-regulatory and voluntary agreements are the favoured environmental policy options in New Zealand (PCE 2006), and as demonstrated in the failings of the PSB reduction targets of the NZPA (MFE 2004). Moreover, the "lack of political will" (MFE 2006) for regulatory methods for environmental policy, means voluntary measures are more likely to be applied in New Zealand than both a regulatory ban, or an EI of a levy on PSB.

Reflections on Research

A significant limitation of this research is the lack of stakeholder involvement. Further research would be more comprehensive and representative if all stakeholder groups were represented, such as: territorial authorities; government departments; organisations and individuals involved in litter clean up or PSB actions; landfill operators; retailers; recycling operators; plastics manufacturers; PSB importers; and the general public as consumers of PSB. The interviewing of general public was outside the scope of this research, but consumer input would have added value to this research, particularly in respect to barriers and incentives for behaviour change. Had general public and or consumer contributions been possible I would have employed a community-based social marketing theory approach to uncover barriers and benefits (McKenzie-Mohr and Smith 1999).¹⁸²

¹⁸¹ PSB remain 2.2 percent of all litter in Australia, in 2002 PSB litter made up 2.0 percent of all Australian litter (Clean Up Australia 2006).

¹⁸² CBSM employs the use of qualitative research, observations and focus groups, followed by a survey based on these observations (McKenzie-Mohr and Smith 1999 Page 20).

Additionally avenues for further product specific analyses have come to the foreground during this research. Frequently littered items that could be addressed by product specific management are; chewing gum; automatic teller machine (ATM) receipts; plastic water bottles; polystyrene fast food containers (Collins et al 2003); waxed paper takeaway cups; and most significantly cigarette butts.

First Objective

The first objective of this research was to investigate what the environmental problems associated to the consumption, and subsequently litter of PSB. The environmental impacts of PSB are a result of resource use and disposal, impacting on wildlife through entanglement and ingestion, ecosystem processes, biodiversity, water quality, and species survival. The body of research about the impacts of plastic impacts on the marine environment provides evidence that the impacts are far greater and infiltrating than other materials littered. Plastic debris in general are the most pervasive marine litter items, and both the ingestion of plastic and the erosion of plastic in the environment is contributing to the build up of microscopic pieces of plastic in animals and the environment. There was limited literature on the terrestrial build of plastic pollution and its impacts, and there exists an opportunity for further research. Specifically the impacts of terrestrial plastic pollution to food sources and animals would be beneficial considering the evidence of biodegradable plastic soil impacts. PSB could be used as an exemplar item to advertise and begin actions addressing this serious environmental threat that has not received enough public attention despite the significant amounts of academic research.

Second Objective

The second objective of determining PSB use, disposal recycling in New Zealand estimated that New Zealand use between 1.5 billion and 245 million PSB annually. The widespread wide range of estimates demonstrates the lack of data available. This lack of data on New Zealand's use of PSB was further limited by a lack of involvement in this research by key stakeholders, and a lack of achievement of the NZPA Plastic Shopping Bag Targets in the NZPA 2004 which provided for the creation of baseline data. Moreover, if these targets were achieved I believe that the NZPC would be unlikely to transparently report statistics due to lack of public involvement in the NZPA process, which alludes to a

dislike of public involvement in voluntary agreements as it leads to harder goals and more public accountability.

The reuse of PSB is evident from Field Connection's (2005) data, 81 percent of PSB are reused. However this reuse rate does not change rates of PSB to landfills as the majority of PSB are involved in waste activities and end up in landfills anyway. Without New Zealand consumption data it is difficult to determine how many PSB end up in landfill, however estimations suggest between 68 and 8,000 tonnes of PSB, or 0.113 to 1.33 billion PSB are sent to landfill in New Zealand annually. Once the PSB are at a landfill they can still contribute to littered PSB from dispersal at the landfill site. Littered PSB are estimated between 14.7 million and 134.1 million PSB are littered in New Zealand every year (Authors Calculation 2007). The lack of New Zealand specific data provides an opportunity for future research, and reveals both the lack of achievement and accountability for failure to meet NZPA targets.

Third Objective

The international management of PSB was covered through two in-depth case studies of Ireland's PlasTax, and Australia's voluntary actions, as well as presentation of international actions presented in appendix 6. The case studies provided an opportunity to investigate what had been done, why these particular actions had been chosen, and what the impacts of management actions were. Ireland's success with the PlasTax was a result of a well run education, consultation and marketing campaign before the levy was introduced (Convery and McDonnell 2003), as well as infrastructure for the application of the levy. Australian voluntary actions while reducing PSB consumption have done little to address PSB litter. The lack of achievement of a reduction in PSB litter, and the failure to achieve the NPC PSB reduction targets has resulted in the serious and public consideration of government intervention to address PSB. The substantial amount of Australian research has resulted in the recommendation of a PSB levy, or a ban on PSB (ACG 2006a, EPHC 2007). While informing policy suggestions, the case studies are subject to cross cultural differences of comparability, cultural variations and validity of the research used in the

case studies. A more comprehensive case study comparison of actions addressing PSB internationally may provide an opportunity for future research.

Fourth Objective

In exploring the alternatives to PSB this research has concluded that both biodegradable and paper bags are more environmentally damaging than PSB. International research demonstrates that the environmental impacts of all bags are: energy use; water use; water pollution; air pollution,¹⁸³ solid waste production; littering (Cadman et al 2005b, Ecobilan 2004). However the ACG (2006a Page 21) states that the lowest green house gas emissions are from the use of reusable bags, and that reusable bags are the best alternative to PSB.¹⁸⁴ Therefore the use of reusable bags counts towards the fight for sustainability and reducing green house gases that contributes to global warming and climate change.

The limited policy analysis conducted to determine the best policy tools to address PSB in New Zealand used the policy cycle approach. This approach concluded that there concerns both about the environmental impacts from the use and litter of PSB, as well as concerns about the validity of environmental impact research. The suggested policy objective is to address first the consumption of PSB and secondly the environmental impacts of PSB. However, the achievement of these objectives is tricky as the point at which consumption reduces environmental impacts is undefined. While Ireland's PlasTax reduced both the consumption and littering of PSB, Australia's voluntary measures did reduce consumption but did not meet NPC targets or reduce littered PSB. The policy analysis repeats this conclusion by suggesting that a tax on PSB would be the most effective and efficient policy action to address PSB in New Zealand. However there are practical, legal, political and implementation issues of applying a PSB tax in New Zealand. The most significant being the legal barriers and the lack of political will to address PSB and to use EI in environmental policies in New Zealand. Therefore the current reality suggests that another voluntary mechanism is the most likely approach to PSB.

¹⁸³ Air pollution indicators are: green house gases, nitrogen dioxides, photo chemicals, ground level ozone creation potential (smog), and atmosphere acidification (Cadman et al 2005, Ecobilan 2004).

¹⁸⁴ Lower green house emission from reusable bags with 2.0kg of greenhouse gas emissions (kg CO₂ equivalent per annum), biodegradable bags released 2.5kg, HDPE shopping bags were estimated at 6.1kg, calico bags at 6.4kg, and paper bags were the highest producer with 30.2kg of greenhouse gas emissions (ACG 2006 Annual Emissions Table Page 21).

While the ACG (2006a) analysis suggests that all policy options addressing PSB cost more than the benefits, this is according to the quantification of social benefit used by the ACG analysis. ACG (2006a) does point out that if the social benefit of actions addressing PSB is significant the costs of addressing PSB will be justified. However it could be said the quantification of the social benefits of addressing PSB: reducing green house gas emissions, extending the worlds plastic supply, reducing minute plastic pollution, and retaining biodiversity and ecosystem process seems unnecessary. Moreover the experience and approach of addressing an everyday comprehensible object such as PSB provides a tangible and symbolic example to introduce further everyday behaviour changes promoting environmental protection, sustainable consumption and reductions in greenhouse gas emissions. Such a symbolic example is necessary to ensure reductions in green house gas emissions and more sustainable activities that are requisite.

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Appendix 1. New Zealand Packaging Accord Sector Action Plan 2

5. Programmes to Achieve National Targets, 5.1 Plastic Shopping Bag Reduction Target. 5.1 Plastic Shopping Bag Targets.

Retail sector assist public in responsible disposal of PSB to alleviate this litter problem.

Retail Signatories to this Accord are committed to the responsible use of PSB, including reducing unnecessary use of bags, providing reusable bag alternatives and collaborating with other sectors to promote the recovery and recycling of PSB.

