

**Product Stewardship and Stakeholder
Participation in Solid Waste Management:
A New Zealand Study**

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fulfilment of the degree of Master of Arts (Policy Studies)**

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Mohammad Nasir Uddin Mia

ID: 0948370

Primary Supervisor: Prof. Charles Crothers

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no materials previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution for higher learning.

Mohammad Nasir Uddin Mia

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“Environmental Stewardship for a Prosperous New Zealand”

The above policy statement has been accepted by the Ministry for the Environment which necessarily shows the strategic importance of ‘stewardship’ programmes for upholding the clean and green image of New Zealand. The apparent success in waste management in New Zealand reminds one of the efforts of policy-makers, members of local authorities, waste management organisations, and finally the mass of people who aspire to leave a better environment for future generations. Their efforts have inspired me to do this study on product stewardship and stakeholder participation in solid waste management.

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Abstract

Product Stewardship (PS) is one of the strategies adopted to incorporate stakeholders' participation for the minimisation of solid waste. The term PS is defined as a comprehensive programme implemented by the stakeholders - i.e. producers, brand owners, manufacturers and importers for managing their products at the end of their life. The prime objective of PS is to reduce the impact of the product on humans and the environment when it becomes waste.

There are a number of PS schemes for white-ware, used oil, agrochemical products, refrigerants, paints, electronic goods and glass packaging products in New Zealand. The legal framework behind PS is the Waste Minimisation Act 2008 and all of these schemes are voluntarily implemented and managed by the stakeholders. So there is scope to enquire into the motivations of the stakeholders for implementing voluntary PS programmes as a means for end of life management of their products. The research also aims to investigate the stakeholders' views about the problems, benefits and the perception for sustainability of the PS schemes.

Mixed-method social research has been adopted for this study. Data were collected through online questionnaire surveys of local authority personnel and those from host business organisations of PS and waste management organisations. Semi-structured interviews were conducted with the managers of the PS schemes. The semi-structured interview transcripts with the PS schemes personnel were analysed through content and thematic analysis.

Stakeholder participation in the management of the PS schemes of New Zealand was found to be varied. Awareness about the product stewardship among the stakeholders was high; however the actual participation rates were identified as a problem that needs to be addressed. Stakeholder awareness and participation and adequate information campaigns seem to be the key and the apparent lack of trust in government agencies created through previous attempts to promote such schemes needs to be overcome. Although there are debates about the sharing of responsibility among the stakeholders, research participants unanimously emphasised the principles of 'polluters pay' and 'producer responsibility' for defining the concept of PS implemented in New Zealand.

Industry-led PS schemes were found to be more fragile compared to the PS schemes implemented by the group of producers, brand owners, and importers. Financial drawbacks, lack of recyclable materials, lack of participation by the stakeholders as well as problems with free-riders have been identified as major challenges for the PS schemes in New Zealand. Lack of monitoring and control has been identified as a major loophole in the policy. Participants in this study generally shared the view that there was regulation in place but nobody to enforce it, and no 'rewards' for compliance or 'punishment' for non-compliance.

In general, the PS schemes studied have been perceived to be environmentally sustainable by the respondents. However, the economic stability of some of the schemes is in jeopardy. It has been found that these PS schemes have a number of positive impacts on the national economy and developing into as an industry which has induced growth in some other sectors like freight, financial services, and recycling companies.

In principle PS schemes should be sustainable and self-funding and not subsidised by the waste levy. Most of the respondents in this study were of the view that PS had to be mandatory for certain products and producers, brand owners, importers, and finally consumers should take the entire responsibility for the products. Government should take a proactive approach for identifying priority products, and possibly include a new provision for compulsory PS status if the majority of members of an industry agree to it. That way responsible industry participants could avoid being penalised by free-riders taking advantage of a scheme without contributing to it

Chapter 1 Introduction and Background to the Research

This chapter provides a brief introduction to the questions, objectives, methods of the research along with a brief theoretical perspective. First, a brief background discussion over the issue of solid waste management and stakeholder participation in recycling and reusing of waste is provided. This background discussion assists in identifying the research gap. Then the research questions and research objectives are noted. Finally, a brief explanation about the theoretical perspective and methods adopted for the research is provided, and to conclude the chapter, there is an outline of the thesis.

Waste can be defined simply as anything that is discarded, unnecessary and thrown away for disposal (Griffiths, Williams, & Owen, 2009). According to the New Zealand Waste Minimisation Act 2008, waste means;

- Anything disposed of or discarded; and
- Includes a type of waste that is defined by its composition or source (for example, organic waste, electronic waste, or construction or demolition waste); and
- To avoid doubt, includes any component or element is disposed of or discarded.

(MfE 2009d: 1 s5)

In general, all waste except the liquid waste which is disposed of through the sanitary sewer network system is considered as solid waste. The term solid waste management (SWM) includes prevention, reuse, recycle and disposal of solid waste in a landfill for biodegradation, and transformation to inert materials which are not harmful for human and environment (Ahluwalia & Nema, 2007; Griffiths et al., 2009).

1.1 Minimisation of Waste: A Comprehensive Strategy

Solid waste management through recycling and reusing of wastes is not new; rather these practices were prevalent in ancient civilisations (Wilson, 1976). Solid waste management can be traced in ancient civilisations through the burial of wastes especially in rural areas such as that specified by Moses as being practised by predecessors of present Israel (Deuteronomy 23, vv 12-13 as cited in Wilson 1976). Evidence showed that from 3000 to 1000 BC, solid waste was dumped with layers of soil in the capital of Knossos during the Minoan civilisation (Wilson, 1976). However, the significant part of solid waste

management in ancient civilisations was to adopt and implement the reuse of solid waste in different ways. There is evidence of the reuse of floor and street sweepings as mud or dust for ceramic shards in ancient civilisations. With the development of improved technology during the industrial revolution, essentially solid waste management became a profitable business through recycling and reuse of most of the solid waste (Wilson, 1976).

Historically solid waste management was one of the prime roles and responsibilities of central and local government, especially municipalities and metropolitan authorities (Gidakos, Havas & Ntzamilis, 2006; Davies, 2009). Due to massive growth in population, solid waste management has become a concern for most of the developed and the developing nations of world (Saeed, Hassan, & Mujeebu, 2009). With the passage of time, various techniques or methods have been introduced in order to improve the management of solid waste. Though recycling or reuse were adopted in ancient times, the paradigm of waste minimisation through the incorporation of stakeholder participation is very recent and considered to be a particularly significant development in modern solid waste management (Goven & Langer, 2009; Fahy & Davies 2007; Wilson, 1976).

Solid waste management has typically been considered as the responsibility of local authorities. Stakeholders or beneficiaries have been involved in different forms. In most of the developed countries there are comprehensive waste management programmes operated by the local authorities, which are funded from taxes, or rates levied on the citizens (Bailey, 1985; Boyle, 2000; Goven & Langer, 2009). At the end of twentieth century most traditional solid waste management was found to be ineffective due to increases in the generation of solid waste and the involvement of certain hazardous wastes like electronic and clinical wastes (Kahhat, Kim, Xu, Allenby, Williams & Zhang, 2008; Blenkarn, 2006). With the advancement in technology and reduction in prices, people are buying more and more electronic goods (such as computers, home appliances, mobile phones and others) and the life spans of those goods are reducing (with some notable reversals). This is creating an extra pressure on the waste management system. From 1980 to 2004, an estimated 180 million units of electronic goods awaited for disposal in storage in the United States. In 2005 approximately 1.36-1.72 million metric tonnes of electronic goods were discarded in landfills (U.S. EPA, 2007a as cited in

Kahhat et al., 2008). This electronic waste is also becoming a concern for New Zealand where every year about 80,000 tonnes of these wastes are disposed of. Over a million unused mobile phones and computers are sold to be stored in New Zealand homes which should be recycled, reused or disposed of (Sustainability, 2010). In order to manage the increasing amount of this hazardous waste it is necessary to develop management systems through the collection, recycling and reuse of electronic goods. Management of electronic waste through recycling and reuse will definitely reduce the environmental impact of the products and would increase the recyclability of materials found in those products (Kahhat et al, 2008). Though governments in developed countries have been introducing various programmes, for example E-day in New Zealand, they are not sufficient to cope with the growing demands for management of this waste (Sustainability, 2010). In this regard producers, brand owners, importers and consumers of those hazardous products have been targeted for taking responsibility of recycling and reuse of the products, and thus streamlining solid waste management through the extended participation of stakeholders (Blenkharn, 2006; Fahy & Davies, 2007; Davis & Herat, 2008).

1.2 Incorporation of Stakeholders in Solid Waste Management

The roles and responsibilities of producers, manufacturers, brand owners, importers and consumers in respect of the environmental impact of their products have been ignored for some time. Extended producer responsibility, product take-back programme and the recycling of packaging products are identified as forms of stakeholder participation in solid waste management (Carlton & Thompson, 2009; Davis, Wilt, Dillon, & Fishbein, 1997; Dussault, Gendron, Juneau, & Savoie, 2008). A number of states in the USA have enacted legislation to ensure collection, recycling and reuse of electronic products through the engagement of producers and brand owners. The Electronic Product Recycling Law enacted from 2006 in Washington State requires the manufacturers of computers, monitors, laptops, and televisions to provide recycling services at no cost to consumers. In California, consumers are charged advanced recycling fees for electronic goods (Kahhat et al, 2008). In Canada, most of the provinces have adopted strategies to restrict the burning of waste and have introduced tipping fees as an attempt to encourage minimisation of waste and to make consumers responsible for its disposal (Wagner &

Arnold, 2006). Similarly, in New Zealand, a waste disposal levy has been enacted from July 2009 to reduce the amount of waste disposed (MfE, 2010b). So the overall responsibility of stakeholders: i.e. designers, producers, brand owners, manufacturers, retailers, importers and consumers, is to ensure active participation in recycling, reuse and finally disposal of hazardous waste, as well as in traditional waste management systems implemented by the local authorities (Wagner & Arnold, 2006; Kahhat et al., 2008).

Stakeholder participation in the form of public-private partnership is another important dimension of modern solid waste management (Goven & Langer, 2009; Davies, 2008, 2009). Among the various forms of stakeholder participation product take-back programme, extended producer responsibility, and PS are notable concepts which are recent and involve comprehensive principles adopted by certain developed countries (MfE, 2009e; Product Stewardship Foundation, 2009a; Tojo, 2003; Veleva, 2008).

Product take-back systems, implemented in Western Europe and in some other countries, are one of the comprehensive policies adopted by governments to implement extended producer responsibility. In order to combat the serious landfill shortage, German government introduced legislation for product take back programme which enforce the manufacturers and distributors to take back packaging and consumer goods and to ensure a portion of that goods were recycled (PPRC, 2011). The German Packaging Ordinance and the Australian Packaging Accord are legislative frameworks for implementing mandatory take-back programmes and policies focused on production facilities for minimisation of waste (Davis et al., 1997).

The product take-back programme soon evolved into a broader principle, extended producer responsibility which makes manufacturers responsible for the entire life-cycle of the products and packaging they produce. Extended producer responsibility includes the principle that each stakeholder involved in the product life-cycle shares the responsibility of reducing the environmental impact of whole product systems. It involves the responsibility of stakeholders for upstream impacts in the selection of materials, the production process itself and downstream impacts from the use and disposal of the products (Davis et al., 1997; PPRC, 2011). The concept of extended producer responsibility includes environmental policies throughout much of the industrialised

world, covering products such as consumer batteries, pharmaceuticals, mercury-containing products, electrical and electronic equipment, end-of-life vehicles, and chemicals. The various countries that have mandated extended producer responsibility have imposed different requirements, complicating the business environment for companies that do business globally (PPRC, 2011).

Compared to extended producer responsibility, 'PS' emphasises the responsibility of producers, brand owners, importers and consumers for recycling, reducing and reuse of products at the end of their usual life (Davis et al., 1997). There are basic differences between the concept of extended producer responsibility and PS. PS recognises the role of all stakeholders i.e. designers, manufacturers, retailers, consumers, recyclers and disposers involved in the product life-cycle. Whereas extended producer responsibility focuses solely on producers, and manufacturers. Extended producer responsibility emphasises on post-consumer waste whereas PS addresses on environmental impacts of the product throughout the product's life-cycle (MfE, 2009e; Product Stewardship Foundation, 2009a; PPRC, 2011; Tojo, 2003; Veleva, 2008). The Product Stewardship Foundation (2009a:1) and PPRC (2011: Para 2) provide a comprehensive statement on PS and also include the concept of stakeholders considered for this study such as,

PS is a 'cradle to cradle' methodology that helps reduce the environmental impact of manufactured products. Under product stewardship schemes, designers, manufacturers, producers, brand owners, importers, retailers, consumers, disposers and other parties accept responsibility for the environmental effects of their products – from the time they are produced until the end of their useful life and disposal.

1.3 Theoretical Framework for the Research

The PS concept includes the efficient use and management of products from manufacturing to recycling, reuse or safe disposal (Carlton & Thompson, 2009). PS schemes implemented in New Zealand and other similar stewardship programmes like extended producer responsibility or product take-back are principally focused on managing the products at the end of useful life, thus reducing their impact on the environment (Product Stewardship Foundation, 2009a; Carlton & Thompson, 2009).

The concept of 'end of life management' or 'life-cycle management' has been widely used in research and in more general discussion promoting the sustainable management of end products through PS, extended producer responsibility, and take-back programmes

(Ahluwalia & Nema, 2007; Ferrao, Ribeiro,& Silva, 2008; Guerin, 2008; Funk, 2004; Villanueva & Wenzel, 2007). Because of restrictions on disposal, and due to regulatory requirements, producers, brand owners and importers are often involved in developing a sustainable route for disposal of their end products (Guerin, 2008; Funk, 2004; Villanueva & Wenzel, 2007). The end of life management of different products like electronic goods, used oil, plastics, and mobile phones is particularly important because these products are not perishable, and their end products pose severe threats on humankind and environment. So tracking and identifying means of safe disposal of these goods at the end of their life is needed. Besides, various studies have demonstrated that often recycling and reusing of products like oil, plastics, electronics, computers, mobile phones results in economic gain through end of life management (Ahluwalia & Nema, 2007; Guerin, 2008; Funk, 2004; Villanueva & Wenzel, 2007).

End of life management is often emphasised in “product life-cycle theory”. Theodore Levitt in 1965 used product life-cycle theory for the first time in the article “Exploit the product life cycle” published in the *Harvard Business Review* (Levitt, 1965 as cited from Rink & Swan, 1979). The concept of ‘product life-cycle’ has been popular in marketing research in order to reflect a value addition to any product at different stages (Luck and Nowak, 1954, Patton, 1959 as cited in Hashimoto, 2003). The underlying principle of product life-cycle is the value addition from different factors like level of advertising, nature of distribution, pricing strategy, in different stages of product development (Polli & Cook, 1969). Different life-cycle patterns are developed based on the change in value in different stages of a product development. The following life-cycle patterns as cited in Rink and Swan (1979:122) best show the theoretical differences of value addition due to end of life management in a product’s life cycle (see Figure, 1 and 2).