Brand Owners and Retail Sector Plan 2, 5. Programmes to Achieve National Targets; 5.1 Plastic Shopping Bag Targets. Retail sector assist public in responsible disposal of PSB to alleviate this litter problem. Retail Signatories to this Accord are committed to the responsible use of PSB, including reducing unnecessary use of bags, providing reusable bag alternatives and collaborating with other sectors to promote the recovery and recycling of PSB.		
Company/Organisation	Activities	Year
Individual Retail signatories to the Accord will develop and implement plans in order to achieve national reduction targets for PSB.	<p>Reduce-discourage unnecessary use of PSB.</p> <p>Reduce- maximise the number of items packed per bag appropriate to item type.</p> <p>Reuse- provide alternative multi trip/ reusable (cloth and plastic) shopping bags for sale in store.</p> <p>Recycle-provide customer recycling facilities for checkout bags. <i>(Implementation will differ according to the type of retail environment.)</i></p> <p>Targets- using the 2003 and 2004 years as a baseline establish company reduction targets of a minimum of 20 percent by 2008 and adjusted for growth in sales.</p> <p>Quantify- the use of PSB: Total units across all bag types Mass-bag weight x units Recycled- content new bags-</p>	Years 1-5

	<p>percentage of recycled content of total mass</p> <p>Relativity to sales-kgs HDPE per \$1m sales</p> <p>Customer recycling- approximate mass of returned bags.</p> <p>Promote- use company advertising media and in-store communications to engage customer support for the above initiatives.</p>	
Sector	Activities	Years
Retail Accord signatories will collaborate in non-commercially sensitive ways to achieve the national reduction target for PSB.	<p>Standardise- while still retaining competitive differentiation and sourcing, the industry will investigate the creation of a New Zealand standard for PSB, incorporating a plastics ID code, appropriate messages promoting responsible reuse and recycling, and recycled materials content and degradability (where this is an accepted option for all sector groups.)</p> <p>Recycle- investigate the feasibility of a retail industry standard checkout bag recycling receptacle for placement in large stores, malls and retail precincts. <i>(Implementation will differ according to type of retail environment.)</i></p>	<p>Years 1-2</p> <p>Year 1</p>
Joint		
Cross-sector collaboration to achieve national reduction target for PSB.	<p>Recycle- develop a joint recycling initiative with recyclers and local government to enable consumers to recycle their bags through establisher kerbside collection systems.</p> <p>Promote-investigate tans-sector initiatives to promote responsible use of PSB targeting reduction, recycling, and litter.</p>	<p>Years 1-2</p> <p>Years 1-5</p>

Appendix 2 Primary Research Key Stakeholder Questions

Research Questions: Manufacturer/Importer/Distributor

1. Is your organisation? A. Manufacturer B. Distributor C Importer
 - a. If your answer is B, Are the bags you distribute made in New Zealand or imported?
2. How many types of bags do you produce/distribute, and what are they?
3. How many PSB do you make/distribute annually?
4. What percentage of your company's total revenue does HDPE PSB represent?
5. Would you consider manufacturing/distributing alternatives to plastic bags, for example biodegradable bags? Please explain why, materials, machinery, viability, markets Etc.
 - a. If yes, do you imagine alternatives to be as profitable as conventional plastic bags?
6. Are you aware of campaigns around the world concerning levies and bans on PSB?
7. If there were to be similar action here in New Zealand what would you prefer? (Please rank top four choices)
 - a. Low levy on PSB
 - b. Moderate levy on PSB
 - c. High levy on PSB
 - d. Low levy on paper and PSB
 - e. Moderate levy on paper and PSB
 - f. High levy on paper and PSB
 - g. Allow only degradable PSB
 - h. Regulation allowing only recyclable shopping bags (HDPE)
 - i. Regulation allowing only recyclable HDPE bags and a levy on PSB
 - j. Complete ban on all PSB
 - k. Other
8. Do you have any ideas about how this research itself should be conducted, and how the results might be used?
9. Please feel free to add any further comments about plastic bags, plastic bag management, new generation plastics, bio-plastics or any other aspect surrounding this topic.

Research Questions: Recycler

1. Is your operation currently involved in recycling any plastic carry bags?
 - a. If yes please specify; HDPE, LDPE, Other.
 - b. If No what would you have to change to be able to recycle plastic bags?
2. Please explain why, materials, machinery, viability Etc.
3. Is your operation able to recycle all plastic bags or select types of bags?
4. Could you indicate the estimated cost of this change?
5. Would you consider recycling plastic bags?
 - a. If No, what are the issues and considerations preventing this item from being recycled?

- b. If Yes, please explain the reasons for recycling plastic bags.
6. Are you aware of campaigns around the world concerning levies and bans on PSB?
7. If there were to be similar action here in New Zealand what would you prefer (Please rank top four choices)?
 - a. Low levy on PSB
 - b. moderate levy on PSB
 - c. High levy on PSB
 - d. Low levy on paper and PSB
 - e. Moderate levy on paper and PSB
 - f. High levy on paper and PSB
 - g. Allow only degradable PSB
 - h. Regulation allowing only recyclable shopping bags (HDPE)
 - i. Regulation allowing only recyclable HDPE bags and a levy on PSB
 - j. Complete ban on all PSB
 - k. Other
8. If there was a tax applied to HDPE shopping bags how do you see this impacting your current operations?
9. Would it be practical to have a regulation requiring all shopping bags to be HDPE for recycling purposes? Please explain reasons.
10. If biodegradable plastics were available on the mass market what potential do you see for large-scale composting?
11. If HDPE plastic bags were banned and degradable bags allowed in their place, how would it affect your operations?
12. Do you have any ideas about how this research itself should be conducted, and how the results might be used?
13. Please feel free to add any further comments about plastic bags, plastic bag management, new generation plastics, bio-plastics or any other aspect surrounding this topic.

Research Questionnaire: Retailers

1. What is your store?
 - a. Supermarket
 - b. Food supplier
 - c. Liquor Store
 - d. Café
 - e. Takeaway
 - f. Convenience store
 - g. Petrol station
 - h. Homeware
 - i. Gardening
 - j. Trade supplier (hardware/automotive/safety)
 - k. Fashion (clothes/shoes/accessories)
 - l. Department Store
 - m. Other
2. What store-type is your store? A. Chain store, B. Franchise, C. Independently owned and operated.
3. Does your retail outlet provide customers with PSB for their purchase?
4. Are the Bags provided,
 - a. plastic
 - b. what type of plastic bag is supplied?
 - i. #2 HDPE
 - ii. #4 LDPE
 - iii. Degradable
 - iv. other (please specify)
 - v. Unknown.
 - c. Paper
 - d. Both paper and plastic
5. Are customers offered the option to refuse a bag?

6. Are customers charged for bags?
7. How many bags does your store use in one year?
8. What is your total expenditure on bags in one year?
9. Does your store offer discounts, credits or some reward for using their own bags?
(Please specify if offered)
10. Has your store considered giving rewards to customers using their own bags?
11. Does your retail outlet have reusable shopping bags for sale?
12. Has your store considered selling reusable bags?
13. Are plastic bags used as part of your store security program?
14. Are you aware of campaigns around the world concerning levies and bans on PSB?
15. If there were to be similar action here in New Zealand what would you prefer? (Please rank top four choices)

<ol style="list-style-type: none"> a. low levy on PSB b. Moderate levy on PSB c. High levy on PSB d. Low levy on paper and PSB e. Moderate levy on paper and PSB f. High levy on paper and PSB g. Allow only degradable PSB 	<ol style="list-style-type: none"> h. Regulation allowing only recyclable shopping bags (HDPE) i. Regulation allowing only recyclable HDPE bags and a levy on PSB j. Complete ban on all PSB k. Other
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16. If there were a levy on plastic bags how would your store approach the situation?
(Please rank top four, 1 2 3,4)

<ol style="list-style-type: none"> a. Start charging for plastic bags b. Charge more for plastic bags c. Start to offer paper bags d. Change to paper bags only e. Start selling reusable bags 	<ol style="list-style-type: none"> f. Offer rewards for customers who refuse/bring their own bags g. Use biodegradable plastic bags h. Other
---	---
17. What issues do you think would arise from these alternatives, in relation to handling, storage, cost, and customer reaction?
18. Do you have any ideas about how this research itself should be conducted, and how the results might be used?
19. Please feel free to add any further comments about plastic bags, plastic bag management, new generation plastics, bio-plastics or any other aspect surrounding this topic.

Research Questions: Supermarket Group

1. Are your stores (please circle); Franchise, Independently owned and operated, Chain stores under national management.
2. Are store regulations and policies rolled out nationally or does each store choose to participate?
3. Are the bags currently provided at the checkouts in your stores; Plastic (HDPE, LDPE, or Other), Paper, Other
 - a. If plastic bags, what is the recycled content of the bags provided?
4. How many stores have in-store recycling facilities for customers?

5. How many bags are used annually throughout your stores?
 - a. Plastic HDPE
 - b. Recycled-content HDPE
 - c. Other plastic
 - d. Paper
 - e. Plastic Reusable
 - f. Cloth Reusable
6. What is total expenditure on bags annually (NZPA Commitment)?
 - a. Nationally
 - b. Banner groups
 - c. Regionally
 - d. Store
7. Alternatively, what is the relativity to sales-kilograms of HDPE bags per \$1m sales?
- In-Store Training
8. Is it policy to ask customers if bags are needed?
9. Do customers pay for bags?
10. Do all your stores sell re-usable bags?
11. Do you have or plan to have any rewards or deals related to the reusable bags?
Example; Spend \$20 and get a reusable bag between 1st April and 30th May.
12. Is there currently, or would the company consider rewards or deals for people who bring their own bags?
13. What issues do you think would arise from these alternatives, in relation to handling, storage, cost, and customer reaction?
14. Are plastic bags used as part of the company's store security programs?
15. Is the 2003-2004 baseline data on plastic bag use available?
16. Is the 2004-2006 data on plastic bag use available?
17. What is the company reduction target?
18. How is the company maximising number of items per bag?
19. Has the feasibility study for the in-store recycling been completed?
20. How many in-store recycling facilities are to be established for customers?
21. How is the sector work towards kerbside recycling for PSB progressing?
22. Has the feasibility study for kerbside recycling been completed?
23. What advertising and/or promotions has the company undertaken to reduce unnecessary plastic shopping bag use?
24. What are the steps you have taken towards a national plastic shopping bag standard?
25. What are the objectives of the lightweight bag trial (mentioned in PA Report 2005)?
26. Are there any outcomes or conclusions available?
27. What is your preferred management of PSB?
 - a. Levy on PSB
 - b. Levy on paper and PSB
 - c. Allow only degradable PSB
 - d. Regulation allowing only recyclable shopping bags (HDPE)
 - e. Regulation allowing only recyclable HDPE bags and a levy on PSB
 - f. Regulation allowing degradable bags only
 - g. Complete ban on all PSB
 - h. Mandatory minimum charge on plastic bags
 - i. Code of best practise for plastic bag use
 - j. Other
28. Do you have any ideas about how this research itself should be conducted, and how the results might be used?
29. Please add any further comments about plastic bags, plastic bag management, new generation plastics, bio-plastics or any other aspect surrounding this topic.

Appendix 3. Primary Research Consent Forms

“Money or the Bag? Options for Management of Plastic Shopping Bags”

INFORMED CONSENT FORM

Participant’s Copy

Researcher: Rhian Tough
Telephone: 021-959918
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Environmental Studies
School of Earth Sciences
VICTORIA UNIVERSITY OF WELLINGTON
KELBURN
WELLINGTON

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E-mail: ralphchampan@vuw.ac.nz

I have been provided with adequate information about what the above-described research entails, and I have been given opportunity to seek further clarification or explanations.

I understand that information or opinions I have provided will be kept confidential and reported only in a non-attributed form.

I understand that I may withdraw from this study at any time before the final analysis without providing reasons. I understand that if I do choose to withdraw from the research any data and information I have provided will be destroyed in a secure manner.

I understand that the information I have provided will only be used for this research and project and that further use will require my written consent.

I understand that when this research is completed the information obtained will be held in a secure location for two years prior to destruction.

I request that a summary of the research project **be sent** to me

I request a summary of the research project **is not sent** to me.

Participant

Name: _____

Signature: _____

Date: _____

Appendix 4. Stakeholder Views, Responses and Concerns

Industry Responses

If there were to be similar action here in New Zealand what would you prefer?	None-the people that propose these actions do not truly understand the environmental effects of plastic/paper. The response is often emotive and not very scientific. Often these people are very passionate about what they do and really don't know the facts. This is a very real problem facing the plastics industry and is not easy to address.
Further comments	In brief, environmental studies should truly look into the problem first before trying to find solutions to problem they don't really understand. Again this is reacting to emotion rather than reacting to a true scientific solution.

Recycling Operators Responses

If there was a tax applied to HDPE shopping bags how do you see this impacting your current operations?	Would reduce our recycled product due to reduced use of bags, therefore reducing our income. Bigger picture for us however is that reduce is better than recycle.
If biodegradable plastics were available on the mass market what potential do you see for large-scale composting?	I don't know enough about this. What I have read is that the bio-plastics need certain conditions to break down. At present bio plastics can easily be mistakenly put into other plastic product, degrading the value.
If HDPE plastic bags were banned, how would it affect your operations?	We process a lot of plastic bags, coloured bags, pallet wrap, [and] farm plastic. It would be one less line to sort. Our kerbside recyclers would have nothing to put their paper and card in!
Do you have any ideas about how this research itself should be conducted, and how the results might be used?	Would be worth sharing findings with a) packaging industry, b) chain stores, c) community and councils. They make recommendations for their own groups and perhaps government about actions they wish to take.
Further comments	Ultimately, the aim is to use less, make less, use less energy. If by removing them, or putting a levy on plastic bags, this can happen, then it's a good thing.

Recycler 2

Would you consider recycling plastic bags?	Yes. To have them out of the waste stream! - preserve landfills.
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If there were to be similar action here in New Zealand what would you prefer?	<p>1st-Regulation allowing only recyclable shopping bags (HDPE)</p> <p>2nd-Allow only degradable plastic shopping bags</p> <p>3rd Regulation allowing only recyclable HDPE bags and a levy on plastic shopping bags</p> <p>4th Moderate levy on plastic shopping bags.</p>
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Do you have any ideas about how this research itself should be conducted, and how the results might be used?	The results could be used to lobby local councils and local government for the funding required to make a change to recyclable shopping bags
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Recycler 3

Would you consider recycling plastic bags?	Yes. A currently untapped resource going to landfill.
If there were to be similar action here in New Zealand what would you prefer?	<p>1st- regulation allowing only recyclable shopping bags (HDPE).</p> <p>2nd-regulation allowing only recyclable shopping bags (HDPE) and a levy on plastic shopping bags.</p>
Do you have any ideas about how this research itself should be conducted, and how the results might be used?	Awareness that plastic bags are not as big an environmental issue as thought.
Further comments	There is a great need for education on behalf of the consumer about recycling. This should be funded by government agencies.

Retailer 1

If there were to be similar action here in New Zealand what would you prefer?	<p>1st-Regulation for only recyclable HDPE bags and a levy on bags</p> <p>2nd-Regualtion allowing only recyclable HDPE bags</p> <p>3rd-Regulation allowing only biodegradable bags</p> <p>4th-High levy on plastic shopping bags</p>
If there were a levy on plastic bags how would your store approach the situation?	<p>1st- Use biodegradable plastic bags (compostable)</p> <p>2nd- Start charging for plastic bags</p> <p>3rd- Change to paper bags only</p> <p>4th- Start to offer paper bags</p>
What issues do you think would arise from these alternatives, in relation to handling, storage, cost, and customer reaction?	Cost-alternatives are more expensive. Customer resistance, some people don't care. Though we won't loose bags as paper or biodegradable plastic bags will

	always be available. Storage is not a problem for us
Do you have any ideas about how this research itself should be conducted, and how the results might be used?	It's a matter of weighing cost of alternatives versus the environmental benefits. I hope other retailers take issue seriously. It appears an easy choice for management but actions probably based on who knows options out there.
Further comments	Shame that it's got to the point at which one or two items are put in bags for security. We are quite happy to have no bags, and we need to start addressing our own impacts.