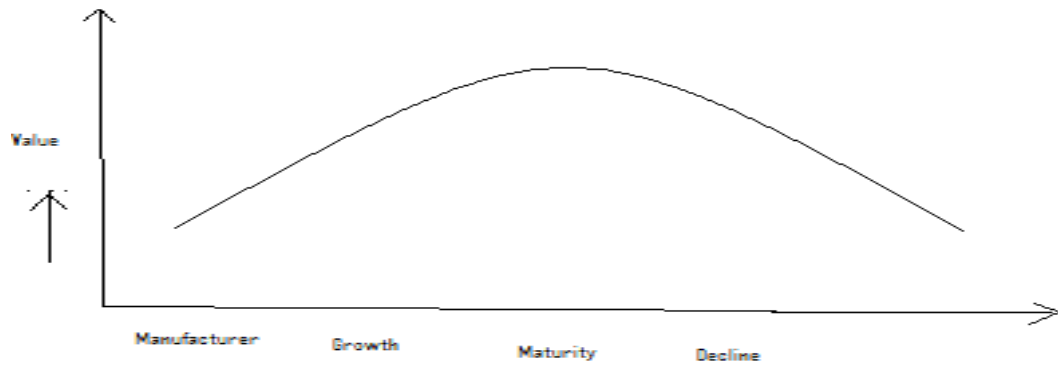


Figure 1 Classical Product Cycle Curve
(Source: Rink & Swan, 1979: 222)

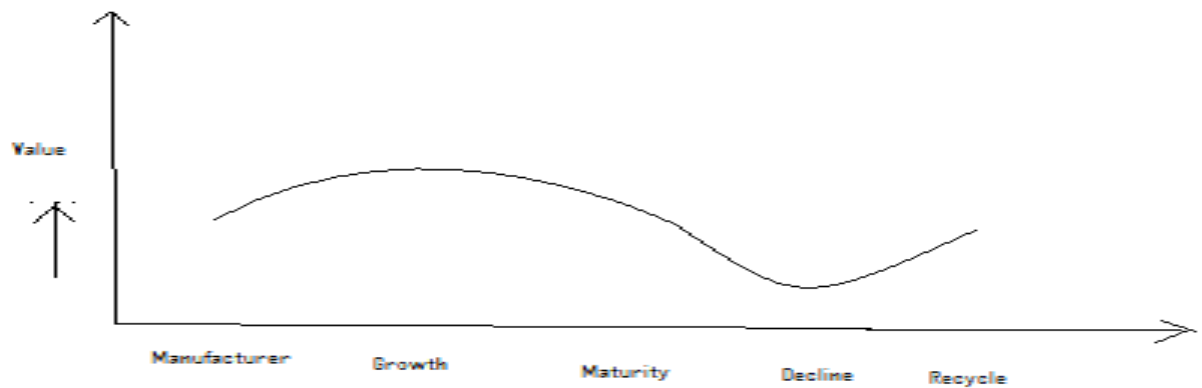


Figure 2 Product Cycle Curve based on Cycle-Recycle
(Source: Rink & Swan, 1979: 222)

The differences between the above two figures indicate how end of life management can potentially add value through recovering and recycling of the product (as shown in Figure 2).

However, producers, brand owners and importers are not encouraged solely by the prospect of economic gain from end of life management. Rather there is a range of factors which may induce involvement in end of life management. From the literature, it has been found that factors like environmental accountability, governance, innovation, leadership, consumer satisfaction are all of particular importance and therefore motivate businesses to become involved in end of life management (Ahluwalia & Nema, 2007; Guerin, 2008; Harvie & Jaques, 2003; Khanna, Koss, Jones, & Ervin, 2007; Villanueva & Wenzel, 2007). This study emphasises the factors that have motivated producers, brand

owners, and businesses to establish PS schemes for managing the end of life of their products.

Environmental liability or concern for the environment has always been a motivational factor for businesses interested in sustainability to rethink and redesign their products based on life-cycle analysis (Harvie & Jaques, 2003). Environmental liability can be complex and needs careful attention and monitoring when it involves end of life management for certain hazardous products like used oil, mobile phones, computer equipment and, used tyres (Ahluwalia & Nema, 2007; Guerin, 2008; Ferrao et al., 2008; Funk, 2004). For example all major oil companies in Australia and New Zealand have been involved and have contributed financially to PS programmes for sustainable management of used oil (Guerin, 2008; Halliday, Rynne, Slaughter, & Totty, 2007). The environmental liability of end of life management of used oil in Australia has been studied by Gurein (2008). A number of secondary sources of information from academic databases were reviewed in his study. Guerin conducted meetings with environmental regulators for identifying the role of local authorities in implementing the legislation for end of life management of used oil. The study found that the liability issues were becoming increasingly complex because of the involvement of a large number of activities and parties in the end of life management programmes of used oil (Guerin, 2008: 264).

Computer producers like IBM, HP, and Dell are operating recovery and recycling programmes for their corporate clients in most developed countries like the USA, Canada, Switzerland, Australia, and New Zealand. Researchers have showed that one vital reason for implementing these programmes is producers' concern about the detrimental effects of computers and accessories on the environment (Kahhat et al., 2008; Khatriwal, Kraeuchi, & Widmer, 2009; MfE, 2010a). Similar studies were carried out by Kahhat et al. (2008) and Khatriwal et al. (2009), identifying the status of the end of life management of electronic waste through extended producer responsibility programmes in the USA and Switzerland. Kahhat et al. (2008) completed an assessment of electronic waste management systems of different states in the USA. In Khatriwal et al. (2009), in-depth semi-structured interviews were conducted with the government administrators, experts from electronic manufacturers, and producers. Overall the objectives of these

studies were to identify the stakeholders including consumers (polluters) participation in extended producer responsibility for end of life management of electronic wastes. The extended producer responsibility that emphasised the “polluters pay” principle has been identified as a potential solution for end of life management of growing electronic wastes (Kahhat et al., 2008; Khatriwal et al., 2009).

Governance through acts, regulations, standards, and directives are often considered as persuasive factors for producers to involve themselves in management of their own products at the end of life (Bulkeley, Watson, & Hudson, 2007; Zoeteman, Krikke, & Venselaar, 2010). The Basel Convention 1989 requires participating countries to enact framework legislation or directives to ensure minimisation and sustainable management of hazardous wastes (Zoeteman et al., 2010). Since then several states of the USA, and some provinces of Canada have enacted legislation or set out framework for establishing extended producer responsibility programmes for waste material and in electrical and electronic equipment (Renckens, 2008; Murayama, Shu, & Williams, 2000; Mckerlie, Knight & Thorpe, 2006). Multinational companies have upgraded their end of life management due to government policies based on waste minimisation through extended producer responsibility or PS programmes (Zoeteman et al., 2010). According to Directive 2002/96/EC of the European Union, all EU member countries had to implement operational end of life recovery systems for electronic waste from August, 2005 (Zoeteman et al., 2010). Plastics and glass packaging waste are also of great concern for policy-makers. The German Packaging Ordinance, The Container Deposit Legislation (Australia) and the New Zealand Packaging Accord have been implemented to work toward reducing plastic and glass packaging waste in landfills (Lewis, 2005). In New Zealand, the Waste Minimisation Act 2008 was enacted to promote minimisation of solid waste through establishment of PS schemes, and implementation of a waste disposal levy (MfE, 2009d). This government legislation is supposed to influence producers to act progressively towards the planning and implementation of end of life management of their products.

Companies may introduce end of life management of their products for reputation and branding. Companies may try to improve product quality and increase sales through incorporating innovative environmental approaches or strategies which in turn will help

to build up a reputation for the company (Roberts, 2003). Case studies were conducted in three sectors i.e. branded clothing and footwear, forest products and branded confectionary to identify the efforts of the brand owners through adoption of sustainable practices in their supply chains for building up reputations (Roberts, 2003: 160). Among them one important strategy adopted by proactive multinational companies is to introduce innovation in their management systems (Khanna et al., 2007; Harvie & Jaques, 2003). An important dimension of innovation implemented by various multinational companies is the voluntary engagement in environmental programmes for end of life management of their products (Koehler, 2007; Khanna et al., 2007). According to Khanna et al. (2007: 751), “firms are increasingly undertaking initiatives to proactively improve their environmental performances and go beyond simply complying with regulatory standards”. Multinational companies like Dell seem to be implementing ‘extended producer responsibility’ programmes worldwide through free recycling services, even when they are not required to do it mandatorily (Zoeteman et al., 2010). In New Zealand, Fisher & Paykel has been implementing recovery and recycling programmes for white-ware, voluntarily from the 1970s which could be seen as an example of innovation through end of life management (MfE, 2009e).

In general, all of the motivational factors stated above are indirectly focused towards attainment of consumer satisfaction and public awareness. People are more aware of environmental protection so the companies are keen to attract public or consumer attention through implementation of voluntary environmental programmes and sustainable technologies (Harvie & Jaques, 2003; Henriques & Sadorsky, 2008). Public policies related to end of life management are also aligned with public attitudes. There is evidence that consumers are keen to buy products manufactured through clean and green technologies and for which the end products can be disposed of in a sustainable manner (Harvie & Jaques, 2003; Koehler, 2007; 3R, 2006). So producers, brand owners and businesses are voluntarily implementing extended producer responsibility and PS programmes to add a new dimension of innovation through end of life management, and these programmes are also argued to be a marketing strategy for them (Koehler, 2007; Khanna et al., 2007; Carlton & Thompson, 2009; Zoeteman et al., 2010).

At this point it can be said that the factors like environmental concern, public policies, innovation, leadership, consumer satisfaction and public attitudes have significant impact on the end of life management. PS and extended producer responsibility programmes are considered to be key parts of the end of life management for the products. Here in New Zealand various PS programmes are implemented voluntarily by producers, brand owners and importers. This study aims to examine the motivational and other factors which have induced the producers, brand owners and importers to incorporate these PS schemes as the means for end of life management.

1.4 Product Stewardship as Stakeholder Participation for Minimisation of Waste

PS is one of the recent principles adopted mostly in the manufacturing industry for minimisation of solid waste and thus to promote sustainable end of life management for the products. PS is defined as a comprehensive principle to guide the stakeholders involved in the life-cycle of any product to share the responsibilities of impacts on human health and the natural environment that result from the production, use, and end of life management (PSI, 2008 as cited from Veleva, 2008). The prime objective of PS is to promote reduction of solid waste, especially a group/category of hazardous waste by encouraging the manufacturers or producers to redesign their products in a sustainable way to ensure recycling or, reusing at the end of life (Veleva, 2008; Fishbein, Ehrenfeld & Young, 2000). End of life management through recycling or reusing of waste becomes the most important factor for defining the roles and responsibilities of producers, brand owners, importers and consumers i.e. stakeholders under the framework of PS (Lease, 2000; Lewis, 2005; MfE, 2009e).

Several voluntary PS schemes operate in New Zealand. Some of them are part of a company; others operate by agreement among producers, brand owners and importers. According to the Ministry for the Environment, the following PS schemes are operational in New Zealand:

- Agpac: Currently rebranded as Plasback, operates to take back used farm wrap
- Agrecovery: This scheme is for agrochemical containers, silage wrap and other chemicals
- Dell New Zealand Ltd: Take back programme for any computer equipment
- Enviropaints Ltd: Recycling of unused paints
- Exide Technologies: Recycling of lead batteries

- Fisher and Paykel Appliances Ltd: Take back and recycling of white-ware
- IBM New Zealand: Take back of computer equipment from their corporate clients
- New Zealand Packaging Accord: Deals with recycling packaging waste
- Recovery: A trust set up to collect and disposal of ozone depleting refrigerants.
- Paintwise: Known as Resene, recycle unused paints
- Telecom New Zealand: Take back of any type of mobile phone and accessories
- Tyre track: Tracking of end of life tyres
- Holcim-Geocycle: Collection of used oil and reusing it as fuel
- Vodafone New Zealand Ltd: Take back of mobile phones and accessories.
- HP New Zealand Ltd: Take back of computer equipment from their corporate clients
- Glass Packaging Forum: Collection and recycling any glass products or containers (MfE, 2009e: 1).

The objective of PS in New Zealand is to promote and ensure minimisation of solid waste which will help to attain a clean and green environment (MfE, 2009e). The PS schemes in New Zealand are designed to establish separate collection system in addition to the traditional waste collection system, implemented by the local authorities. However, the Waste Minimisation Act 2008 does not cover the initial role of producers or brand owners to redesign their products to ensure recycling or reusing. Most of these products like unused paints, agrochemicals, batteries which are included in PS schemes in New Zealand, were traditionally being disposed of in landfills (MfE, 2005). Now, there are separate collections and treatment systems established by the producers or brand owners under these PS schemes to manage these products at the end of their useful lives. In New Zealand PS schemes seek to minimise the solid waste through managing end of life of the products along with reduction of waste generated from their products (MfE, 2009e, MfE, 2005).

In addition to the environmental benefit, the PS schemes are directed to bring some economic gain to the businesses. According to the MfE (2009e:1), the following economic benefits can be achieved through PS schemes:

- Product stewardship helps business profitability by increasing resource efficiency and driving innovation
- Recycled materials can replace the need to import key raw materials (such as plastics, oil and metals)
- And the recycled materials can be a potentially valuable export commodity.
- Well-managed end of life schemes represent an added value feature and can generate brand loyalty.

The following two figures show the differences between the management approaches of solid waste in New Zealand in respect of implementation of PS. Generally all forms of solid waste generated from households and farms were being disposed of by the general collection system. In rural areas, farmers were burning and burying a portion of their solid waste which has been reduced in recent times due to environmental restrictions on burning certain hazardous wastes. Other forms of solid wastes were supposed to be collected and disposed of through the collection and waste management system implemented by the local authorities which were financed from council rates. Thus solid waste management also imposed pressure on the general tax system because central government used to provide financial support to the local authorities for planning and managing solid wastes. Figure 3 indicates the traditional flow of solid wastes in New Zealand.

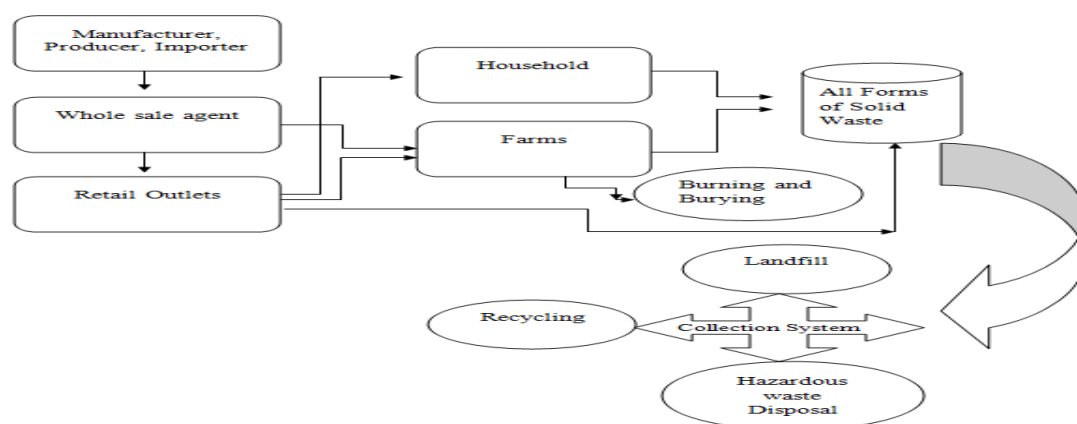


Figure 3 Schematic Diagram Plotted to Show the Flow of Waste in Traditional Waste Management System

From 2001, with the implementation of the Hazardous Substances and New Organisms Act 2001 (HSNO Act), traditional waste collection systems in New Zealand no longer accepted forms of solid waste like unused oil, batteries, unused paints, electronic appliances, mobile phones, computers, refrigerant products, agrochemical products.

Producers, manufacturers, brand owners, importers of these products became responsible for collection, recycling, reusing and disposal of these products (MfE, 2009g). Figure 4 shows the present status of collection systems of solid waste in New Zealand. For the above stated products, separate collection systems by the PS schemes have now been implemented as shown by the shaded area in Figure 4.

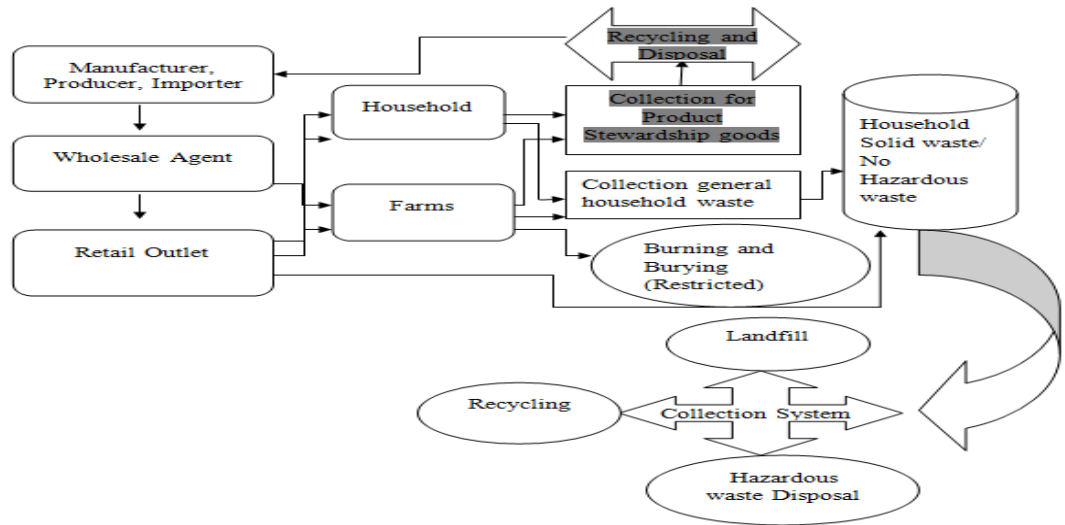


Figure 4 Schematic Diagram Plotted to Show the Flow of Waste in Management System where Producers, Brand owners and Importers Implement PS Schemes for their Products

Responsible producers and brand owners have established various stewardship programmes or recycling schemes to manage their products up to the end of their useful life. Though most of the PS schemes in New Zealand are voluntary, the Waste Minimisation Act 2008 provides the legal requirement of a waste disposal levy which has to be collected from anybody who wants to dump waste in the landfills or transfer stations. From July 2009 Government has implemented a \$10 per tonne (excluding general sales tax) waste disposal levy on all waste sent to landfills. The reason for introducing the waste disposal levy was to encourage people and organisations to reconsider their waste disposal behaviour. Another objective of implementing a waste disposal levy is to create a Waste Minimisation Fund which could be a source of finance for the PS schemes or waste minimisation projects. So in an indirect way each consumer becomes responsible for implementation of the PS schemes. However the producers, brand owners and importers have to bear the major responsibilities through the establishment, financing and management of the schemes.