Ministry for the Environment

I have previously been informed that the MFE is not concerned about plastic bags, as they are not a large proportion of the solid waste stream. What is your view on this?	Minor waste issue, more a social consumption and sustainability issue but needs attention due to public interest.
Do you see problems with legislative back up of actions to reduce plastic bag consumption? (In reference to the legal challenges San Francisco is facing?)	Voluntary options will be used first through the NZPA, and then will look at legislation. However there is a lack of political will to go through with it.
Alternatives	<p>Campaign needs to present alternatives, not dictate that there is only one option, reusable bags.</p> <p>Alternatives need to be ready to go and easy to implement.</p> <p>We have a culture of not speaking up about achievements and this impacts on publicity and behaviours. Australian voluntary campaigns very vocal and publicly aware, has public involvement and culture is benefiting from it. Even tourists are encouraged to buy and use reusable bags.</p>
Implementation of action	Opportunities for a campaign, fuel dockets seem to be the current 'thing' and looking for the next hook.
Do you see a possibility that a reduction in plastic bag use could flow on to other more sustainable behaviours?	Yes- recycling is already embedded and this is an extension of this. Levy loses impact, like petrol prices we accept increases, if alternatives are available influence could be significant, particularly for dashing in shopping (impulse or last minute shopping).

Appendix 5. Case Study Timelines

Ireland's Timeline

- 1994** Plastic bag levy is discussed in parliament
- 1996** Framework legislation enacted (Waste Management Act 1996)
- 1997** Irish government released a statement of intent on environmental taxes (DEHLG 2004).
- 1999** Consultancy report recommended upstream levy, for producers and importers (Feily Timoney and Company 1999).
Environment minister Dempsey wanted stronger signal directly to consumers and insisted on a down-stream charge to consumers.
- 2000** Plastic bag tax proposal agreed to in cabinet.
- 2001** Waste Management Amendment Act (2001) strengthened the 1996 Waste Management Act.
National litter action plans was created at the National anti-litter forum (DEHLG 2004).
- 2002** March, tax of 0.15 Euro cents per bag was implemented.
- 2003** Convery and McDonnell, Applying Environmental Taxes and Levies-Lessons from the experience with the Irish Plastic Bag Levy (Department of Environmental Studies, University College Dublin).
- 2004** 90% reduction in plastic bag consumption, plastic bags represent 0.03% litter, previously to tax was 5% of total litter, and 20 million Euros revenue from the PlasTax DEHLG Ireland¹⁸⁶).
- 2007** Levy will be increased to 0.22 Euro-cents (the maximum allowed by existing legislation) in March to offset increased LWPB use and desensitisation to the levy.

¹⁸⁶ www.environ.ie/DOEI/DOEIPub.nfs/enSearchView/825D1E7CF9C6215280257289004092?Opendocument&Lang=en

Australia's Timeline

- 2001** Week long national public awareness campaign “Bag Yourself A Better Environment”, Clean Up Australia, Environment Australia, ARA, Coles and Woolworths Supermarkets.
- 2002** Planet Ark carries out a pamphlet drop the same day Irish ‘PlasTax’ introduced, sparking media interest and public awareness (Collins et al 2003 and EPHC 2007). October, at an EPCH meeting “ministers agreed to pursue a number of actions relating to the adverse impacts of plastic bags on the Australian environment (PBWG 2002 Page 7)
- Nolan ITU presents the PSB- Analysis of Levies and Environmental Impacts Final Report, to the Department of Environment and Heritage, also known as the “Nolan Report” (December).
- The Nolan report (2002b) places HDPE consumption at 6 billion, and LDPE 0.9 billion.
- Nolan ITU (2005) later reports HDPE use at 5.95 billion in the 2002-2004 Interim Consumption Report.
- The Plastic Bags Working Group Reports to the National Packaging Covenant Council (December).
- Rubbish Report estimates plastic bag littering at 2.0% of total litter (Clean Up Australia 2002)¹⁸⁷.
- 2003** -Month long (extended version) of the national public awareness campaign “Bag Yourself A Better Environment”, Clean Up Australia, Environment Australia, ARA, Coles and Woolworths Supermarkets. This time national government sponsored the campaign and local government was heavily involved (Collins et al 2003).
- ARA drafted the Code of Practice for the Management of Plastic Bags.
- Clean Up Australia Rubbish Report sets plastic bag littering at 2.2% of total litter.

¹⁸⁷ Clean Up Australia Rubbish Report 2002,2003,2004 & 2005
www.cleanup.com.au/au/NewsandMedia/rubbish-report.html?kw=rubbish%20report

-Total HDPE use for 2003 is 5.24 billion (Nolan ITU 2005), reduction of 0.71 billion (11.9%) from 2002.

2004 -Clean Up Australia Rubbish Report sets plastic bag littering at 2.2% of total litter.

-Public survey finds 93% Australians were concerned about the impact that plastic bags had on the environment (August, EPHC 2007).

-HDPE consumption 4.73 billion (Nolan ITU 2005), 0.51 billion less than 2003 (9.7%), and total reduction of 1.22 billion from 2002 (20%).

2005 -Nolan ITU Plastic Retail Carry Bag Use 2002-2004 Consumption Interim Report (March).

-HDPE consumption is 3.92 billion (Hyder Consulting 2006), a reduction of 0.81 billion from 2004 (17%), and a total reduction of 2.03 billion from 2002 (34%).

-Per capita use of plastic bags reduced 35% from 2002 (EPHC 2007)¹⁸⁸

-Guidelines for Management of Plastic Bag Litter at Landfill Sites, Department of Environment and Heritage (June).

-The National Packaging Covenant July 2005 to June 2010, National Packaging Covenant Council, July 2005.

-National Environment Protection Measure (Used Packaging Materials) Measure as Varied (July)

-Australian Retailers Association Code of Practise for the Management of Plastic Bags Final Report, (December).

-Clean Up Australia Rubbish Report sets plastic bag littering at 2.2% of total litter.

2006 -Hyder Consulting report Plastic Retail Cary Bag Use 2002-2005 Consumption (May) for the Department of Environment and Heritage.

-ACG Report “Phasing Out Light-Weight Plastic Bags a Cost Benefit for the DEH (May).

-Victorian Government publishes their Sustainability Action Statement “Our environment Our Future”, containing a plan to ban plastic bags within the state by 2009 (July)

¹⁸⁸ 2002 consumption per capita 303, 2005 use was 195, $303/195 \times 100 = 35.6$ (1d.p), reduced by 108 bags per capita.

-EPHC noted a mandatory charge or ban would be considered further
(November)

2007 -Consultation Regulatory Impact Statement (RIS): Investigation of Options to
Reduce the Environmental Impact of Plastic Bags, EPHC, January 2007.

Appendix 6. International Practice of Plastic Bag Management

The examples below are presented by policy tools; regulation, economic instruments, voluntary measures and education and information;

International Application of Regulatory Tools

Gulf of Aqaba, of the coast of Jordan, has seen the production, distribution, and trade of plastic bags banned due to the large numbers found in the gulf (by the Board of Aqaba Special Economic Zone) (MCS 2004).

Bangladesh banned the manufacture and use of plastic bags in March 2002 after they were found to have blocked drains, exacerbating the 1988 and 1998 floods that affected two thirds of the country. Flouting the ban results in a £9,000 fine. Jute bags have replaced plastic bags, leading to growth in the jute industry (www.banthebag.org.uk/round_the_world.htm and www.reusablebags.com/facts.php?id9).

Canada; Manitoba, Leaf Rapids As part of this town's experiment as a model environmentally aware community, Leaf Rapids have banned retailers from using plastic bags from April 2nd 2007. Retailers will be fined \$1,000 if they give out disposable bags. The ban follows a previous tax on single use plastic bags that was introduced in 2006.

France has legislated to ban all non-biodegradable bags from January 1st 2010. Many retailers have already implemented voluntary charges for plastic bags and the majority of consumers bring their own bags or have reusable bags (www.banthebag.org.uk/round_the_world.htm). Legislation has defined "biodegradable bags" as bags made from renewable materials, which excludes all synthetic biodegradable plastics. Petroleum based disposable bags will be eliminated in 2007 (Vink 2006).

Hong Kong has prohibited medium to large retailers from providing free plastic bags. An education and information campaign, "No Plastic Bag Please" demonstrates alternatives and promotes environmentally aware purchasing, and supermarkets have provided in-store

recycling facilities (www.banthebag.org.uk/round_the_world.htm). In addition, a campaign for ‘Plastic Bag Free Day’ has been taken up with enthusiasm, showing a strong co-operation between government and retailers.