1.5 Research Questions for this Study

As the PS programmes or schemes in New Zealand are at an early stage, given the relevant legislation came into effect only from 25th September 2008 (except the waste disposal levy), there is scope to examine the following issues:

- a) How is the concept of PS defined by the participant stakeholder groups - i.e. local authorities, host business organisations (producers, brand owners) and waste management organisations and management of PS schemes?
- b) What sorts of problems and benefits of the PS schemes in New Zealand have been stated by the participant stakeholder groups?
- c) Is the New Zealand legislation for promoting PS well-formulated and what are the suggestions of the participant stakeholder groups for improving the existing policies for PS?
- d) To what extent are the PS schemes of New Zealand perceived to be economically and environmentally sustainable by the participant stakeholder groups?
- e) What are the reasons and motivations of stakeholders for implementing PS schemes in New Zealand and how their responsibilities are shared?

PS is not well researched as it is recent and the preceding concepts of PS such as product take-back programmes and extended producer responsibility are characteristically different from PS. Consequently, the stakeholders of PS programmes should be in a good position to contribute to an evaluation of PS. There is a scope to conduct a study among the New Zealand stakeholders to get their views and ideas about the PS schemes.

As the pioneers of PS in New Zealand, these schemes might have faced various problems and challenges during their implementation, which would be useful to address or record for further investigation. The stakeholders of these schemes are targeted as respondents to identify the potential problems and benefits. Once these problems or challenges are identified, then possible remedies may be found. Furthermore, benefits of these PS schemes to the economy, environment and society have to be evaluated.

Claims related to sustainability have to be researched rigorously in order to identify the problems and benefits of these schemes. Some of these schemes are funded by the host business organisations or the parent company; however most of them have separate

management systems. So these schemes have to be economically viable and sustainable. Principally these schemes should operate from the cost recovered either through charges or levies acquired from the consumers (Nicol & Thompson, 2007; MfE, 2009e). There is a question whether the end product's cost is sufficient to bear the scheme's cost. In that sense, the economic sustainability of these PS schemes is vital and needs to be researched.

On the other hand, the prime objective of implementing PS schemes is to reduce the adverse environmental impacts relating to end product's disposal so they have to be environmentally sustainable. Here the main issue is with the management of the end product. In order to meet the economic sustainability objective, obviously the scheme has to recycle or reuse a portion of the recovered materials. However, these recycled products or items need to be tracked properly and should be used in suitable sectors. For example the recovered plastics from chemical containers should not be used for making children toys. Thus the project seeks to investigate how effective these schemes are in attaining environmental sustainability in terms of end of life management. The research seeks to identify how these schemes are perceived to achieve environmental sustainability.

Identifying the sharing of responsibility among the stakeholders of these PS schemes is one of the key challenges of the research. There are variations in the operating principle and funding of the PS schemes. Some of them are levy based and some are user-charged. It is still a source of debate among researchers how PS schemes should be funded and who should take the burden of responsibility for end of life management of the products (Sachs 2006, Walls 2006, Schwartz, Gattuso & Short, 2004 as cited in Nicol & Thompson, 2007). So the research investigates the responsibility sharing among the stakeholders and to obtain their views and ideas in relation to bearing the cost of the PS schemes or programmes.

1.6 Research Objectives and Methods to Identify the Key Issues

It is to find out the probable answers for the above research questions that this study is conducted: “Product Stewardship and Stakeholder Participation in Solid Waste Management: A New Zealand Study”. The objectives of this study are:

- To define the PS concept based on the views and ideas expressed by the participant stakeholder groups;
- To identify the major problems or challenges and benefits of existing PS schemes of New Zealand;
- To identify potential views and ideas for suggesting further policy improvement for PS which has been implemented under the legal framework of the Waste Minimisation Act 2008;
- To examine sustainability issues related to PS through an analysis of selected stakeholders’ perceptions of the environmental and economic sustainability of the PS schemes; and
- To examine the sharing of costs and responsibilities among the various stakeholders involved in implementing PS schemes in New Zealand.

In order to meet the objectives of the research, the following four groups of the stakeholder of PS have been identified as the key respondents.

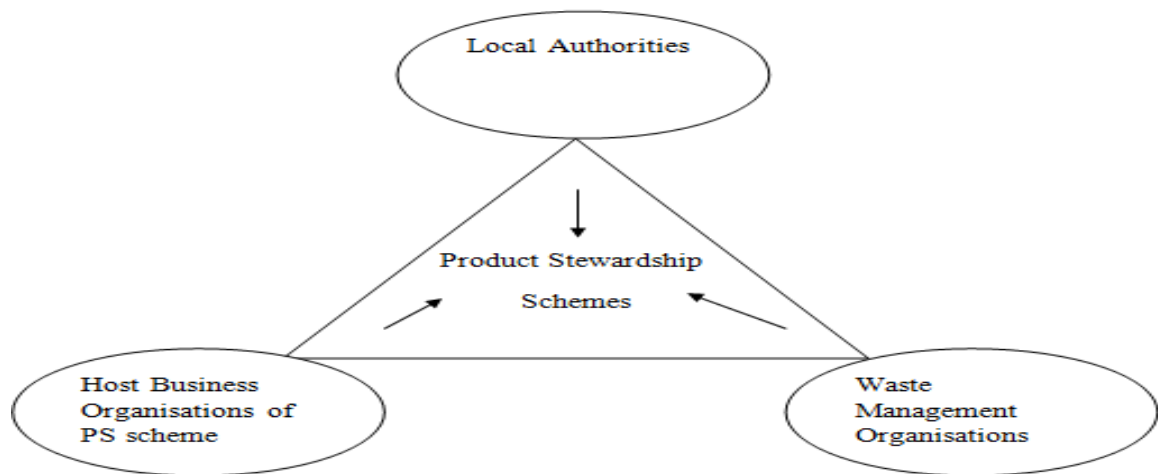


Figure 5 Target Participant Stakeholder Groups of the Research

Figure 5 represents the stakeholders of PS selected for data collection in this study.

Though the broad range of stakeholders of PS is wide however, due to limitation of time and resources only the local authorities, host business organisations, waste management

organisations and the management of PS schemes have been included in the research as participant stakeholder groups. Among them, the local authorities and the waste management organisations are not directly related to PS. Local authorities are prime stakeholders for solid waste management in New Zealand. They have been playing the key role for planning and implementing waste management in New Zealand. In addition the Waste Minimisation Act 2008 specifically defines the roles and responsibilities of these local authorities for the minimisation of waste (MfE, 2009d). So they could be very helpful for suggesting the further development of the policy framework related to PS and waste minimisation. Waste management organisations provide the technical services for waste management and a number of them are expert in recycling and recovering of waste. In addition, some waste management organisations are managing New Zealand landfills and transfer stations. Under the framework of the Waste Minimisation Act 2008, these landfills and transfer stations have statutory roles and responsibilities so the waste management organisations could provide valuable feedback on problems, benefits and the sustainability of PS schemes in New Zealand. Finally the host business organisations that have been engaged with the PS schemes are useful respondents for the research. Host business organisation executives can provide feedback about their reasons and motivations for implementation and the problems and benefits perceived in participating in the PS schemes. In Figure 5, the PS schemes are located in the centre which represents that these schemes' personnel are the core respondents of the research. The managers of these PS schemes were seen as likely to be able to provide extensive views and ideas about the problems, benefits and perception of sustainability of PS in New Zealand.

A combination of quantitative and qualitative social research methods represents the basic approach. This mixed-method of social research has been adopted and includes both questionnaire survey and semi-structured interviews. In order to investigate into the arena of PS; quantitative methods (i.e. surveys among the local authorities, host business organisations and waste management organisations) along with qualitative semi-structured interviews with the management of PS schemes are used to create a firm basis for knowledge about the problems, benefits and sustainability of PS schemes in New Zealand.

1.7 Outline of the Thesis

The organisation of the thesis is guided by the logical sequence of identification of research questions, finding means for collecting evidence to answer the questions and finally to provide conclusions and implications as well as suggestions for further research on the PS concept. In this thesis, the chapter 1 (Introduction and Background to the Research) provides the basis for the research questions identified through brief review of existing knowledge on the topics for discussion. Chapter 1 also provides the theoretical framework, objectives of the research along with a brief explanation how these objectives are achieved through the research method.

The Literature Review, chapter 2, further defines various aspects of solid waste management along with its recent global focus. A comprehensive background study on solid waste management and the legal framework for New Zealand is presented in this literature review. In general PS and its preceding concepts like product take-back and extended producer responsibility are defined from academic and practical perspectives. Globally, the concept of PS promoted in different formats is also discussed.

Chapter 3 on research methodology begins with specification of the research questions along with the scope of the research. The research methodology is outlined in this chapter along with description of data collection methods adopted in the research. A description of the samples selected for data collection, representing the stakeholders of PS schemes of New Zealand is then provided. In addition, data analysis techniques along with possible interferences on data collected are presented.

In Chapter 4, the findings of the research obtained from the data analysis are described. Overall the content of this chapter is based on empirical evidence obtained from the analysed data. The theoretical contribution of the research to the field of end of life management is described. In addition, the scope for further research on PS and end of life management is reflected upon.

The concluding chapter, Chapter 5, summarises the key findings of the research. Recommendations arising from the participants are offered in this chapter, and directed towards for further improvement of policy related to PS in New Zealand.

Chapter 2 Literature Review and Description of Solid Waste Management and Product Stewardship in New Zealand

This chapter begins by defining various aspects of solid waste management along with its recent global focuses. Later, the different aspects of solid waste management and its legal framework in respects of New Zealand are stated. The discussion continues with the strategies adopted in New Zealand for minimisation of waste. The concept of PS and its preceding concepts are discussed along with the global attempts for PS for minimisation of waste. The rest of the chapter deals with the published discussions on problems, benefits, producer's roles, motivations and sustainability issues of PS, in respect of New Zealand and other developed countries. In addition, various studies and reports on PS schemes of New Zealand have been included for elucidating various aspects of PS.

2.1 Solid Waste Management

Solid waste management has become a large, complex and costly service for most countries of the world (Ahmed & Ali, 2006). Generation of solid waste has been increasing at ever faster rate due to increase in global population. During 2005-2006, an estimated 1.6 billion tonnes of solid waste was generated in the world requiring a huge investment in managing these solid wastes. The estimated expenditure for solid waste management in Asian countries was around US\$25 billion during the 1990s which is projected to rise to around US\$50 billion by 2025 (Hoornweg & Thomas, 1999 as cited in Ahmed & Ali, 2006).

Solid waste management is critical for both developed and developing nations (Ahmed & Ali, 2006; Seadon, 2006). In developed countries it is difficult because of the increased use of electronic goods and appliances and their rate of obsolescence. In developed countries fewer tendencies are seen among the consumers towards recycling and repairing; rather they tend to upgrade cars and home appliances with changes in model or fashion.

Although cities in developed countries might have the financial capability and technological skills to handle the cost and complexity of solid waste management, there are growing concerns over the results of increased population and technological development (Ahmed & Ali, 2006; Seadon, 2006). Urbanisation has induced increase in infrastructural activity which necessarily creates more hazardous waste. More and more

people are migrating to cities with hopes of a better life and job opportunities. In addition, technological advancement has a tremendous effect on the characteristics of waste generated. New and cheaper technologies are inducing people to dispose of their old home appliances, cars, mobile phones, computers etc. The availability of cheaper electronic goods in the market has increased the range of users from the rich to include middle class families and arguably even poorer ones (Ahmed & Ali, 2006; Sujaudhin, Huda, & Hoque, 2008; Seadon, 2006).

Solid waste management is a multi-dimensional challenge for the urban local authorities in developing countries too. Developing countries lack financial and technological capacities to handle the growing demand for solid waste management as the rate of urbanisation is higher in those countries. There are increasing problems with growing populations and affluence in most of the developing countries, and the consequent generation of more solid waste (Ahmed & Ali, 2006; Sujaudhin et al., 2008).

Sometimes, the characteristics of solid waste make the situation even more complex. Generation of organic waste reduced significantly over the last decade due to an increase in the consumption of packaged foods, materials mostly in developed countries (Gidarakos, et al., 2006). Organic wastes are easy to dispose of and do not pose any significant threat to the environment. There have been increases in the production of hazardous waste, like clinical and electronic waste, in both developed and developing countries. It is obviously difficult and costly to manage and dispose of this clinical and electronic waste compared to organic waste which can easily be decomposed (Renckens, 2008; Laner & Rechberger, 2009; MfE, 2009c).

A waste classification scheme is one of the traditional approaches for solid waste management which is still popular among the developing and developed nations of the world (Bailey, 1985; Jennings, 1983; Sujaudhin et al., 2008; Tudor, Woolridge, Bates, & Phillips, 2008). Classification of waste prevailed in the early 1980s and was important because it helped to impose restriction on dumping certain categories of hazardous waste in landfills. Waste management practitioners had become interested in the relationship between waste generation and composition (Jennings, 1983). Table 1 gives an indication as to how waste classification was useful for determining the disposal options of solid waste.

Table 1 Waste Disposal Alternatives as per Waste Classification

Types of waste	Hydrocarbon Incineration	Rotary Kiln	Halogenated Hydrocarbon Incineration	Solvent Recovery	Oil Recovery	Organic Liquid Treatment	Metals Treatment	Neutralisation	Anaerobic Stabilisation	Aerobic Stabilisation	Activated Sludge	Deep Well Injection	Secure Landfill	Land Farming
Organic solids		√											√	
Inorganic Solids													√	
Special Solid Waste		√											√	
Halogenated Organic Liquids			√			√						√	√	
Non- Halogenated Organic Liquids	√		√	√		√			√	√	√	√	√	√
Acid Solutions								√				√	√	
Caustic Solutions							√	√				√	√	
Metal Solutions							√					√	√	
Oil and Oily Waste	√	√	√		√							√	√	√
Miscellaneous Liquids									√	√	√	√	√	√
Organic Sludge		√							√				√	√
Inorganic Sludge													√	
Metal Sludge							√						√	

Source: Jennings (1983:74)

Waste minimisation or prevention is the contemporary strategy commonly introduced by developed nations (Fahy & Davies, 2007; Davies, 2009; Gidarakos et al., 2006). One of the key strategies for solid waste management in Europe and other developed countries is to reduce household waste which constitutes the major portion of solid waste (Fahy & Davies, 2007). In this regard, waste management practitioners are keen on ‘recycling’ and ‘reusing’ as the core strategy for promoting minimisation of solid waste (Fahy & Davies, 2007).

It is becoming difficult for governments alone to bear the responsibilities of solid waste management. Public-private partnership involving stakeholder participation is offered as an effective solution for integrated solid waste management (Ahmed & Ali, 2006; Rae & Brown, 2009; Davies, 2009; Goven & Langer, 2009; Saeed et al., 2009; Shekdar, 2009). Often this concept of public-private partnership emphasises community consultation, raising awareness and active participation in decision-making for solid waste management (Rae & Brown, 2009). In most developed countries, management and planning of solid waste has been delegated to the local level, with legislation and policy being implemented at the national level (Goven & Langer, 2009; Shekdar, 2009). It is often argued that solid waste management is a holistic approach as it covers different multi-dimensional aspects like hazardous waste management, land use strategy, governance (Bailey, 1985; Blenkharn, 2006; Boyle, 2000; Seadon, 2006; Davies, 2009).

Solid waste management is sometimes critical due to the dangers involved in hazardous waste management like clinical waste and electronic waste (Blenkharn, 2006; Davis & Herat, 2008; Renckens, 2008; MfE, 2009c). Clinical wastes predominantly comprises wound dressings, swabs, catheters, blades, syringes and needles, and pose severe threats to humankind and the environment as they contain infectious, blood-borne living organisms (e.g. HIV, Hepatitis B and C etc.) (Blenkharn, 2006). In recent times, clinical waste management has received more attention in developed countries. Most European and other western countries have adopted sophisticated and separate waste management and treatment systems for clinical wastes along with strict standards and specifications. However the cost associated for clinical waste management is always a burden for these developed countries (Blenkharn, 2006).

Electronic waste also is becoming a burden for most of the developed countries. According to UNEP, as cited from Davis and Herat (2008:1031), “waste from electronic and electrical equipment (WEEE) is becoming a significant component of the waste stream, increasing at a rate of 3-5% per annum, outstripping the general growth of the municipal waste stream”. As noted earlier the growth of electronic waste has accelerated due to rapid obsolescence, as people and firms keep pace with the advancement of technology. In addition, electronic goods are becoming cheaper and smaller which also fuels an increasing growth of disposal of electronic waste in developed countries (Davis

& Herat, 2008). In 2007, approximately 612,160 pieces of desktop computers and notebooks were sold in New Zealand, which is 2.6 times higher than 10 years earlier (MfE, 2009c). If this electronic waste was dumped in the landfills without treatment, it would pose a severe threat to the natural environment because most of the substances or metals used in these electronic goods do not decompose but remain in the soil unaltered. It becomes difficult for local authorities to manage these huge amounts of electronic waste (Khetriwal, Kraeuchi, & Widmer, 2009). In order to deal with this increasing stream of electronic waste, extended producer responsibility, standards and labelling, PS, recycling and remanufacturing have been considered as potentially sustainable management options (Herat, 2007).

2.2 Recent Global Focus for Solid Waste Management

Globally, environmental directives and regulations are promoting comprehensive product requirements and chemical substance registration that are mostly adopted to restrict the toxic effect of certain metals and elements used for the manufacturing of most electrical appliances and hazardous products. Although, most of these directives and regulations were first adopted by the European Union (EU), many have since been globally recognised and adopted by other developed countries. The most notable environmental regulations which are related to PS or hazardous waste management are the: Waste Electrical and Electronic Equipment (WEEE: EU Directive 2002/96/EC), Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS: EU Directive 2002/95/EC), Eco-Design of Energy-using Products (EuP: EU Directive 2005/32/EC), Registration, Evaluation, and Authorization of Chemicals (REACH: EU Directive 2006/121/EC), and Packaging and Packaging Waste (EU Directive 2004/12/EC) (Hunter & Futornick, 2008: 26). Due to global supply chains, these directives are found to affect the production process of manufacturing worldwide. For example, US electronics and automotive industries had to spend millions of dollars to comply with 'Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment' (RoHS) and 'Waste Electrical and Electronic Equipment' (WEEE) requirements since 2002. US chemical manufacturers, pharmaceutical companies and other manufacturers had to comply with other directives such as

Registration, Evaluation, and Authorisation of Chemicals (REACH) by 2007 (Hunter & Futornick, 2008; Zoeteman et al., 2010).

Among these, WEEE requires producers of electrical and electronic equipment to register, arrange collection, and recycle their own products at the end of their life. Household appliances, communication and consumer equipment, lighting and electrical tools, certain toys, sport equipment, automatic dispensers, military equipment, and medical devices are currently subjected to WEEE (Hunter & Futornick, 2008; Zoeteman et al., 2010).

RoHS applies to similar product categories and has similar exemptions and is accepted by certain EU member countries. If the enforcing authority of any EU member state advises demonstration of RoHS directives, the manufacturer has to abide by the RoHS directives. In addition, enforcement procedures in EU member states often vary in terms of the imposition of fines, prohibition of sales, revocation of trade license, product recalls and even sometimes imprisonment for non-compliance with restrictions or directives like RoHS, WEEE (Hunter & Futornick, 2008; Zoeteman et al., 2010).

On the other hand, EuP is a framework directive for designing eco-friendly products which use energy or power to operate. It is more applicable for EU member countries compared to the USA and Canada where manufacturers are mostly focused towards RoHS and WEEE. At present, high energy-use products like boilers, water heaters, personal computers, imaging equipment, consumer electronics, battery chargers, lightings, and electric motors are included under the EuP directives (Hunter & Futornick, 2008).

Table 2 gives a brief statement of the above stated international environmental directives that are adopted by the European Union. Similar environmental regulations are implemented by Japan, Taiwan, Korea, certain Canadian provinces and some US states. Producers who do not comply with the following directives may not enter the market of EU member states. Failure to meet the compliance of any product with the following standards and directives may lead the product into unfair competition in the USA and Canada also.

Table 2 International Environmental Directives/Standards

Name	Description	Date of adoption
RoHS: Restriction of the use of certain Hazardous Substances in Electrical Equipment	New electrical and electronic equipment put on the market should not contain any of the six banned substances: lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), in quantities exceeding maximum concentration values	July 1, 2006
WEEE: Waste Electrical and Electronic Equipment	Producers will be responsible for taking back and recycling electrical and electronic equipment. They will provide incentives to design electrical and electronic equipment in a more environmentally efficient way, which will take waste management aspects fully into account.	August 13, 2005
EuP: Eco-design of Energy-using Products	Defines conditions and criteria for setting requirements regarding environmentally relevant product characteristics.	April 13, 2005
REACH: Registration, Evaluation, and Authorization of Chemicals	Requires industries to identify and manage the risks from chemical substances and provide safety information to all downstream users. Similar to other EU directives, producers and sellers who do not comply with REACH may not be able to place their products in EU market	December 18, 2006
Packaging: Packaging and Packaging Waste	Requires EU Member States to take measures, that may include national programs, to prevent the formation of packaging waste, and encourages them to develop packaging systems.	December 15, 1994

Source: Hunter & Futornick (2008: 26).

Table 3 gives a brief statement of initiatives or environmental requirements of different countries of the world, which mostly promote recycling, reusing and sustainable waste management of various hazardous products.

Table 3 Environmental Requirements of Different Countries of the World

Name	Environmental requirement/Initiative	Target Year
China	RoHS	2007
	WEEE	2006
Korea	Industry agreements to limit certain materials and for products to be recycled	2008
Japan	RoHS	2006
European Union	REACH	2008
	EuP	2007
	RoHS	2006
	WEEE	2006
Norway	RoHS: Restriction on 18 substances	2005
Canada	Electrical, Electronics and Equipment Provincial Requirements	Varied in different provinces
USA	Federally Restricted Substances for Mercury (Hg)	1996
	In California and other 29 States of USA enacted Prop 65: Restriction on materials	

Source: Hunter & Futornick (2008: 29).

The global requirements and standards promote stakeholder participation and end of life management for waste management. In general, these standards and directives are focused to restrict the use of certain hazardous chemicals and metals in electrical and electronic products. These directives are also aimed to promote end of life management of those products which are difficult to dispose of or pose detrimental effects to the environment. Most of them are implemented through stakeholders' active participation for end of life management of their products. Certain directives like WEEE directly require the producers and manufacturers to be held responsible and pay for their product's end of life management. Other directives like RoHS, EuP, and REACH also promote end of life management through restricting use of certain hazardous metals or chemicals (Crane, 2008; Hunter & Futornick, 2008).

2.3 Solid Waste Management in New Zealand

In 2006, The World Economic Forum ranked New Zealand first out of the 133 countries of the world for ensuring sustainable health, biodiversity, energy, water, air and natural resources (based on the Environmental Performance Index) (Kelley & Slaney, 2006).

Due to its strategic advancement of environmental practices along with the management of emission of chlorofluorocarbon (CFC) gas, New Zealand earned 88 out of 100 possible points (Kelley & Slaney, 2006). The United Nations Development Programme ranked New Zealand 3rd, based on human development index (HDI) in 2010 among the 169 countries of the world which also indicates the comparative advantage in health, education and living standards (UNDP, 2010). The promotion of solid waste management in New Zealand has been influential in attaining global leadership in various environmental aspects.

New Zealand's environmental history has not been without problems. Initial damage to the environment occurred through burning of bush and wildlife habitat. Deforestation of one third to one half of indigenous forest by fire exaggerated the formation of unfavourable geomorphology in the southern part of the country (Harada & Glasby, 2000). There were also major impacts on native birds through destruction of their eggs. European colonisation after 1840 was responsible for the greatest damage to the environment due to introduction of different flora and fauna, new farming methods and urbanisation (Harada & Glasby, 2000). Around 27% of the native forests in New Zealand (which include 13% of the land area) were cleared for farming and urbanisation during the period of 1890 to 1900 (Harada & Glasby, 2000). Most of the resident terrestrial mammals such as cats, stoats, weasels, deer, rabbit, and possums were introduced during the colonisation period. These animals are accused of posing a threat to the indigenous flora and fauna, especially the native birds (Harada & Glasby, 2000). The inherent ideology of colonisation was to subdue the environment in order to meet the requirements of human needs rather than to live as an integral part of the nature. Rapid urbanisation through farming was one of the major reasons for immigration of settlers from the temperate and continental region of the world who were not used to living in a

geologically active region. These groups of people are also proclaimed for disturbing the nature and active environment of New Zealand (Harada & Glasby, 2000).

The continuous efforts of successive New Zealand governments, central and local in developing both legislation and policy on solid waste management for a better environment are appreciable. Public-private partnership, voluntary participation, strict regulatory framework with passive role of the central government and an active involvement of local authorities in waste management have been found as the core strategies through waste governance analysis of New Zealand (Davies, 2009, 2008).

Overall the solid waste management strategy of New Zealand has been focused on reducing the social cost and risk of waste. Reducing the damage to the environment from waste generation and disposal and increasing the economic benefit of products by promoting recycling and reusing have been core to policies in New Zealand (MfE, 2005).

Active stakeholder participation has played a pivotal role in the formulation and implementation of legislation and strategies for waste management. There has been active involvement at grassroots level in New Zealand on environmental issues and decisions which were being taken at local or regional level rather than by central government (Kelley & Slaney, 2006). Stakeholder participation in decision making can be beneficial because local citizens and businesses are more aware about the problems and requirements for their neighbourhood. Besides, stakeholder participation aids in ensuring required diversification based on local situations and demands. The strategies and policies adopted in New Zealand were always focused to promote stakeholders' participation in planning and implementation of solid waste management (Buhrs, 2003; Kelley & Slaney, 2006). The Solid Waste Management Strategy 2002 and the Waste Minimisation Act 2008 are notable, among the policies and legislation of New Zealand for promoting stakeholder participation in the management and minimisation of waste.

New Zealand's Solid waste management policies are often argued to be influenced by neo-liberal economic policy implementation in the early 1980s. The neo-liberal approach of political and economic reforms in the mid-1980s also initiated environmental reforms in New Zealand (Buhrs & Bartlett, 1993, Memon, 1993 as cited in Buhrs, 2003). The neo-liberal approach to policy-making reduced the state involvement in the development and management of resources like land, forest, energy etc. Among the notable concerns

for environmental management of New Zealand was the need to implement effective solid waste management strategies. Legislation such as the Local Government Act 1974, the Environment Act 1986, Resource Management Act 1991, Hazardous Substance and New Organisms Act 1996, were enacted. These effectively promoted public-private partnership, stakeholder participation and sharing of responsibility by consumers for waste management (Buhrs, 2003; Kelley & Slaney, 2006).

Environmental legislation and solid waste management policies were concurrent with major changes in governance, public and economic policies (Buhrs, 2003; Cocklin & Furuseth, 1994). New Zealand's environmental management legislation was influenced by global initiatives for up-grading environmental protection. The International Union for the Conservation of Nature released the World Conservation Strategy in 1980. The World Commission on Environment and Development published the Brundtland Report in 1987. These global initiatives promoted the concept of sustainability worldwide, and fostered increased political and public awareness towards the environment (Cocklin & Furuseth, 1994). In the 1970s and 1980s, environmental and resource management of New Zealand received more public attention specifically on the issues surrounding the coastal environment, energy, indigenous forest and nuclear technology (Wilson, 1982 as cited in Cocklin & Furuseth, 1994). In addition, the organisation for Economic Corporation and Development (OECD) played an important role in reviewing and strengthening the environmental administration of New Zealand (Cocklin & Furuseth, 1994). In the early 1980s, several OECD reports emphasised the inadequacies of the existing environmental framework in New Zealand and urged for reform. According to the OECD (1981) as cited in Cocklin and Furuseth (1994: 461), "The economics of environment will play more critical role in policy decisions and the early integration of environment with development policies, plans and major projects will become more urgent and complex in New Zealand as elsewhere".

The strategy for solid waste management has always been dynamic and directed towards the achievement of a healthy natural environment for New Zealand. New Zealand has adopted an integrated solid waste management approach which could be termed as "the 5Rs of waste management". It represents the global hierarchy of "Reduction; Reuse; Recycling; Recovery and Residual Management" (MfE, 2005: 5). Previously, the 4Rs

(Reduce, Recycle, Reuse and Recover) approach to solid waste management was adopted by the New Zealand government. A number of projects, programmes and campaigns like “Reduce Your Rubbish” have been launched by both central and local government in New Zealand to promote and implement the ‘5Rs’ for solid waste management (MfE, 2005).

The efforts of environmental reform and reorganisation of waste management administration in New Zealand can be seen in a series of statutory and administrative measures as above. There was “reorganisation of agencies responsible for environmental management and resource development at central government which took place over the period of 1984-1988” (Cocklin & Furuseth 1994: 461). Besides there was also reorganisation of roles and responsibilities of local authorities over the period 1988-1989 (Moran, 1988, 1992, Dixon & Wrathall, 1990 as cited in Cocklin & Furuseth, 1994). On top of these, there was crucial reform of legislation relating to the management and use of resources and the environment in New Zealand which took place over the period of 1988 to 1991 (Robertson, 1993 as cited in Cocklin & Furuseth, 1994), and resulted in the Resource Management Act 1991 which contained the concept of sustainable management.

2.4 Legal Framework for Solid Waste Management in New Zealand

Solid waste management in New Zealand is one of the prime responsibilities of local authorities. There are statutory laws like the Resource Management Act 1991, the Local Government Act 1974 and 2002 which state the roles and responsibilities of these local authorities in relation to environmental planning and waste management (MfE, 2005). The later part of twentieth century was significant for developing a number of policies and legislation that promoted a clean and green environment.

Table 4 shows the chronological development of waste management laws and policies in New Zealand.

Table 4 Legislation and Policies related to Solid Waste Management in New Zealand

Policy Interventions	Title	Year	Details
Legislation	Local Government Act	1974	Defines the purpose and roles and responsibilities of local governments in relation to providing service to the residents including imposition of local revenues.
	Resource Management Act	1991	Aims to reduce effects of development on environment including waste. 14 national standards under RMA in 2004 including banning discharges of dioxins and other toxics to air and requiring landfills over 1 million tonnes required to collect and destroy greenhouse gas emissions.
	Local Government Act (Amendment of 1974 Act)	1996	Includes requirement to produce waste management plans; bylaws for management of waste; full cost accounting
	Local Government Act (Amendment of 1996 Act)	2002	Includes requirement for waste management plans
Policy Documents	Waste Minimisation Act	2008	Defined roles and responsibilities of stakeholders like consumer, producers, local government organizations, landfill operators in solid waste minimisation and introduces pros and cons of PS schemes in New Zealand.
	New Zealand Waste Strategy (NZWS)	2002	Provides a comprehensive plan for all waste from generation to disposal. Includes provisional targets and standards, supports information and communication, full cost accounting.
	Review of targets in New Zealand Waste Strategy	2004; 2006	Details progress towards targets; Progress in organic waste; concerns about private control of waste; lack of data
Policy Instruments	Sustainable Management Fund	1994	Funds projects for partnerships (1994–2005)
	National Waste Database	1997	Includes solid, gaseous, liquid, hazardous waste, notes monitoring waste is ad hoc, identifies scarcity of data

Policy Interventions	Title	Year	Details
	Producer Responsibility Schemes	1996 onwards	Voluntary agreements including packaging, tyres, waste oil, paint, refrigerants and electronic and electrical waste

Source: (Davies, 2008: 166)

The enactment of the Waste Minimisation Act 2008 sets the framework for achievement of stakeholder participation for solid waste management in New Zealand. The Waste Minimisation Act 2008 provides a comprehensive outline of PS and responsibilities of the stakeholders for solid waste management. According to MfE (2009d: part 2 s.9) “the purpose of product stewardship is to encourage the people and organisations involved in the life of a product to share responsibility for ensuring there is effective reduction, reuse, recycling, or recovery of the products, and managing any environmental harm arising from the product when it becomes waste”.