India: Himachal Pradesh (northern state) has a total ban on plastic bags production, storage, use, sale and distribution. Penalties for non-compliance include seven years in jail or 100,000 Rupee fine (£1000) (www.banthebag.org.uk/round_the_world.htm).

Mumbai Council has banned plastic bags and promoted recycled paper bags as a replacement (www.banthebag.org.uk/round_the_world.htm).

Kerala has law prohibiting plastic bags thinner than 20 microns in an effort to reduce littering and encourage reuse (www.reusablecabags.com/facts.html).

Maharashtra (western state) has implemented state legislation banning the manufacture, sale and use of plastic bags. Manufacturers and stores selling bags will be fined 5,000 rupees and individuals using bags will be fined 1,000 rupees (www.reusablecabags.com/facts.html).

Kenya plans to implement regulations banning plastic bags under 30 microns thick, undertake a consumer and anti-littering campaign, introduce a plastic bag levy collected from suppliers, with the costs passed onto consumers. The levy would be partially targeted to support the development of reusable bags, such as cotton, which would have the double benefit of helping Kenya’s cotton agriculture and industry. There is also support for a suitable plastic bag recycling scheme, and a new body known as the Plastics Levy Management Committee is to be set up to manage and implement the new measures (www.unep.org/documents.multilingual). The 2005 Nobel Peace Prize winner, Wangari Mathaai, endorsed action for this plan, as her research has linked discarded plastic bags with facilitating the spread of malaria.¹⁸⁹

¹⁸⁹. Littered plastic bags can fill with water offering ideal breeding grounds (warm water) for mosquito’s who are the carriers for malaria. www.Banthebag.org.uk/round_the_world.htm

Pakistan, Karachi The enforcement of regulations such as micron thickness of plastic bags appears time consuming and costly. In Pakistan, Karachi, the specification requires all bags to be a minimum of 30microns thick and the monitoring of this regulation is being carried out manually, using micrometers. In addition, jurisdiction of monitoring officers has been questioned, and any property searches would require the presence of a magistrate (www.thenews.com.pk.html).

Rwanda has banned plastic bags less than 100 microns thick, and has in conjunction with public awareness campaigns eliminated the sight of previously common black plastic bag from Kigali (National Park?) (www.unep.org/documents.multilingual).

U.S.A., San Francisco, in a suite of ‘Eco-Bills’ has introduced a policy banning supermarkets from using plastic bags. After legal challenges were brought from retailers against the bill, the requirements have been altered to use of only recyclable paper or compostable plastic bags (Sabatini 2007).

South Africa banned plastic bags thinner than 30 microns thick in 2003, and introduced a plastics levy, which funds a plastics recycling company (www.unep.org/documents.multilingual). Plastic bags were dubbed ‘the national flower’ as they were a common sight in trees, bushes and fences. The government wanted the ban to be set at 80 microns, but after extensive lobbying from the plastics industry a compromise was reached at 30 microns.

Taiwan banned free distribution of plastic bags in 2003. The ban applies to shops, government agencies, schools, military, fast food outlets and street dealers. This ban also includes disposable plastic cutlery and dishes (www.banthebag.uk/round_the_world.htm).

Tanzania has banned thin PSB, less than 30 microns thick. Penalties for importing or selling thin bags include a fine of 1.5 million Tanzanian shillings (USA \$2000) or up to six months in jail (Bengali 2006).

International Applications of Economic Instruments

Denmark introduced a suite of ‘green taxes’ in 1994 that incorporates a plastic bag tax. The plastic bag tax targets retailers, and is either absorbed into product prices or customers are directly charged for the bags to recover the costs. This tax resulted in a sixty-six percent drop in checkout plastic bag consumption (www.banthebag.org.uk/round_the_world.htm, PBWG 2002 Page 29, and www.reusablebags.com/fact.html).

The *EU* recently introduced import taxes to plastic bags coming from Asia into Europe.

Ireland introduced a plastic bag tax, ‘Plastax’, of €0.15 in 2002, to much international interest. The tax resulted in significant reductions in plastic bag use initially. Consumers have since acclimatised to the levy and accordingly plastic bag use has increased. To offset this increase the ‘Plastax’ will rise to €0.22

The Italian government introduced a pollution tax of 100 lira per bag in 1989. The tax was set upstream (producers), and introduced to represent the cost of bags to society and the environment, encourage alternatives and reduce plastic waste. From 1989 to 1992 the tax raised 250 billion lira, approximately \$150 million US (www.economicinstruments.com/itlay, www.iisd.org/susprod/displaydetails.asp?id=148 and www.reusablebags.com/facts.html). However this plastic bag tax was challenged in court and removed.

Scotland was considering a 15 pence plastic bag tax similar to Ireland’s, and extended to include paper bags. Progress towards the tax was halted when the bill for the tax was not approved by parliament. However, actions to reduce plastic bag consumption is to be addressed in Scotland’s Waste Minimisation Strategy soon to be released¹⁹⁰

Switzerland has a levy on both paper (15 cents) and plastic bags (25 cents). However, most shoppers use their own bags so there have been no significant reductions in plastic bag use (www.banthebag.org.uk/round_the_world.htm).

¹⁹⁰ *United Kingdom* has many supporters for a plastic bag tax similar to Ireland’s but is facing strong opposition from the Carrier Bag Consortium, a group made of British plastic manufacturers, and other plastics groups. Many retailers are taking voluntary steps and selling ‘bags for life’ reusable bags as well as implementing charges and ‘penny back’ schemes for plastic bags (www.reusablebags.com/facts.html).

South Africa banned plastic bags thinner than 30 microns thick and introduced a plastics levy in 2003. The funds from this levy run a plastics recycling company (www.unep.org/documents.multilingual).

International Applications of Voluntary Instruments

Hong Kong's "No Plastic Bag Please" and Plastic Bag Free Days.

Appendix 7. Paper Bag Processes and Potential Impacts

Process	Impact
Milling	Land degradation, ecosystem damage (Nolan ITU 2002b), fuel use, carbon emissions, human risk
Transporting 1; Processing plant	Carbon emissions, road/rail damage, human risk, helicopter increases carbon emission considerably
Machine Processing (Stripping Bark and Chipping)	Fuel use, carbon emissions, energy consumption, human risk, waste
Pulping (Pulping, and washing)	Limestone, sulphurous acid steam vented to atmosphere, large amounts clean water used, dirty water expelled heated and untreated, waste, human risk
Drying and Rolling	Energy consumption if aided by heat, energy use by machine rolling, waste, human risk
Printing, Folding and Gluing into Bags	Energy use, chemicals, human risk
Transportation 2; Distribution	Energy use, carbon emissions, road/rail damage
Use	
Recycling; Composting or Recycling (re-pulping etcetera to use)	Compost emits amounts of greenhouse gases. Re-pulping, uses sodium hydroxide, hydrogen peroxide and sodium silicate, energy to heat pulp, large amounts of water for rinsing ¹⁹¹ , energy to dry pulp

¹⁹¹ Most recycling plants screen and clean the water used and remove contaminants. Another method is 'sludge handling' removes particles of inks and waste, this sludge can be used in bricks fertilisers and other products.

Appendix 9. Identification and Presentation of All Policy Options

Regulation

Regulatory policy employs the targeting of methods, technologies, specifications, prohibitions, controls and applications. Examples of regulatory policy could be a mandatory 'Code of Best Practise' for PSB, mandatory participation in an extended producer or product responsibility program (EPR), requirement that retailers charge consumers directly for PSB (co-regulatory), and the application of specifications, such as bag thickness, or recycled content for PSB. Prior to examining the regulatory options for New Zealand, first let us look at what regulatory policy is, how the regulatory tools work.

Cohen (1997) defines regulation as “any attempt by the government to influence behaviour of citizens, corporations or sub-government”. Regulatory actions are classified as mandatory, and regulations typically present limited options for action, has legal sanctions and the ability to abolish some practices; in contrast, voluntary actions are non-binding and discretionary (Hatch 2005).

Regulatory actions are often described as command and control techniques, which are frequently based on technology or performance indicators. Technology based regulatory options require specific equipments, procedures or processes. In contrast, performance based regulations specify outputs such as levels of pollution permitted in the case of PSB production (Stavins 1998). Porter (2002 Page 35) describes the process of packaging regulation of activity “by quantitative mechanisms, such as regulating size, quantity, shape or composition of packaging”.

Specifications and Standards

Specifications and standards place controls on the methods, technologies, requirements or standards for goods and services. In this instance, specifications and standards could apply to PSB by: determining the best practise for the manufacture and sale of PSB;

minimum/maximum thickness; amount of recycled content; a minimum sale price for PSB; allowing only biodegradable PSB; allowing only reusable bags.

Deposit or Refund Schemes

Deposit and refund schemes make use of an extra charge at the point of sale, and are both a regulatory and economic instrument. Deposit/refund schemes are commonly applied to food and beverage containers for recycling/reuse. Deposit/refund systems are probably the most common policy measure adopted by governments to encourage consumers to return packaging (Ferrara and Plourde 2003). Ferrara and Plourde (2003) state that the level of deposit/refund needs to be set higher than the cost of returning packaging, as well as operating as a viable reuse opportunity for producers; as otherwise technical barriers increase the reuse cost. Traditionally deposit/refunds are applied to packaging and containers in the packaging mix. However, as PSB are less expensive and they are innumerable, the application of a deposit/refund scheme to encourage recycling may not be as effective as with other packaging waste.¹⁹²

Limits and Quotas

The regulation of emissions is often controlled via limits and standards, requiring strict legislation, enforcement and monitoring of emissions and emitters. Minimum quantity legislation, legislation mandating minimum refillable quantity from the percentage of sales (Ferrara and Plourde 2003), could be applied as a minimum recycled content quota for PSB. Although encouraging resource efficiency and recycling, a minimum recycled content quota would not guarantee a reduction in the negative social impacts from packaging, unless the legislation is accompanied by successful mandatory deposit/refund schemes (Ferrara and Plourde 2003). Moreover, a minimum recycled content quota or maximum virgin plastic material limit does not overtly address the environmental issues and consumption levels of PSB; and in some ways encourages the continuing use of PSB.

¹⁹² Mandatory recycling measures (in store and kerbside) may suffer the same incentive problems as refill deposit schemes as well as increases in illegal dumping and litter (Ferrara and Plourde 2003). “Market imperfection of packaging is considered to be the socially under priced in the current market, essentially because their consumption involves an opportunity cost, user cost of a loss of benefits to future generations due to reductions in consumption probabilities, energy and water being the most significant examples (Ferrara and Plourde 2003).

Other forms of quotas and limits are eliminations and bans of PSB. A quota could be applied to PSB used each year in New Zealand, in particular shops, regions or cities, which could be reduced each year until PSB are eliminated or reduced to a given level (based on ACG 2006 limited phase out plan); or PSB could be banned completely with retailers not permitted to restock PSB.

Extended Producer Responsibility (EPR)

EPR is based on a cost sharing principle where the costs and responsibilities for waste are shared between the producer and user of the goods (PCE 2006). Lindhquist (1992) coined the term EPR and defined it as an “environmental protection strategy for an environmental objective to decrease the impact of a product by making the producer responsible for collection, recycling and disposal”. The OECD have defined EPR as post consumer life cycle responsibility, characterised by a full or partial, physical or financial responsibility, that is shifted away from municipalities, incentives for producers to employ environmental design¹⁹³, and responsibility of impacts during the full life cycle of product (OECD 2007). In addition to extended **producer responsibility**, there are also extended **product responsibility** (also EPR), and **product stewardship** (PS) programs.

Origins of the PS theory are based in the ideas of responsibility; shared, government and consumer, and regulation; mandatory, co-regulatory and voluntary (Lewis and Sonneveld 2005). Lewis and Sonneveld (2005) also note divergence in the meaning and name of PS through the development of the PS paradigm; United States and Canada worked with the term ‘stewardship’ in chemical life cycle management called “Responsible Care”; Europe used EPR for end of life product waste management; the United States then took on the term ‘product stewardship’ as an umbrella term for shared responsibility for end of life products while also using ‘extended product responsibility’ interchangeably. This evolution of EPR and PS results in no absolute definition, but demonstrates a non-specific principle referring to recycling and waste minimisation at end of life or throughout the life cycle (Lewis and Sonneveld 2005).

¹⁹³ Some elements that are considered environmental design are; reducing product size/mass, or creating a foldable product, extended product life, improved recycling potential, and improved performance in use. Gottberg, Morris, Pollard, Mark-Herbert and Cook 2005 Producer Responsibility, Waste Minimisation and the WEE Directive: Case Studies in Eco-design From the European Lighting Sector.

In application of the principles, the Australian Plastic Bag Working Group (PBWG 2002) explain the PS philosophy as seeking to ensure that products have no, or there are improvements or reductions in negative environmental and social impacts. PS also requires that new materials or products impacts are identified, understood (and minimised) or existing problems with products are resolved. EPR and PS both hold these philosophies, but how the EPR/PS programs are applied and managed determines whether these aspirations are met.

The application of EPR/PS can be implemented in a variety of ways due to EPR/PS occupying voluntary, regulatory and economic instruments across the policy continuum due to the nature of the cost sharing. The regulatory, co-regulatory or voluntary nature of an EPR/PS program is determined by the policy, but the economic instrument nature is owing to the considerable costs involved for producers to collect and dispose of packaging. The high cost for brand owners or producers to collect and dispose of product packaging often leads to brand owners and producers joining together and having a single collection; the Green Dot program in Germany is an example of this (Porter 2002). Additional examples of EPR/PS programs are the European Union's Directive of Waste Electrical and Electrical Equipment (WEEE) 2004, and New Zealand's voluntary EPR programs for waste oil, electronic waste, tyres, and paint (PCE 2006).¹⁹⁴ The application of EPR/PS for PSB could be applied to producers of PSB, but with the majority of PSB imported into New Zealand, an EPR/PS program would be better applied at a distributor or retail level. Following Ireland's experience with the PlasTax, while policy initiatives were recommended upstream at a distributor level (Fehily, Timoney and Company 1999), policy was applied to retailers to directly impact consumers, reducing the market demand for PSB (Dunne 2004b).

Policy tools using the regulatory, co-regulatory or voluntary application of EPR/PS to address the consumption and litter of PSB could include retailer or distributors of PSB to be responsible for: providing information about the costs and environmental implications from the use of PSB; encouraging the use of and providing reusable bags for sale; charging

¹⁹⁴ The tyre scheme "Tyre Track" is funded through an advanced disposal fee charged to consumers at the point of sale. For further information please see: www.tyretrack.co.nz, www.resene.co.nz/paintwise.htm

for PSB; providing in-store recycling; funding litter clean up initiatives; supporting kerbside recycling of PSB; phasing out the supply of PSB; or eliminating PSB.

Economic Instruments

At a basic level, economic instruments (EI) provide economic motivation for behaviour change. EI can be designed to achieve various results, such as; raising awareness of social and economic costs of behaviours; influencing individuals or groups towards desired behaviour; creating incentives for adopting desired behaviour processes and technologies; reducing environmental impacts through true cost pricing of disposal; and raising revenue for funding initiatives (PCE 2006). EI tools can be: taxes; levies; charges; deposit schemes; subsidies; credits; and quantity based tradable permits (PCE 2006). I will now examine what the price based EI are and how they operate.

Taxes

Taxes are designed to fully or partially remove costs of clean up and impacts from behaviour away from society, and back to the polluter (polluter-pays principle). Pigou (1960) held that pollution created costs is carried by all of society, not the perpetrator, and that these external costs should be internalised by imposing the cost on the polluter. These costs can be paid in the form of a tax, set at the level that reduces pollution to the point where marginal benefits of internalisation equal the marginal cost of abatement (i.e. the point where the ascending marginal cost curve transects the descending marginal benefit curve) (Pigou 1960). The end result of a tax set at the right level is the achievement of the given level of abatement of pollution at the least cost, called “static economic efficiency”, achieving optimum at minimum cost. Pigou (1960) also held that the constant nature of a tax stimulates a responding constant incentive to innovate to reduce the tax bill creating “dynamic efficiency”; and the tax system would be fair because the polluter pays, either as the producer or consumer of the product through higher prices. However, as Convery and McDonnell (2003 Page 1) point out, the theory and practise of the application of taxes concentrates on the internalisation of measurable emissions, and research investigating costs of measuring monitoring and charging for goods and services that are immeasurable and practically impossible, is rare. In these cases the second best option of taxing the good itself is used to represent the external costs in. Product taxes could be applied to PSB as

either a static or escalating charges to reduce their use, or could be applied to both paper bags and PSB; to discourage the replacement of PSB with paper bags. An additional suggestion is to put product tax on virgin material bags, to “address the wider issues of resource use and consumer engagement” (Baker 2004 Page 7). Although theoretically a good idea with the economic validity and uncertainties of recycled materials markets under scrutiny (Porter 2002) this option may be unviable.