The Waste Minimisation Act 2008 also provides a legal framework for implementing the waste levy from July 2009 and guidelines for implementing PS schemes in New Zealand (MfE, 2009d). 50% of the income from the waste levy will be distributed among the local authorities for improving waste management technologies. According to MfE (2009e: 3) “PS is a tool with the potential to improve the solid waste management. It encourages producers, brand owners, importers and consumers to help managing the environmental effects of their products throughout the life cycle”. Besides, there is an on-going process to apply for grants from the Waste Minimisation Fund that is created through the waste disposal levy. Those in charge of voluntary schemes or projects related to waste minimisation can apply to the Ministry for the Environment for grants from the Waste Minimisation Fund (MfE, 2009f). There are explicit guidelines in the Waste Minimisation Act 2008 for the potential stakeholders i.e. business organisations, retailers, households, producers of waste, and landfill operators (MfE, 2009d).

In March, 2009 there were policy discussions organised by the Ministry for the Environment for enacting the waste disposal levy. From July 2009, on the basis of positive feedback to these policy-consultations, a waste disposal levy (\$10 per tonne of waste disposed in the landfills) has been imposed (MfE, 2009b). As one of the stakeholders, the landfill operators are assigned with the following roles and responsibilities under the Waste Minimisation Act 2008,

- Provide the Ministry for the Environment or the levy collector the records and information to ensure the amount of levy has been collected accurately;
- Measure compositions of waste disposed at landfill and report it to the Ministry for the Environment ;and
- Identify the need for infrastructural up gradation for waste disposal and asses New Zealand's performance in waste minimisation and waste disposal (MfE,2009h: 1).

The Waste Minimisation Act 2008 offers explicit guidelines for the establishment and accreditation procedure for the PS schemes in New Zealand (MfE, 2009d). The Minister for the Environment has been empowered to declare any product as a 'priority product' for which the producer has to implement a PS scheme compulsorily. The accreditation of the PS schemes is considered as recognition and the process involves investigation into the economic and environmental sustainability of the schemes. Each scheme has to develop and implement operating procedures and standards to meet the requirement for accreditation (MfE, 2009d). So there is scope to verify the economic and environmental sustainability of the PS schemes in this research. This study is intended to be useful for New Zealand policy-makers and other stakeholders involved in solid waste management. This study also builds a platform for a future more comprehensive study in order to formulate economically viable schemes or policy recommendations for ensuring stakeholder participation in waste management in developing countries such as Bangladesh where the author is employed as a government policy implementer.

2.5 Strategies Implemented for Minimisation of Waste in New Zealand

In 2006, 3.156 million tonnes of solid wastes were disposed of in New Zealand. Over the years due to increase in population and economic activity, there are increases in generation of solid waste in New Zealand (MfE, 2009a).

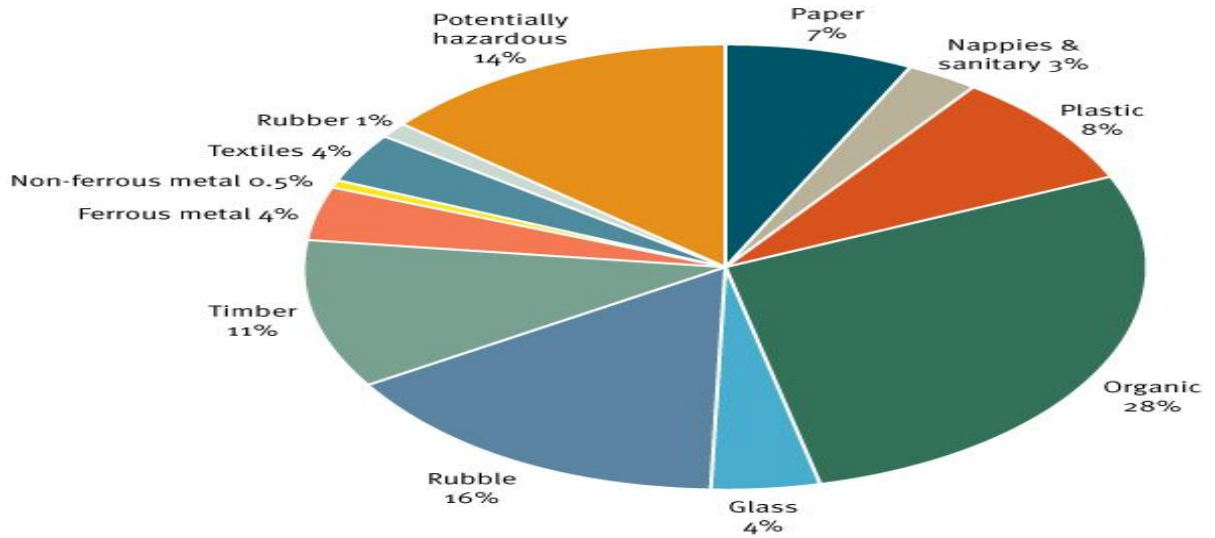


Figure 6 The Composition of Solid Waste in New Zealand over the period 2007-2008; Source: Ministry for the Environment, 2008b as cited in (MfE, 2009a).

Organic waste (at 28% of the solid waste stream) was the highest among the total wastes disposed of in 2007-2008 (as shown in Figure, 6). Rubble and potentially hazardous waste constitute almost 30% of the total waste. From 2002 to 2008, the amount of waste like organic, plastic, nappies and sanitary waste has increased whereas rubble, paper and metal have decreased (MfE, 2009a). This might be the consequences of source recycling of paper, plastic and metal products through the initiatives of the industry groups along with the local authorities (MfE, 2009a). Generally, two thirds of the total waste is potentially reusable or recyclable. However, due to the recent recession, the demand for recycled products may have declined (MfE, 2009a). The recovery rate of the potentially recyclable waste, in light of this occurrence, would likely to reduce in the near future. These may lead to a pressure or extra burden for landfills and waste management organisations in New Zealand (MfE, 2009a).

Every year, the average amount of waste sent for disposal in New Zealand is around 2.5 million tonnes which is estimated to be over a tonne of rubbish per household (MfE, 2010b). According to the Waste Minimisation Act 2008, all landfill and transfer stations are responsible for providing feedback on the amount of waste disposed of at their facilities. Figure 7 shows the monthly recorded amount of waste in tonne sent for disposal from July, 2009 to August, 2010.

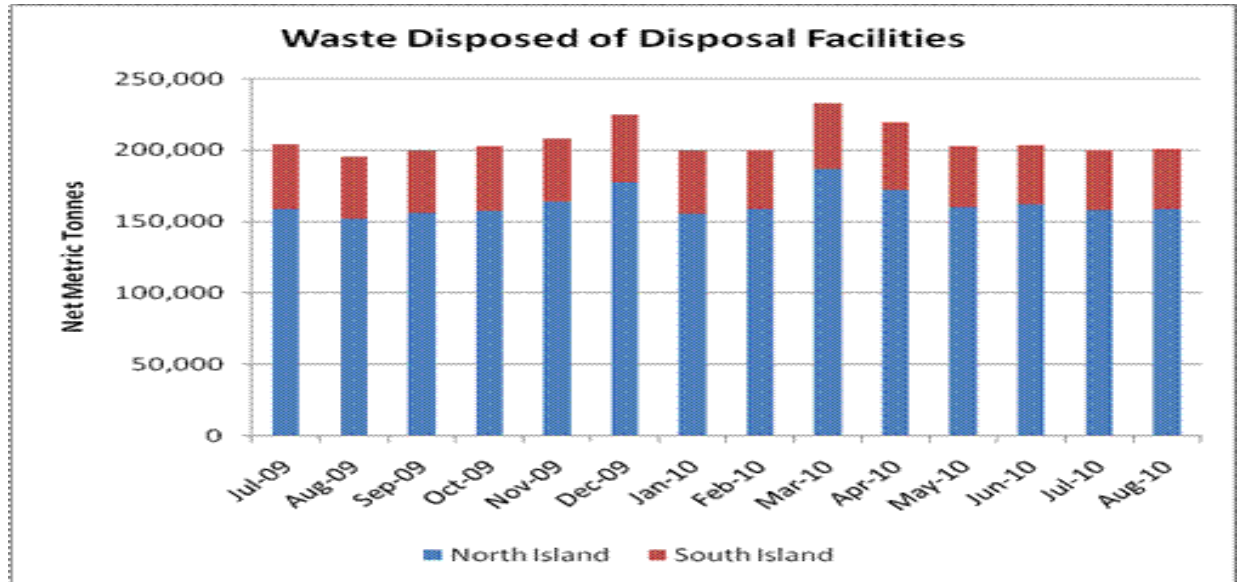


Figure 7 Amount of Waste Disposal from July 2009 to August 2010 in New Zealand (Source: MfE, 2010b)

An important attempt is undertaken by the Ministry for the Environment to monitor the disposal of waste in the landfills. Monitoring of waste disposal in the landfill will ensure the collection of waste disposal levy and help to track the trends in waste generation.

Figure 7 shows that overall the disposal rate of waste per month is at fixed level and more than 70% of wastes are generated and disposed of in the North Island of New Zealand.

The increased density of population in the North Island of New Zealand might impacted directly on the generation of waste compared to southern part of the country which is also demonstrated in some studies on developing nations (Saeed et al., 2009; Sujaududin et al., 2008).

Half of the Waste Minimisation Fund will be allocated for different projects implemented for minimisation of waste. And the process has begun as the Ministry for the Environment allocated \$880,000.00 out of \$6.0 million from the Waste Minimisation Fund for raising awareness and an educational campaign for the PS schemes (MfE, 2010c). In the 2010-2011 rounds, a total of 163 eligible applications were received by the Ministry for funding requests totalling \$ 55 million (MfE, 2010c). Figure 8 shows the sector wise distribution of the projects applied for grant from the Waste Minimisation

Fund.



Figure 8 Chart showing the Different Sector Applicants from Waste Minimisation Fund (Source: MfE, 2010c)

Table 5 gives the detail of the projects which have received fund from the Waste Minimisation Fund in 2010-2011 round by the Ministry of the Environment.

Table 5 Description of Projects received Funding from the Waste Minimisation Fund in the 2010-11 rounds.

Description of the Project/Type	Applicant	WMF contribution	Comments
Nappy composting facility for Wellington	Envirocomp Solutions Ltd Investigative	\$30,000.00	This study will investigate demand for recycling facility for nappies in that region and try to locate suitable location
E-waste recovery from a nationwide network of collection points	RCN and Associates Ltd Infrastructure and services	\$400,000.00	RCN, in partnership with the Community Recycling Network will work with landfill operators, recycling centres and town councils to collect e-waste from household consumers and small businesses.
Tyregone-Pyrolysis Project	Tyregone Processors Ltd Investigation and development	\$300,000.00	This project plans to tackle a key waste issue; tyres. It will expand an existing continuous feed pyrolysis plant for tyre recycling in Auckland
Whaingaroa Organic waste recycling feasibility study	Xtream Waste Incorporated Society Investigative	\$21,740	Xtreme Waste will investigate the most effective and financially feasible way of collecting and processing organic waste from the Whaingaroa/Raglan area

Description of the Project/Type	Applicant	WMF contribution	Comments
Marae-based recycling in remote areas	Community Business and Environment Centre Investigative	\$30,000.00	This study will investigate using Marae as drop off points for recycling in remote rural areas
Bay of Plenty Vermi-composting trial	Environment Bay of Plenty Investigative	\$100,000.00	The project expands a pilot project that combines organic waste with bio-solids, in a vermi-composting process, to produce a soil amendment product
Waste 2 Gold: Deconstruction technologies for organic waste utilisation	Scion Research Infrastructure and service	\$1,000,000.00	Using a patented process, this project will take bio-solids and organic waste processing technology out of the lab and into a pilot scale project. Using a thermal deconstruction process, the amount of bio-solids and organic waste going to landfill will be reduced
Plasback educational campaign	Agpac Ltd Education and awareness	\$130,000.00	Plasback is a product stewardship scheme for packaging waste from farms. Funding will promote awareness of this scheme that collects used and/or contaminated plastic wrap, agro-chemical containers and other packaging waste from farms so it can be recycled.
E-day 2010	2020 Communication Trust, Education and awareness	\$750,000.00	E-Day 2010 will provide an opportunity for New Zealanders to dispose of their electronic and computer waste at convenient drop-off points.
Recycling in public places; making public place recycling happen for the love of New Zealand	Glass Packaging Forum Infrastructure and service	\$1,635,500.00	This project will expand the recycling facilities available in the 12 regions hosting Rugby World Cup games. The facilities will remain in place after the event. The project will promote the LoveNZ brand by working with local councils and industry and through public education around recycling away from the home at concerts and targeted events.

Source: (MfE, 2010c: 1)

The above table indicates that there has been several projects initiated both from public and private entities to promote waste minimisation. Among the projects, Plasback and the Glass Packaging Forum (which are also accredited PS schemes in New Zealand) have received one third of the total \$6 million dollar fund allocated by the Ministry for the Environment (MfE, 2010c).

2.6 Preceding Concept and Definition of Product Stewardship

To date, the oldest government policy embodying the principle of PS has been the mandatory take-back programme under the German Packaging Ordinance 1997. It is often argued that the preceding concept of PS is extended producer responsibility and product take-back programme. Extended producer responsibility is considered to be an environmental policy approach that defines the responsibility of the producers in relation to the management of their products at the post-consumption stage. It is believed to be an effective policy tool for controlling the environmental impact of any product along with significant effort to minimise waste (McKerlie et al., 2006; Dussault et al., 2008).

Although the concept of PS or extended producer responsibility is broad compared to the mandatory take-back programme adopted in the German Packaging Ordinance 1997, the basic principle behind the process was to promote recycling, reuse and to prevent waste from being dumped inefficiently. This sort of packaging accord has been popular in most of the developed nations such as USA, Canada, Australia, New Zealand (Alcorn, 2008; Nicol & Thompson, 2007; Tojo, 2003).

PS is considered to represent the responsibilities of managing the product during the product life-cycle and endeavouring a safe and efficient disposal system (Carlton & Thompson, 2009; Cerin & Karlson, 2002). However, the definition of PS varies in respect of countries, industries and stakeholder views. According to the Product Stewardship Foundation¹ (2009a: Para 1), “PS is a ‘cradle to graveyard’ approach that helps to reduce the environmental impact of manufactured products”. These schemes hold producers, brand owners, importers, retailers, and consumers to be responsible for

1. Product Stewardship Foundation is a New Zealand based organisation established to promote model stewardship policies, Programme and legislation; researching technical issues; and helping agencies, organisations and companies to develop viable solutions. The board of Trustees includes experts from local authorities & management consultants for PS.

managing the environmental effects of their products through all stages of its life-cycle (Ahluwalia & Nema, 2007; Product Stewardship Foundation, 2009a; Peachey, 2008; D'arcy, 2009). Lewis (2005) conducted a stakeholder survey for defining PS and sustainability in the Australian Packaging Industry. The sample in the study comprised manufacturers, retailer, industry-associations, state and local authorities, non-governmental organisations, consultants, academics, and importers, covering a wide-range of stakeholder types considered as experts for PS of the Australian packaging industry. The survey was sent to 50 participants from May to October 2003 by email and 60% of them responded. Based on the stakeholder survey Lewis (2005: 54) indicated that “the principle of shared responsibility has been accepted by most stakeholders as a key element of PS as this was the term used by major survey respondents”.

PS is a contemporary strategy for solid waste minimisation and is often argued to be influenced from the concept of extended producer responsibility (Khetriwal et al., 2009). Extended Producer Responsibility is a policy implication that introduces producers' responsibility for reducing the impacts of their products throughout the life cycle (McKerlie et al., 2006). It has been introduced directly or in similar format in most western countries including the USA, UK, Canada, Japan, Australia, Ireland, New Zealand, and Switzerland (Kahhat et al., 2008; Lewis, 2005; Khetriwal et al, 2009; MfE, 2009e; Gottberg, Morris, Pollard, Mark-Herbert, & Cook, 2006). Among them, New Zealand has implemented and enacted producers' responsibility in the form of PS through the Waste Minimisation Act 2008 (MfE, 2009d, 2009e).

2.7 Global Initiatives for Product Stewardship

PS schemes in different forms are prevalent around the world. Most developed countries have developed different programmes which seemed to corroborate the objectives of PS schemes in New Zealand. Table 6 gives a brief statement of different schemes or programmes adopted by different countries of the world.