Advanced Disposal Fees (ADF), Up-Front Charges, and Producer-Take-Back

This group of EI are charges added to the product at the point of sale (PCE 2006). The fees are designed to charge the manufacturer or user according to the marginal social cost imposed by the clean up, collection, resource recovery, recycling, reuse and disposal of waste produced by products (Porter 2005 Page 34 and PCE 2006 Page 15). Producer-take-back schemes operate by placing the responsibility to collect, reuse, recycle or dispose on the producer or brand owner; but do not explicitly charge producers or consumers for this collection and disposal. The indirect cost responsibility sometimes results in take-back schemes labelled as EPR or PS programs (PCE 2006). However, Porter (2002) states take back schemes do internalise marginal costs, meeting Pigou’s criteria of environmental taxes.

In efforts to avoid extra costs of take-back schemes it is possible for producers to increase product prices to cover recovery, and make no attempt at source recovery (Porter 2002). The increased price of these products, in combination with social stigma associated to not “caring”, could affect sales of these products and may push producers to make the changes that were encouraged in EPR schemes. In addition, the internalisation of the cost of waste and work to reduce packaging may have positive benefits for companies (Porter 2005).¹⁹⁵ However, the complexity and inefficiencies of take back schemes’ producers and brand owners may merge collections to reduce costs, as has been seen in Germany’s experience of the producer-take-back Green Dot program and the Duales System Deutschland collection agency.¹⁹⁶

¹⁹⁵ Xerox use recaptured goods to lower their manufacturing costs (Porter 2005).

¹⁹⁶ The DSD was created as recyclable packaging collection initiative under the 1991 Packaging Waste Ordinance (Toepfer Decree). The high Government recycling goals (50% by 1994, 80% by 1995) meant the DSD was unable to keep up with material flows due to the difficult and expensive recycling processes, and

In contrast to take-back schemes, ADF apply economies of scale by subsidising existing municipal collections (Porter 2002) and are a more economically effective option than take-back schemes which are controlled by producers and brand owners. In theory, the correct setting of an ADF would be the cost of disposal times, the fraction of the products likely to end up in municipal waste, at the public's expense (Dayley and Farley 2004). Porter (2002) suggests that the charge need only be 1-2 percent of the total cost of a product's price to cover the collective cost of packaging disposal. If this theory was applied to PSB, the charge would be AUS\$0.0006, as PSB have an average cost of AUS\$0.03 each (ACG 2006 Page 15). In this instance, the setting of a PSB ADF using this theory is ineffectual, and would require a significant increase to impact on consumer and retailer behaviour. Therefore an ADF of greater than five times the cost of PSB is suggested for PSB; for example this would result in an ADF of AUS\$0.15.

User Charges

User charges can be direct charges by weight or volume, or indirect via property rates where all users pay the same despite different levels of use (PCE 2006). User charges can minimise waste and costs by changing individuals' purchasing behaviour, encouraging the consumption of goods with less packaging or more recyclable packaging (Ebreo, Hershey, and Vinning 1999), provided there is true cost pricing to be consistent with user-pays philosophy (PCE 2006). User charges could be applied to PSB in the form of a significant charge to consumers of PSB at either an upstream or downstream application.

Deposit/Refund Schemes

The key difference of deposit/refund systems compared to an ADF is that the fee is refunded at the deposit of the product, primarily to encourage recycling rather than to cover the cost of disposal (PCE 2006). A successful scheme has been operating in South Africa for thirty years, and has an 80 percent recovery rate of recyclable materials (PCE 2006). To have such success deposit/refund schemes need to be set higher than the cost of returning packaging, as well as operating as a viable reuse opportunity for producers (Ferrara and Plourde 2003). As discussed earlier, the application of a deposit/refund scheme to PSB

packaging was stored in warehouses at additional cost (Ferrara and Plourde 2003).

would increase the number of PSB recycled, but the deposit/refund amount would have to be significant enough to outweigh the costs of returning bags and with such a low cost virgin material item (AUS\$0.03 ACG 2006 Page 15) even a significant amount may not be incentive enough to induce behaviour change.

Subsidies and Tax Concessions

A subsidy is a bonus or payment for an activity being encouraged, designed to provide motivation to alter behaviour (PCE 2006). A tax concession reduces the amount of tax owed by those participating in encouraged activities (PCE 2006)¹⁹⁷. A Pigouvian subsidy is a payment to firms for units of reduced pollution, and ideally the subsidy is equal to the marginal benefit of abating pollution; and firms will reduce pollution so long as the cost of abatement is lower than the subsidy (Daley and Farley 2004). On the other hand, while a subsidy follows the ‘polluter pays principle’, it also assumes the polluters right to pollute (Daley and Farley 2004). Additionally, subsidies can lead to increased pollution via increasing profit margins for the specified industry, possibly attracting new entrants, with more firms contributing to pollution.

Tradable Permits or Allowances

Also known as a ‘cap and trade’ (PCE 2006) sets a quota for the maximum amount of pollution or resource depletion that society will allow (Daley and Farley 2004). Quotas for waste management are usually aimed at reducing the amount of waste sent to landfill (PCE 2006); either specifically on special wastes such as hazardous or organic waste, or generally, applying to the total solid waste.¹⁹⁸ Landfill operators that have not used up their quotas can divert waste, or purchase additional allowance from other operators (PCE 2006). A potential allowance application for PSB consumption is a quota for PSB use; which at a common sense level is troublesome and impractical. Moreover the use of allowance trading limits environmental effectiveness, as emissions trading represents the right to pollute (Hatch 2005). Alternatively, as suggested with the regulatory option of limits and quotas, a minimum recycled content for PSB may be possible; but is affected by

¹⁹⁷ New Zealand introduced an environmental tax concession for those “preventing, remedying, or mitigating the discharge of contaminants, monitoring effects of pollution and testing options for dealing with environmental issues “ PCE 2006 Page 18.

¹⁹⁸ The Landfill Allowance Trading Scheme was introduced in Britain in 2005, www.defra.gov.uk/environment/waste/localauth/lats/intro.htm (PCE 2006)

the importation of PSB, which is harder to monitor and regulate than onshore manufacture, but as this is not tradable, it is classified as a regulatory tool only.

Voluntary Measures

The term voluntary is not used in a strict and accurate manner. Actions taken are often in response to consumers, community pressure, industry peer pressure, competitive pressures or the threat of new regulation or taxes. A better description is ‘encouraged’ or ‘quasi mandatory’ when operating within and rely on elements of legal system. Alternatively, voluntary actions can be seen as a bartering between self-regulation and government enforcement (Rennings, Brockmann and Bergmann 1997). This scrutiny of definitions of voluntary activities highlights understanding that there is no strict dichotomy between regulation and voluntary actions (Sullivan 2005). Subscribing to the theory of understanding that policies exist on a continuum of coercion tactics to change behaviours, from totally compulsory techniques or command and control methods, to truly voluntary instruments which are devoid of state involvement (Howlett and Ramesh 1995).

Voluntary approaches may be divided into different classifications; Carraro and Leveque (1999) divide into three main types; Negotiated, Unilateral Commitments, and Public Voluntary Schemes¹⁹⁹. OECD (1999) and Gaines and Kimber (2001) divide voluntary agreements into four categories; Unilateral commitments (self regulation); Private agreements made by direct bargaining between polluters and those affected, Agreements negotiated between industry and public authorities; Voluntary programmes developed by public authorities. There are multiple labels for voluntary actions, these include; Negotiated agreements, Environmental agreements, Self-regulation, Co-regulation, Covenants, Accords, Non-statutory agreements, most contain targets to be met in specified time, and the responsibility for implementation is shifted to industry or industry association.

¹⁹⁹ Negotiated, between private bodies such as industry and a regulating authority; Unilateral Commitments, companies who instigate their own recycling or energy efficiency policies; Public Voluntary Schemes, organised by environmental or government agencies (Carraro and Leveque 1999).