Table 6 Product Stewardship Initiatives in Different Countries

Country	Description of Scheme	Organisation
Canada	Electronic Product Stewardship: 2009 Electronics Recycling Standard defines minimum standard for end of life for electronics.	Electronic companies like Lenovo, Apple, Brother, Canon Dell, Epson and Microsoft become the part of the scheme
	RCBC is a multi-sector, non-profit, membership driven organisation that promotes the principles of zero waste through information and the exchange of ideas and research.	Recycling Council of British Columbia (RCBC)
	An end of life bottle and packaging recovery, energy and water conservation programme	Brewers Association of Canada
Ireland	Improved packaging: Remove or reduce PVC in packaging Green Chemical initiatives to improve energy consumption in manufacturing process and reduce amount of chemicals and waste in process	Sustainable Packaging Committee develop metrics, sets goals, identify improvements.
USA	The mission of the NWPSC is to work together and with other governments, businesses and non-profit groups to integrate product stewardship principles into the policy and economic structures of the Pacific Northwest	Northwest Product Stewardship Council (NWPSC)
	PPI is a non-profit education and technical assistance organisation. It aims to prevent waste and promotes sustainable production and consumption practices	Product Policy Institute (PPI)

Country	Description of Scheme	Organisation
	PSI works with state and local agencies, and other prime stakeholders to reduce the health and environmental impacts of consumer products	The Product Stewardship Institute (PSI) US product stewardship for Manufacturers
Australia	Recycling of mobile phone industry A non-profit, industry led organisation that helps recover and recycle electronic and electrical products in a sustainable way Guide how to use resources more efficiently and reduce environmental impacts of different products	Mobile Master Product Stewardship Australia Sustainability Victoria
UK	Helps individuals, businesses and local authorities to reduce more and recycling for better use of products. Provide advice, perform research and inspire business enterprises, cities and public sector bodies for capacity building and reducing waste and recycling	WRAP, UK Forum for the Future: A charity based organisation
European Union	First Pan-European take back scheme to implement WEEE directives in European Union	European Recycling Platform (ERP)

Source: MfE (2010a: 1)

PS programmes operated in British Columbia of Canada (termed as Household Hazardous Waste Stewardship Programme) have proved successful and could be reflected as a pioneer model for New Zealand PS. British Columbia's Stewardship programmes were successful in diverting huge amounts of solid waste from disposal to recycling or reusing. Ministry of Environment, Land and Parks of British Columbia as cited in Lease (2000:1) reported that "in 1999, about 84% of beverage containers, 50 million litres of lubricating oil, nearly 12 million litres of paint by the agencies and 130,000 litres of paint from the resident were recovered through the PS programmes". Previously most of these household hazardous wastes were either dumped in the landfills or disposed of illegally (Lease, 2000).

2.8 Reviewing the Product Stewardship Schemes of New Zealand

In course of the development of PS in New Zealand several policy discussions and industry studies were carried out by individual consultants. Mostly these studies were conducted to measure the feasibility of PS schemes in major industries. The study reports were submitted to the Ministry for the Environment to consider as an instrument for constituting a framework of legislation for PS (MfE, 2009e). These studies cover a wide range of products such as agrochemicals, mobile phones, used oil, tyre and white-ware which were considered to be the initial target sectors for PS schemes in New Zealand. One such study is described below, as an example.

The agrochemical products were found to be widely used as pesticides, herbicides, insecticides and plant growth regulators and defoliant in New Zealand. The stakeholders of agrochemical sectors were the major brand owners, generic suppliers or companies (via imports); industry association i.e. Animal Remedies, and Plant Protection Association, retailers and farmers (or growers). The study on the agrochemical sector reflected that the estimated amount of annual sales of plastic containers was 1.2 million which is roughly equal to estimated annual volume of 13.3 million litres (3R, 2006). According to the report of 3R² (2006: 12), major concerns for the environment in relation to agrochemical sectors are as follows:

- The inappropriate disposal of farm chemical containers could be an environmental hazard;
- Containers used for pesticides, herbicides, and cleaning products are often contaminated with residual product and often buried or burned on farms;
- Besides plastics that are burnt in open environment with low temperatures could release toxic fumes; and
- Farmers and growers were facing severe problems and the only feasible option to them was to dispose of the containers to engineered landfills

The study report stated that the farmers and the retailers agreed to travel some distance to deliver the used containers to a collection site for recycling.

2. 3R is a New Zealand based organisation which design & implement PS schemes on behalf of producers, brand owners.

A life-cycle analysis of agrochemical container was conducted in 2003. Based on the life-cycle analysis, cited in 3R (2006: 13) “ this program where farmers drop off waste plastics at transfer stations, for recycling into products as a replacement for virgin plastic, will have the least negative effect on the environment”.

Figure 9 gives a clear indication about the differences between the previous and present system of solid waste management in the agrochemical sector of New Zealand.

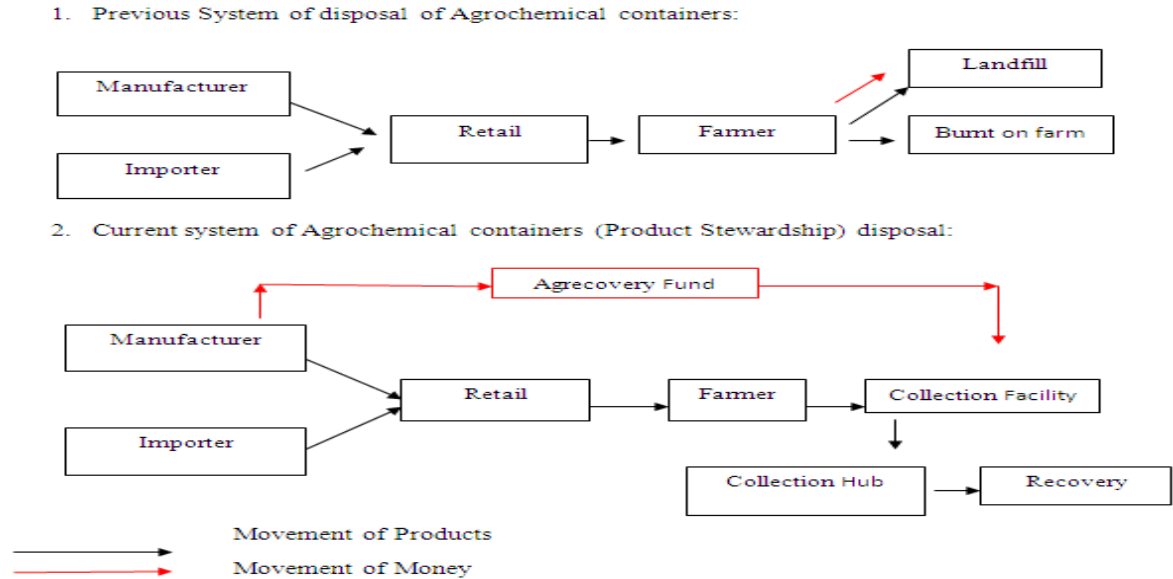


Figure 9 Flow of Products and Finances in Previous and Present Agrecovery System (Source: 3R, 2006)

The product flow system between the previous and present system of waste management in agrochemical sector seems similar. The notable difference between the two systems is the flow of capital. Previously farmers used to pay landfills for disposal of the used containers, silage wraps and, bale wraps, whereas now they are paying a levy while purchasing the products. The levy is collected and transferred by the producers, brand owners to the PS scheme for the collection and management of agrochemical products. The red line shown in Figure 9 illustrates how consumers or farmers and the producers and manufacturers are sharing their responsibility for management of waste in agrochemical sector through PS schemes in New Zealand.

Participation of the consumers (in this case farmer) is significant for any PS scheme because if the level of participation is not sufficient, the scheme might not be financially

sustainable in the long run. In this regard, the Product Stewardship Foundation along with the New Zealand Business Council for Sustainable Development (NZBCSD) commissioned a general survey to assess consumers' attitudes towards the waste levy and PS. This online survey was conducted by Shape NZ³ among 2791 respondents between March and April 2008. More than 50% of the people surveyed expressed their support for the imposition of the waste levy and for PS schemes. Respondents showed a positive attitude towards PS schemes for agrochemicals, plastic containers, batteries, car accessories, computer and electronic goods, mobile phones, paints, petroleum oils, and nappies. In addition, the respondents expressed that they intended to purchase more of the products which will be under PS schemes, even though they have to pay for the environmental handling charges (Product Stewardship Foundation, 2009b).

2.9 Sharing Responsibility and Participation in Product Stewardship

PS schemes vary in respect of their sources of finance. This is often a critical issue and needs to be researched to identify the sharing of financial responsibility among the stakeholders. In European stewardship programmes, non-uniformity was found in respect of financing the schemes. Some of the schemes are dual in nature where industry both pays for and operates the recovery system (Powell, 2009). These sorts of schemes are also prevalent in New Zealand, like PS schemes for telecommunication equipment and computer accessories (MfE, 2009e). There are PS programmes in EU countries where industry pays for the programme, and others such as local authorities, operate the recycling system. These sorts of PS schemes are not prevalent in New Zealand. Most PS schemes in New Zealand like used oil, paints, agrochemical products are funded by the producers or brand owners and managed by individual boards of trustees or management. In addition there is provision for an accreditation process under the legal framework of the Waste Minimisation Act 2008 which necessarily introduced an indirect monitoring by the government (MfE, 2009e; Powell, 2009).

3. Shape NZ is an organisation operated by New Zealand Business Council for Sustainable Development. They did a number of surveys and study on behalf of the council.

The agrochemical sector of New Zealand was investigated before entering into PS scheme by 3R Group Ltd as noted above. In its report, funding for the PS scheme in the agrochemical sector was proposed to be from the levy paid by supporting brand owners or retailers that sell chemicals into the market. The PS levy was proposed to be based on the sales volume of member companies (3R, 2006). The motivation for establishing a PS scheme in the agrochemical sector was found to be in meeting or avoiding regulation or further government intervention. The rising cost of legitimate disposal of the containers was the other motivating factor for establishing a scheme for recycling (3R, 2006).

Research in western developed countries indicates that it is often difficult to involve the retailers in stewardship programme in comparison to manufacturers and brand owners. Scott Cassel of Product Stewardship Institute of USA (as cited in Powell, 2009: 36) stated that “the large retailers have not stepped up and discussions are underway to involve retailers”. The issue of investigating into the involvement of stakeholders in PS schemes is fascinating because in most of the cases their involvement is voluntary and proactive. This study aims to get feedback from those business enterprises who are hosting current PS schemes in New Zealand. It is hoped to get a clear picture of the contributions of various stakeholders of PS schemes in New Zealand.

There are concerns over the range of products included in these schemes as listed in chapter 1. One question concerns whether the products included in PS schemes are all that should be included. Business enterprises are at liberty to introduce any PS scheme in New Zealand. At present there are successful PS programmes operating for beverage containers in British Columbia, Canada and pharmaceuticals products in Canada and USA (Lease, 2000; Veleva, 2008). So there is scope to introduce new products like alcoholic and non-alcoholic beverage containers and pharmaceuticals in PS schemes in New Zealand.

The search for new products to be considered for PS or extended producer responsibility is a continual process in developed countries (Alcorn, 2008; Powell, 2009). The Product Stewardship Institute in USA organised the 4th National PS forum on June 4-5, 2008 which was attended by state officials and experts in PS or extended producer responsibility. Dozens of new PS laws and pilot projects were reported as being implemented across the USA for electronics, pharmaceuticals, fluorescent lamps, medical

sharps, phone books, carpet etc. Products like batteries, mercury products such as switches, thermostats, pressurised gas cylinders, radioactive devices were also identified as target sector for PS. The range of PS schemes in any country is unlikely to be exhaustive at this point. Rather, there is scope that more products should be included to reduce the environmental hazards and to promote sustainability (Alcorn, 2008, Powell, 2009).

2.10 Producers' Role and Motivations for Product Stewardship

When defining PS, responsible utilisation and management of products during the life-cycle becomes the dominant factor (Carlton & Thompson, 2009). Often public and private demands for sustainable development persuade the companies to optimise the total life-cycle environmental management of their products (Cerin & Karlson, 2002). In recent times, major agrochemical companies are considered to be pioneers in life-cycle management through environmental stewardship or PS of their product (Carlton & Thompson, 2009; Cerin & Karlson, 2002; Crane, 2008).

Manufacturers or producers play an important role in shaping PS policy in the developed countries. According to the Product Stewardship Institute (USA), as cited in Veleva (2008:30), “any successful initiatives like product stewardship require the involvement of all key stakeholders, such as manufacturers, retailers, recyclers, governments, nongovernment organisations and others”. Traditionally, European companies were more supportive of environmental regulations whereas companies in USA and Canada were in favour of little government intervention rather than voluntary participation by private entities (Lease, 2000; Geiser, 2001 as cited in Veleva, 2008; Hunter & Futornick, 2008). However, producers, brand owners, and businesses in New Zealand showed their enthusiasm towards PS through voluntary participation and in response to government policy formulation. Both consumers and business entities were in favour of legislation for PS schemes in New Zealand (MfE, 2009e; Product Stewardship Foundation, 2009b). Figure 10 states the roles and responsibilities of producers beyond sales and distribution. Here the upward arrow indicates production processes and the downward arrow shows

the responsibilities for management of waste or end products.

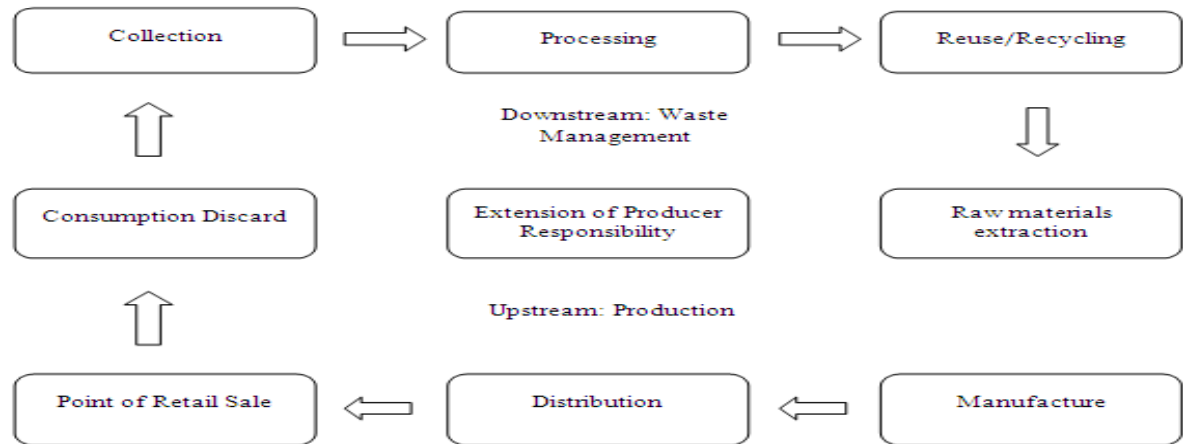


Figure 10 Extended Producer Responsibility Encompasses both the Upstream and Downstream Stages of a Product's Life-Cycle

(Source: McKerlie et al., 2005)

Voluntary PS programmes for used oil recovery in British Columbia, Canada and New Zealand have showed enthusiasm among the producers, brand owners, importers 'and specifically the consumers (Lease, 2000; MfE, 2009e). In both of the countries the legislative framework for PS came into effect after a stretch of successful voluntary stewardship initiatives. In British Columbia the Return of Used Lubricating Oil Regulation was enacted in 1992. However, there were well-established used oil recovery programmes from the 1970s in British Columbia. Danny Kelly, Manager of Marketing and Customer Service at Mohawk Lubricants as cited in Lease (2000: 5) reported that "the enactment of the return of Used Lubricating Oil Regulation did not substantially increase oil recovery as recovery programmes were already established". Mohawk Lubricants has been operating as used oil refinery in North Vancouver since 1978, whereas in New Zealand, the Used Oil Recovery Programme was established in 1996 to collect and reuse the used oil as fuel for the Holcim cement plant and Dominion Oil refining plant (Halliday et al., 2007). The used oil recovery programme was established voluntarily by the companies in response to growing industry concern that used oil was not being recovered and used responsibly (MfE, 2001 as cited in Halliday, et al. 2007).

Statutory requirements, public awareness and demand for environmental protection become the motivational factors for the producers, brand owners and stakeholders to implement PS schemes. Carlton and Thompson (2009:126) emphasised “a number of possible approaches which act in favour for increasing the level of PS across the agrochemical industry:

- Increased encouragement from the regulatory sector for companies to deliver stewardship by providing a framework of best practice;
- Increased push from the agrochemical industry although this can generate suspicion about their motives;
- Public pressures demanding the responsible production and use of materials in relation to the environment, workers and the food produced; and
- Increased efficiency of pesticides use by farmers where benefits have been demonstrated.

Sometimes the constraints on increasing the landfill capacity and avoiding detrimental effects on the environment played an important role for enacting mandatory recycling and take-back programmes. The German packaging Ordinance 1997 was implemented to manage the diminishing landfill capacity and to instigate environmental sustainability during product design (Fishbein, 1998 as cited in Murayama et al., 2000). Product ‘take-back’ or recycling systems in Europe and Asia (specifically Japan), Canada (Nova Scotia) were implemented in response to limited landfill space and consumer pressure (Wagner & Arnold, 2006; Murayama et al., 2000).

2.11 Problems of Product Stewardship

The established PS schemes are not charitable organisations; rather they are similar to business enterprises which have to face a number of barriers or challenges. PS schemes have some inputs like capital, machinery and raw materials which are collected for recycling. Then these inputs are processed for having the desired output which has to be marketed properly. In this context, operating the PS schemes as a sustainable business is always a challenge for the management or authority of those schemes (Fargher & St John, 2004).

Regulatory frameworks can be a potential barrier for any kind of business organisation. So the PS schemes might have to face a number of barriers due to the imposition of legislative frameworks (Fishbein, Ehrenfeld, & Young, 2000). This situation is

exacerbated if there are options for voluntary involvement. Then the free-riders always get some potential advantages compared to the businesses which already have introduced PS schemes. There are variations among the standards, directives or regulations followed, among the countries of the world. The European countries are following a set of standards or directives which becomes a challenge for the producers and brand owners (Hunter & Futornick, 2008). There are a number of variations observed in legislative frameworks among the states of countries like Canada, USA, Australia (Fishbein et al., 2000; Lease, 2000). In some industrialised countries environmental policies were formulated in response to different problems arose at different times and in different domains of environmental concern. So there exists a possibility of non-uniformity and unrealistic forms of legislation, standards or directives which could be a hindrance to the smooth running of PS schemes (Fishbein et al., 2000).

Sometimes organisational inertia towards disseminating the information related to PS seems to be a barrier against the success of the programmes. In New Zealand people are not aware about the PS programmes because the companies have adopted stewardship programmes which are not publicised well (MfE, 2009e). Similar situations have also been observed in cell phone take-back programmes in USA also. In 2008 Inform Inc conducted an evaluation on cell phone take-back programmes in New York City (Inform, 2008). This study had the goal of enquiring about the presence of visible signs for recycling and collection system in the retail stores of different cell phone service providers. It was found that only 70% of the stores listed on the recycling system had a cell phone take-back box in their retail outlets. Besides, employees of the cell phone retailers did not have sufficient knowledge about take-back programmes (Inform, 2008).

PS schemes also have to face different sorts of economic challenge. Demand for recycled products is generally not increasing (MfE, 2009a). It has been proved that though people are aware of environmental issues, they are not willing to convert their choices towards recycled products. In a study, almost 50% of US adults show that they value for the environment; however, only 15% appeared willing to convert their values into market choice (Fishbein et al., 2000). Also, the sale value of the recycled product is not sufficient to recover the total cost for recycling (MfE, 2009e). In this regard, subsidies from

government or donations from the stakeholders are essential for these stewardship programmes to get over the financial drawbacks (MfE, 2009e, Lease, 2000).

Often it was argued that PS schemes face different challenges especially at the beginning stage. Trading problems, logistics and sharing of financial responsibilities, free-riders and retroactive legislation are sometimes considered to be imminent challenges for most PS schemes (Fishbein, 1998, Willard, 1999 as cited in Murayama et al., 2000). Most researchers are of the view that public-private partnership along with mass stakeholder participation could be the most feasible option for overcoming these challenges (Ahmed & Ali, 2006; Davies, 2009; Quick, 2008). Sometimes framework legislation or policy guidelines providing market advantages could be effective in successfully implementing these sorts of scheme (Alcorn, 2008; Carter, 2007; Davies, 2009, Willard, 1999 as cited in Murayama et al., 2000). However, the effectiveness of legislative frameworks in generating motivation among the stakeholders for implementing voluntary PS schemes has to be examined, which is one of the core objectives of this study (Carter, 2007).

2.12 Sustainability and Product Stewardship

The concept of PS is often related to the term sustainability. According to the United Nations Department of Economic and Social Affairs, Division of Sustainable Development, as cited in Crane (2008:56), “sustainability has social, environmental and economic dimensions that include protecting and promoting human health conditions, protecting natural resources, and preserving and enhancing the economic mechanisms that enable humans to function and prosper”. In some industries, the term PS refers to the commitment and dedication of the manufacturer to assure that the product can be safely manufactured, installed or applied and used on the basis of independent testing and certification. However, in recent years PS aims to reduce the life-cycle impact of the goods and promote sustainable end of life management.

Producers, manufacturers and brand owners are keen to show that they are adopting sustainable practices in production and management of the products (Collins, Lawrence, Pavlovich, & Ryan, 2007). Large companies are found to be in better position in terms of overcoming the barriers of adopting sustainable practices. In a study of over 800 firms in New Zealand, it has been found that large companies compared to the small and medium

enterprises are more actively engaged in sustainable practices. Mostly the large companies preferred to upgrade their reputation and brand name through the adoption of sustainable practices (Collins et al., 2007). In general, the large companies were found to engage in environmental practices as a result of both external and internal pressure from parent companies, shareholders and employees. Overall companies in New Zealand, irrespective of their size, have mentioned cost-implications, management time and other priorities as the main barriers for implementing sustainable practices in their businesses (Collins et al., 2007).

Most PS programmes are focused to promote environmental sustainability along with better management of solid waste. Dr Thomas Pinfold, vice president of Gardner Pinfold Consulting, completed a research project on behalf of Ministry of the Environment of British Columbia, Canada. He investigated the possible benefits of provincial regulation on recovery of tyres, beverage containers, oil, electronics, solvents, and pharmaceuticals. His results as cited in Powell (2009:36) showed that:

- The various stewardship programmes collected 132,000 tons of these materials in 2007, thus creating 1,600 recycling-related jobs (and 500 more non-recycling jobs); and
- In terms of global warming, recovery of aluminium cans and tyres accounted for 82 % of the greenhouse gas reductions, or the equivalent of removing 73,000 cars from the road. From the perspective of a landfill manager, stewardship programmes removed bad materials, thus lowering management costs.

So the benefit of PS schemes should be counted in respect of both economic and environmental factors.

PS and sustainability are mutually dependent on certain factors like on-going sources of finance, and effective and efficient collection and recycling systems. However, the major emphases are on the funding and active participation of stakeholders. There are different types of PS programme such as beverage containers, used oil, paints, pesticides, gasoline, flammable liquids, and pharmaceuticals occurring in British Columbia (Lease, 2000). Among these, consumers have to pay for the beverage containers, if they do not redeem container deposits and through recycling fees for non-alcoholic beverage containers. In 1998 the net unredeemed deposits on all beverage containers amounted to CA\$ 16.0 million. The programme costs for used oil recovery programmes in British Columbia were borne by the oil industries (Lease, 2000).

In New Zealand the situation is similar to the British Columbia's used oil stewardship programme. Major oil distributors like Shell, BP, Mobil and Caltex along with D R Britton (Valvoline), Holcim NZ in partnership with the Ministry for the Environment have been funding the used oil stewardship programme since 1996. The programme is designed to ensure that the used oil is collected, transported, recycled and reused as fuel for cement production (Halliday, et al. 2007). On the other hand, the paint stewardship programme of British Columbia is funded by 'eco-fees' (Lease, 2000: 6). This eco-fee is collected at the point of sale and may increase the product's price. However, the percentage of increase in the cost is negligible. There are also provisions of 'eco-fees' for gasoline and other flammable liquids in British Columbia (Lease, 2000). From 1994 to 1998 a total of Can \$ 13.5 million was earned as revenue from 'eco-fees' in British Columbia and all programme costs related to 'eco-fees' were recovered from the accumulated revenues (Lease, 2000). All of these PS programmes, although they are voluntary and not funded by the government, are perceived to be sustainable because they have sound funding and due to active participation by the stakeholders (Lease, 2000; Halliday et al., 2007).

The sharing for the environmental cost of any product (either from inefficient resources use or disposal cost) is another significant factor for sustainability of PS schemes. With PS, the environmental costs of any product are usually included in the price. Otherwise the costs of the environmental impact from a product are usually borne by general taxpayers, ratepayers rather than the consumer or producer. So "polluters pay" is the basic principle behind the implementation of PS schemes. However, sometimes partial disposal costs are paid by the consumers and a significant portion is diverted to the general tax payers (Lease, 2000; MfE, 2009e).

2.13 Benefits of Product Stewardship

PS had positive environmental impact and encouraged the manufacturers to rethink about product design (Fishbein, 1998 as cited in Murayama et al., 2000). Ryan (1998 as cited in Murayama et al., 2000: 2), concluded that "extended producer responsibility systems could be capable of reducing environmental impact if used as a feedback loop for producers to redirect design and stimulate ideas".

The environmental benefits of these PS programmes are the major contributions to society and nature. The used oil stewardship programmes of British Columbia and New

Zealand have proved to reduce the energy use and soil and water pollution (Lease, 2000; Halliday et al., 2007). It is possible to restore the lubricating properties of the oil through refining. Besides, this recycled used oil can be used as fuel for cement and other industrial products as practised in New Zealand (MfE, 2009e). If this oil was disposed of without recycling it would definitely contaminate the soil, ground water, the oceans and the atmosphere and increase the extent of pollution of this natural environment (Lease, 2000).

Often household hazardous products like paints, gasoline, flammable liquids, and pesticides can have far reaching environmental impacts. Paints contain flammable ingredients or organic solvents that could have detrimental, mutagenic or teratogenic effects on human and living organisms. When these hazardous wastes are dumped into drains, on the ground, into storm sewers, or disposed in the trash, they may cause severe physical injury to waste workers, contaminate waste water treatment systems, pollute streams, threaten flora and fauna and even pollute ground water (Lease, 2000; Sujauddin et al., 2008, Shekdar, 2009). Even if these materials are properly disposed of in landfills they pose threats to the environment. So the environmental value of this recycling and reuse of these hazardous products through PS is invaluable (Lease, 2000; Veleva, 2008).

It is believed that the practitioners of these schemes could be the best source for enquiring into the success of these PS schemes. In this respect the experts and managers of these schemes could yield specific information. Responsible PS schemes in the paint and coating industry in Canada have been proved successful. One of the most notable reasons behind the success of the PS schemes in the paint and coating industry of Canada is due to the involvement of technical expertise of best stewardship professionals in the world. It is believed that these professionals have proven their ability to consistently develop cost effective and environment friendly schemes (Powell, 2009; Quick, 2008). Jim Quick, the president of the Canadian Paint and Coatings Association, Ottawa, ON stated that “there are those who will tell you that the emergence of paint stewardship in Canada is due to increased provincial regulation. Not true, paint stewardship has developed primarily because the paint industry has made it a priority” (Quick, 2008: Para. 3). The reason behind selecting the managers of host business organisations along

with the PS schemes as samples for this study is that they could provide valuable comments on their motivations and inspiration for establishing such voluntary schemes.

The economic gain through recycling and reusing of products through PS programmes is vital because it opens up a new dimension of designing products in a sustainable manner so they can be recycled effectively and efficiently. Industries like paint, packaging, cell phones, and electronic goods have upgraded their supply chain management through introduction of take-back, recycling programmes introduced in most of the developed countries. There are established take-back or stewardship programmes for cell phones, batteries, paints, electronic goods, computers in countries like USA, Japan, Australia, Canada, New Zealand and EU countries (Wagner & Arnold, 2006, MfE, 2009e; Lease, 2000; Inform, 2008; Arena, Mastellone, & Perugini, 2003). These programmes are a strategic part of supply chain management because once a product is recycled; it induces an economic gain as well as generates a demand for that product in the market also.

PS has a significant contribution in increasing employment opportunities which is definitely an economic gain for most of the countries (Lease, 2000). The PS programmes of British Columbia created new employment opportunities within the province. In 1997, the Ministry for the Environment, Land and Parks of British Columbia reported that due to implementation of an expanded beverage container recovery programme 360 new full time jobs could be generated. There was employment generation in various PS programmes along with possible growth in other sectors like transportation and, financial institutions also (Lease, 2000). In New Zealand most PS schemes like paint, used oil, agrochemical, battery and electronic goods were established as joint ventures among the producers, retailers, importers and brand owners. However, these PS schemes eventually induced a flow of investment which necessarily introduces new collection, transportation, processing and marketing companies. All of these activities induced by the PS schemes have been reported to create job opportunities in New Zealand (MfE, 2009e). The extent of job creation in this PS sector has not been investigated thoroughly in New Zealand.

PS is directed to achieve environmentally safe disposal for certain hazardous products along with recycling and reusing thus to promote end of life management. However, most of these PS schemes or programmes have to depend on certain other factors which determine their longevity. Boks et al., 1998 as cited in Murayama et al. (2000:1) after

performing an international comparison between legislation and end of life scenarios for consumer electronics concluded that “legislation and market forces are major factors determining the end of life scenarios”. In this respect researchers indicated the necessity for framework legislation to cover most of the products irrespective of recycling value (Murayama et al., 2000; Carlton & Thompson, 2009).

2.14 Concluding Remarks

PS schemes in New Zealand are generally at their preliminary stage. Most of these schemes or programmes are voluntary and an accreditation process is going on through the Ministry for the Environment. The legal framework under the Waste Minimisation Act 2008 came into effect recently. Before enacting the Waste Minimisation Act 2008 several policy discussions and feasibility studies for PS scheme for certain products were conducted. The Ministry for the Environment and organisations like the New Zealand Business Council for Sustainable Management and the Product Stewardship Foundation are monitoring the advancement of PS in New Zealand and have been publishing their researches.

The studies covered in this review covered different aspects of solid waste management in New Zealand. Most of these studies reflected about comprehensive legislation to promote minimisation of solid waste, stakeholder participation and public-private partnership and to streamline the governance structure and role in solid waste management (Bailey, 1985; Boyle, 2000; Davies, 2008, 2009; Goven & Langer, 2009). Several studies were encountered during the review which mostly focuses on extended producer responsibility and product take-back programmes (Davis, Wilt, Dillon, & Fishbein, 1997; Dussault et al., 2008; Fishbein et al., 2000; McKerlie et al., 2006; Nicol & Thompson, 2007; Tojo, 2003). Often these extended producer responsibility, product take-back and recycling programmes which are considered as predecessor of PS are prevalent and found to be effective in reducing several hazardous wastes like electronic, and clinical waste (Kahhat et al., 2008; Wagner & Arnold, 2006; Blenkarn, 2006; Davis & Herat, 2008; Herat, 2007; Khetriwal et al., 2009; Lewis, 2005).

Different aspects of PS programmes of different countries were reviewed. Studies on PS mostly focused on different core challenges and aspects of developed countries like

Australia, Canada, EU countries, USA (Alcorn, 2008; Crane, 2008; D'arcy, 2009; Hunter & Futornick, 2008; Inform, 2008; Lewis, 2005; Powell, 2009; Quick, 20008; Tojo, 2003; Veleva, 2008). However, to date there has been no comprehensive published study verifying different aspects of PS programmes as a means for minimisation of solid waste in New Zealand. So there is scope to examine stakeholders' views and ideas about problems, benefits and the perception of environmental and economic sustainability of PS schemes in New Zealand. The sharing of responsibilities among the stakeholders is also a core issue which is not yet comprehensively addressed through research. So this research moves the international research agenda forward, focusing on New Zealand context, as described in the next chapter.

Chapter 3 Theoretical Paradigm and Research Methods

This thesis seeks to examine the problems and benefits of PS as stakeholder participation in solid waste management. In this regard the thesis began by reviewing the literature, exploring and expanding the researcher's background knowledge of PS schemes and its preceding concepts like extended producer responsibility and product take-back programmes. The various academic and professional literatures analysed in the previous chapter have covered the definition, global initiatives, problems and benefits of PS with reference to different countries including New Zealand.

This chapter begins by exploring the relevant theoretical paradigms for the research. The next hurdle was to select an appropriate research method along with research samples which will serve the purpose of the research. The rationale for selecting the research method is an important part of the chapter. The research sample along with sampling methods and reasons for selection are explained in the chapter. The data collection method in terms of the research samples or participants is described in the latter part of the chapter. Finally, the data analysis techniques are described for both the quantitative and qualitative data acquired during the research. Data analysis is very important because it generates the most important 'results and discussion' part of the research which follow in the next chapter.