Environmental Labelling

Environmental labelling consists of production or performance criteria, which provides incentives for innovation. However, this incentive for innovation can only be prompted by internal industry pressure or external market based consumer pressure. Consumer driven pressure for environmentally friendly products is difficult to manufacture in a market. The NZPA sector action plan to reduce plastic bag use has proposed the use of labelling of plastic bags with material codes, and messages about reuse and recycling (NZPA 2004).²⁰⁰

Environmental labelling is often perceived as “rather easy to implement” (Hatch 2005), and as a result is therefore often suggested in initial stages of a plan for action. The setting up of an environmental labelling program would be time, labour and cost intensive as standards and procedures for testing, undertaking tests, monitoring products, as well as categories of certification for each product would be required (similar to costs to regulatory standards), in addition testing and certification standards of voluntary action are more likely to be less rigorous than legislated standards.

National Standards/Statements and Professional Codes of Practice

Upgrading of the current Packaging Accord to make specific mention of plastic bags in the main text as a special form of packaging waste. This could also be a move similar to Australia’s packaging industry that have created a Code of Best Practise for plastic bags, however the code has received considerable criticism due to the nature of goals and systems of measure.

Eco-Audits

The process of auditing can provide the opportunity for innovation, and the benefit is provided without large cost (Hatch 2005). Eco-audits could provide a competitive edge with standards needed to complete each level or grade of sustainability. An example eco-audits in New Zealand is the eco tourism auditing, “Green Tick” accreditation program.

²⁰⁰ Please see Appendix 1 for a copy of the New Zealand Packaging Accord Sector Action Plan.

Information and Education Campaigns

Education and information campaigns are designed to shape public attitudes, values or behaviours with the expectation that the outcomes generate policy results (Weiss and Tschirhart 1994) such as awareness and education producing behaviour change or consciousness, at the very least, generates discussions about an issue.

Definitions of information campaigns include; “intended to generate outcomes or effects, in a relatively large number of individuals, usually within a specified time, and through an organised set of communication activities” (Rodgers and Storey 1987) and produce a policy result (Weiss and Tschirhart 1994).

The effectiveness of information campaigns as policy instruments has been questioned (Weiss and Tschirhart 1994, Rodgers and Storey 1987) and can be traced back to propaganda research of WWII (Hyman and Sheatsley 1947). Weiss and Tschirhart (1994) state there was no explicit evidence of impacts from information campaigns, and the difficulty of evaluating information campaigns are because campaigns do not take place in a vacuum and are open to many variables effecting impacts and information (Weiss and Tschirhart 1994).

Information campaigns seek to change behaviour without altering incentives or authority systems, working through ideas, information, learning (Weiss 1990, Hood 1986, and Schneider and Ingram 1990 respectively). Due to this, information campaigns are a politically favoured policy instrument, because they are viewed in an amenable way, mediator and choice (Weiss and Tschirhart 1994) rather than command and control options. Public information campaigns work on the assumption that the issue the campaign pertains to is a result of individual choice, and this can also be used as a political tool of directing problems away from institutions (Salmon 1992). Moreover, it is more politically palatable to change individual behaviours than corporations, and may change perceptions at the same time that could result in common understandings, and bridging differences between groups (Weiss and Tschirhart 1994).

The types of education and information campaigns vary from short term to long-term programs. There are both short term and long-term uses of the public address information campaign, which employs mass media to impart information. School based programs, such as the “Enviroschools program”, “Play Safe” and “Stranger Danger” are both short and long term. Business and Industry education often takes place via industry associations, government (local or central) information programs as well as through best practise programs and conferences.

Information sharing best applied widely and attractively campaigned and explained, such as the Ireland levy (Convery and McDonnell 2003). While correct on the need for explanation and attractive campaigns (no private company would market a product without a professionally targeted campaign Dunne 2004), reaching the target groups is a potential issue of information and education campaigns. Weiss and Tschirhart’s (1994) research suggested the majority of campaigns target the general public (60%). However, it is more efficient to target resources to the most productive sector considering campaign constraints of time money and labour. Target audiences ought to be those whom you can communicate with, partners for dialogue and most likely to effect change (cost effective). Mass media broadcasting is not as helpful as “narrowcasting”, reaching the intended target not as many people as possible (Vercic and Pek-Drapal 2002). Moreover, industry acceptance can also depend on consultation and information sharing, proving transparency and clarity to actions, which also increases acceptance and compliance (Porter 2002, Dunne 2004). The comprehensive campaign for the levy in Ireland told people why the levy was introduced, how to avoid the charges, as well as information about the environmental fund created from the levy, retailer involvement, on TV and billboard campaign (Collin et al 2003). The level of Irish acceptance was so good it resulted in community enforcement via the reporting of non-compliant retailers (O’Keefe 2003).

Environmental campaigns often have limited funding and education information campaigns fit the budget. However, as McKenzie Mohr (2000) definitively states, education and information campaigns alone will not result in behaviour changes²⁰¹.

²⁰¹ “Studies have established that enhancing knowledge and creating supportive attitudes often has little or no impact upon behaviour” (McKenzie-Mohr 2000 Page 544).

McKenzie Mohr argues that policy makers and planners are not using psychological research to help make successful campaigns. The lack of research operates in tandem with two repeatedly assumed stances for environmental campaigns; that by enhancing knowledge of an issue and encouraging development of attitudes that are supportive of the desired activity, [...] behaviour will change”, And secondly that “behaviour is strongly influenced by economic motives, and adopt programs that “highlight the economic advantages of engaging in a specific behaviour” (McKenzie-Mohr 2000 Pages 544-545). Programs like this have been largely unsuccessful,²⁰² partly because of inadequate design, but mostly because there is an underestimation of the difficulty of changing behaviour (Constanzo et al 1986). Mass media marketing is based on traditional techniques of advertising, which is to alter people’s preferences. Thus placing a sustainable activity as a ‘product’ to be sold, not creating or influencing behaviours. Promoting a new activity is more complex than product marketing; the array and diversity of barriers for new behaviours will mean information campaigns alone will rarely bring about behaviour change (McKenzie-Mohr 2000).

A study of programs promoting environmentally behaviour found that “most programs were found not to identify barriers prior to developing strategies (Kassirer and McKenzie-Mohr 1998). Reasons include; program planner believe the barriers are already well known,²⁰³ programs must be delivered in a short period of time which makes investigation of barriers problematic; financial constraints on research and issues accessing relevant research (McKenzie-Mohr 2000).

Weiss and Tschirhart (1994) provide a list of factors to improve effectiveness; capture attention of the right audience, deliver an understandable and credible message within social contexts that lead toward desired outcomes. Dunne (2004) pointed out that the success of taxes and charges is conditional justification for behaviour, terminology, simplicity, adaptability, and alternatives in a professional campaign and these are factors

²⁰² for example the Californian utilities spent “\$200 million on fostering residential energy efficiency”, and energy consumption remained un-altered. “ In an extreme case a Californian utility spent more money in advertising the benefits of home insulation than it would have to cost to upgrade the insulation of targeted homes” (Pope 1982)

²⁰³ “We readily form personal theories regarding the behaviour of others and then search selectively for information that confirms our beliefs” (McKenzie-Mohr 2000 Page 551)

relevant to any information campaign. The effectiveness of an education or information based campaign depends on the fit between problem and the campaign, the relationship between the target group and the problem as well as the variety of influences on the problem and the contexts in which the targets receive the message in (Weiss and Tschirhart 1994).

Campaigns or programs for education operate on the provision that facts, evidence and information to encourage or convince a change of behaviour. While the premise of an education campaign is always the same, the manner of communication varies; organisation running the campaign, media message delivered in; target group (determining factor). The deciding factor of the application of an education and information campaign would be the target group, as with any marketing campaign it is important to know the target group before embarking on a campaign.

There are many issues and contextual factors effecting how individuals react to information provided. The lack of evaluation of programs has lead to repeated formats, or expensive repetitions of campaigns when results are not seen; moreover the effectiveness of information and education campaigns has not been proven. But as information campaigns are a low-cost means that meet political needs as well as issues, they will remain an attractive tool to policy designers (Weiss and Tschirhart 1994).

The applications of education and information campaigns are almost always used in voluntary mechanisms. For example the current application of the NZPA Plastic Shopping Bag reduction Target, an extended application, or a retailer led EPR programme would incorporate an advertising/education campaign with many facets: provide information of the economic and environmental costs of PSB; demonstrate the environmental impacts of paper and PSB; promoting the use of reusable alternatives

“we don’t respect plastic, like casual sex, it is a passing indulgence [with] no strings, no long-term commitments, shown the door as soon as we are done with it”
(Courtney 2006)