3.1 The Relevant Theoretical Paradigms

The theoretical paradigm of the research is vital because it forms the philosophical background of the research. In this particular research the research questions are at the core for selecting the appropriate paradigms. The meta-theoretical paradigm of 'positivism' played a significant role in formulating the ideas about the research. Since the quantitative part of the research was planned to use questionnaire survey data collection, this study was seen to be in the area of positivist approach of social science (Davidson & Tolich, 1999; Neuman, 1997). Most of the time a positivist prefers precise quantitative data from scientific experiments, surveys and statistics. Positivism aims to measure, and the objectives of the research are used to verify the hypothesis by carefully analysing numbers obtained during data collection (Neuman, 19997).

Though there was component of positivism in the research, it is clear that this theoretical paradigm itself is not sufficient. The paradigm of positivism is quite rigid and expects concrete evidence for approving any hypothetical statement. In positivism, the objectives of the research are preferred to be achieved through the verification and presence of observable findings, perceivable entities or processes (Wolfer, 1993, Poole & Jones, 1996 as cited in Clark, 1998). The research is particularly intended to identify the problems and benefits of the PS schemes in New Zealand. In addition, it aimed to measure the perceptions of the stakeholders about the sustainability issues of the PS schemes which do not have the status of concrete proof; rather the evidence expected from the research is more related to culture, practices, beliefs, motifs, and finally the rationality of the human beings who are involved in PS schemes in New Zealand.

Consequently, the philosophical background of ‘post-positivism’ seems to be more specific and appropriate to meet the desired objectives of the research. Post-positivism has been promoted by works of Karl Popper, Jacob Bronowski, Thomas Kuhn and Charles Hanson (Popper, 1959, Bronowski, 1950, 1956, Kuhn, 1970, Hanson, 1958 as cited in Clark, 1998). Post-positivism differs from positivism because it proclaims the realist perspectives of science that advocates about human perceptions or realisations having the capability of explaining the functioning of observable phenomena (Clark, 1998). This is vital for this research because the objectives of the research are to verify the perceptions of the stakeholders for extracting the problems, benefits and evaluating the sustainability of the PS schemes.

Post-positivism can more readily include the qualitative part of the research as well as the quantitative data from the survey. In post-positivism researchers are interested to enhance the validity and reliability of quantitative or statistical data through qualitative data. Qualitative approaches are gaining more recognition in social science because of the necessity for a dynamic approach due to changes in epistemic and institutional parameters which are supported by the ‘post-positivist’ approach (Adam & Podmenik, 2005). The post-positivist acceptance of mixed-method of social research is stated by Clark (1998: 1245) “Post-positivist research need not exclude either qualitative (i.e. non-numerical) data or ‘truths’ found outside quantitative method; acceptance of this is crucial to rejecting the strict dichotomy often drawn between the qualitative and

quantitative paradigms”. So the research methods are also supported by the epistemological background of ‘post-positivism’.

The theoretical paradigm of ‘post-positivism’ provides a holistic approach to the research and is able to overcome the rigidity of traditional ‘positivism’ in respect of research methods and philosophical background (Adam & Podmenik, 2005). The dynamic characteristics of the post-positivism paradigm are increasing its validity and reliability in various sectors like nursing science and, operations management (Meredith, Raturi, Amoako-Gyampah, & Kaplan, 1989; Clark, 1998). Operations management includes the end of life management of the product for economic gain and reputation. Often this notion has been pronounced as reflecting the concept of PS (Meredith et al., 1989; Cassel, 2010).

3.1.1 Triangulation Metaphor as the Means of Conducting Post-Positivist Research

‘Triangulation’ has been used extensively in social science research in the post-positivist era because it emphasises multiple measurements and observations for extracting the exact position or true pictures of real life (Cox & Hassard, 2005). The use of triangulation was traced to Campbell and Fiske (1959) in social science research and the development of the idea of “multiple operationism” (Jick 1979: 602). The applicability of triangulation in post-positivism lies in the fact that it is a means of representation on the basis of logic and it is possible to attain excellence in research through obtaining a plausible representation by multiple measurements, using multiple methods or multiple levels of analysis (Gersick, 1991, Lewis & Grimes, 1999 as cited in Cox & Hassard, 2005). In social science research ‘triangulation’ was frequently used though in earlier decades quantitative methods were predominant (Coyle & Williams, 2000; Friedemann & Smith 1997). Traditionally, the combination of multiple methods in social science research is advocated to provide convergence which yields completeness through further development of quantitative data from the findings of qualitative methods (Webb et al., 1966, Smith, 1975, Denzin, 1978, Campbell & Fiske, 1959 as cited in Jick 1979; Risjord, Dunbar, & Moloney, 2002). Yet it is possible to attain the completeness and comprehensiveness of the research in respect of research output. So in this research the target groups are diversified along with the inclusion of effective research methods involving a combination of both quantitative and qualitative data collection techniques.

The legitimacy of triangulation in the arena of social science research, though challenged by some theorists (Moccia, 1988; Philips, 1988 as cited in Risjord et al., 2002) is accepted and validated among recent researchers and theorists in social science (Friedemann & Smith 1997; Jick 1979). It has been suggested by various authors such as Duffy (1987), Goodwin and Goodwin (1984), Haase and Meyers (1988), Mitchell (1986) and Shih (1998) that “a single hypothesis can be confirmed by both qualitative and quantitative methods” (Risjord et al., 2002: 270). These proponents of triangulation have rationalised that different methods support each other; enhance the reliability and competitiveness of the result through strengthening of evidential support (Risjord et al., 2002; Friedemann & Smith 1997; Jick 1979; Coyle & Williams, 2000).

Here the research aimed to attain the comprehensiveness through triangulation of data obtained during the research. There is secondary data, mostly obtained through literature reviews on various aspects of, solid waste management strategy in New Zealand, preceding concepts of PS like extended producer responsibility, product take-back system and particularly problems and benefits of PS programmes. The quantitative data obtained by the survey of personnel from the local authorities, host business organisations of PS and waste management organisations is expected to create a firm basis of understanding. The core data is expected to be obtained from the semi-structured interviews of the representatives from PS schemes in New Zealand which constitutes the qualitative part of the research. Triangulation of these sets of data is expected to create a firm basis of understanding as represented in Figure 11.

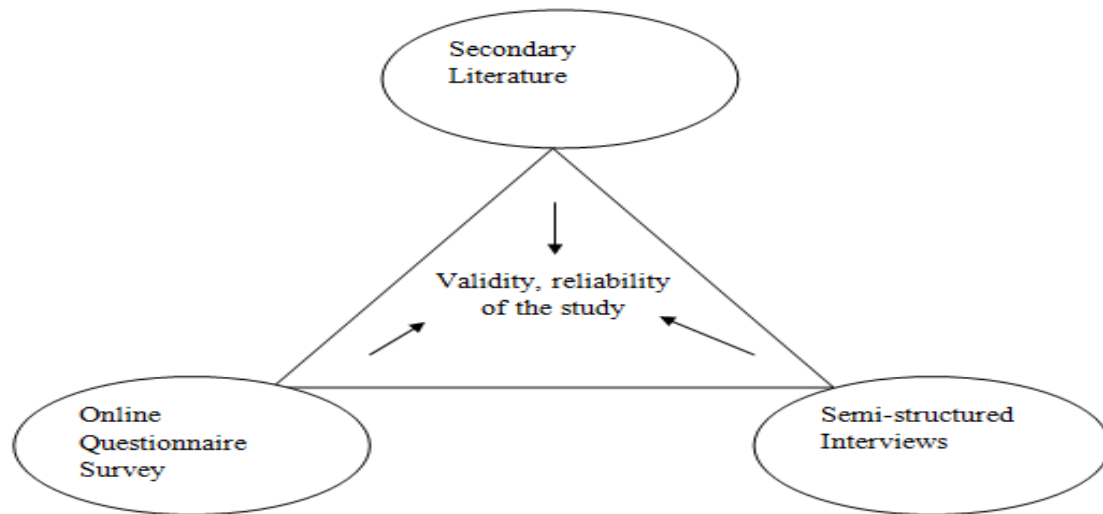


Figure 11 Schematic Diagram Plotted to Symbolize the ‘Triangulation’ Metaphor in the Research

3.2 Research Method

In social research it can be a challenge to select the appropriate method. Background studies and literature review play a vital role for selecting appropriate research method. Several studies were helpful for deciding the methodology of the research (Bailey, 1985; Boyle, 2000; Buhrs, 2003; Goven & Langer, 2009; Davies, 2009; Lewis, 2005; Veleva, 2008). The studies were bipolar in respect of research method, either quantitative or qualitative.

In order to select the research method it was necessary to begin with the aim of the research. The aim of the research was to define the PS concept as stakeholder participation for solid waste management. So to fulfil this aim with any certainty the stakeholders of PS and solid waste management were considered be the best source of data. Thus the research participants include a portion of stakeholders of PS in New Zealand.

The Waste Minimisation Act 2008 which embodies the principles of PS as a means of solid waste minimisation acts as a guiding factor for selecting participant stakeholder groups. The Act specifically defines the roles and responsibilities of local authorities, business organisations and landfill operators in respect of PS and the waste minimisation.

Here landfill operators are included because of their responsibilities regarding the collection of the waste disposal levy.

Among the core objectives of the research, defining the concept of PS is vital because the concept is contemporary and the stakeholders of PS programmes could be the best point of contact for defining it. Similar studies were carried out by Lewis (2005) for defining PS and sustainability in the Australian packaging industry, by Boyle (2000) on solid waste management in New Zealand and by Veleva (2008) to define PS and role of business in USA. In the Australian packaging industry Lewis conducted a survey among the identified experts representing Australian companies, industry associations, government authorities, academia and environment organisations (Lewis, 2005). Boyle (2000:519) in her study conducted survey among a total of “101 organisations representing local governments, general industry, waste management industry, consultants, Iwi (Maori Tribes) and non-government organisations” in New Zealand to verify the aspects of solid waste management. Veleva (2008) in her study also emphasised getting views and ideas from business and state government authorities. Thus in this research the aim has been to select representatives from local authorities, host business organisations of PS, waste management organisations which have expertise in PS, recycling, and reuse as the sample. Survey needs to be conducted among the local authorities, host business organisations and waste management organisations, to get their responses related to the concept of PS. Survey among the stakeholders have been widely used for defining solid waste management in New Zealand as well (Bailey, 1985; Boyle, 2000).

PS schemes managers are the experts in the field so were considered to be able to provide their views and ideas about the problems, benefits and perceptions of environmental and economic sustainability of the schemes. The researcher was concerned to get into contact with the participant stakeholder groups directly to improve the extent of data collection. Goven and Langer (2009) while verifying the potential of public engagement in sustainable waste management did arrange some workshops and seminars among various stakeholders. The idea of their research was to generate ideas and dialogues among the participants which have helped to generate a concrete basis of understanding on the issue of public engagement. Here in New Zealand the PS schemes are spread across different

parts of the country which makes it difficult to bring them together to discuss the issues in a focus group discussion or similar. So the idea to do a qualitative study was selected, based upon the model of Goven and Langer (2009), with semi-structured interviews among the personnel involved in PS schemes in New Zealand in an effort to ascertain thoughtful responses about the problems, benefits and sustainability of PS schemes.

The host business organisations implementing the PS schemes are one of the priority target sector for the research. Personnel from the business organisations which have supported and patronised the PS schemes of New Zealand were included in order to get their views about their roles in PS. The semi-structured interviews solicited their reasons for implementing voluntary schemes in New Zealand.

In this regard, Table 7 has been developed to identify the potential objectives of the research along with the expected participant stakeholder groups for that particular research objective.

Table 7 Objectives-Participant Stakeholder Groups Matrix

Respondents Objectives	Local Authorities	Host Business Organisations	Waste Management Organisations	PS Schemes
Defining product stewardship	Survey	Survey	Survey	Semi-structured interviews
Feedback on policy framework	Survey	Survey	Survey	Semi-structured interviews
Problems and benefits of PS schemes	N/A	N/A	N/A	Semi-structured interviews
Motivation for PS	N/A	Survey	N/A	Semi-structured interviews
Sustainability issues of PS schemes	Survey	Survey	Survey	Semi-structured interviews
Suggestions for improving policy framework	Survey	Survey	Survey	Semi-structured interviews
Responsibility sharing among the stakeholders	Survey	Survey	Survey	Semi-structured interviews

3.3 Rationale for Mixed-Method of Research

The method selected for this particular research falls in the category of mixed-methods of social research. There is a combination of quantitative and qualitative research methods which is often argued to bring forth a comprehensive and competent outcome (Jick, 1979; Friedemann & Smith, 1997). Mixing qualitative and quantitative methods is becoming popular in social science research. This form of research method is sometimes expressed as mixed-design, mixed-methods and multi-methods (Mortenson & Oliffe, 2009). The fundamental principle of mixed-methods research has been described by Johnson and Onwuegbuzie as “the researchers should collect multiple data using different strategies, approaches and methods in such a way that the resulting mixture or combination is likely to result in complementary strengths and non-overlapping weaknesses (Johnson and Onwuegbuzie, 2004: 18 as cited in Niaz, 2008). Here the research methods also aim to integrate and combine a group of data and assimilate and amalgamate the data in order to bring out a better description of the PS schemes or concepts in New Zealand.

3.4 Research Samples

Local authority personnel are prioritised as key respondents for most of the studies done on solid waste management as well as on PS and extended producer responsibility. Local authorities play a significant role in solid waste management and are often associated with policy implications for waste management or minimisation. Here the studies done by Boyle (2000) on solid waste management in New Zealand and Lewis (2005) on PS in the Australian packaging industry were considered as guidelines for selecting local authorities as one of the key respondent group for this study.

Considering various factors of local authorities and the scope of the research, whole population sampling has been selected as the sampling method. There were 85 local authorities such as district councils, city councils and regional councils in New Zealand at the time of data collection on July 2010. Mostly the district and city councils have played a vital role in implementing solid waste management in New Zealand. These councils are also legally bound to develop their own waste management and minimisation strategy or plan based on the local demands and conditions. So the district councils and city councils have to be included as respondent groups. On the other hand, the regional councils play

vital roles for policy formulation on environmental management especially for solid waste and storm-water management. Since the preferred method for data collection among the councils was a questionnaire survey, all of the 85 local authorities (see Appendix I) of New Zealand are included as the participants for questionnaire survey in the research. The online questionnaire surveys were sent to the environmental manager or personnel responsible for recycling operations of all the local authorities in New Zealand. The next survey sample group consists of host business organisations, producers or brand owners which have patronised and are still continuing as the partner of existing PS schemes in New Zealand. Schemes are owned and managed by an individual company and are either under board of trustees or managed by management consultants. There are a number of national and multinational organisations, brand owners and producers who have provided funding for the establishment of schemes which are usually managed by board of trustees. Some of these organisations are federations of producers and importers. However there were specific criteria for selecting the host business organisations. The names of these host business organisations were collected from the websites of PS schemes in New Zealand. It was from among those business organisations which are New Zealand-based and could be reached for participation in the survey that research participants for the survey were selected. Companies which have their own PS scheme were not included for the survey because their schemes would be included in the sample for interviews at subsequent stage of this research. So 40 (see Appendix II) New Zealand based business enterprises or associations of producers were included for the survey as samples. The emails containing the link for online questionnaire survey were sent to the customer services departments of those host business organisations. The customer service departments were requested to forward the email to corresponding managers for providing feedback in the survey.

The purposive or judgemental sample based on certain criteria has been adopted for selecting the waste management organisations. It is an acceptable form of sampling method for special situations. The samples are selected using specific judgement or keeping the purpose in mind in case of purposive sampling (Neuman, 1997). There are various forms of waste management organisations in New Zealand. Some of them are engaged in collection of solid waste on behalf of local authorities and managing landfills

and transfer stations. Besides these, some organisations have experts in the field of recycling, reusing and disposing of unusable wastes. In addition there are organisations which generally work in the field of research and development of recycling and reusing, including sustainable management of waste. The objective behind selecting the waste management organisations in this research was to get valuable feedback from stakeholders who have the expertise and technical know-how. The names of the waste management organisations in New Zealand were collected from the Yellow Pages Directory. The waste management organisations which were working for recycling, reusing of waste, and managing landfills or transfer stations were shortlisted and included in the survey. In addition, the Product Stewardship Foundation and the 3R group Ltd were selected on the basis of their involvement in research and development on PS in New Zealand. Based on the above criteria of purposive sampling 34 waste management organisations (see Appendix III) were selected to respond to the survey. The technical managers for large organisations and the managing directors for small organisations were contacted through email for responding in the online questionnaire survey.

All of the PS schemes listed in the Ministry for the Environment website have been included as the research samples for semi-structured interviews. There were 15 PS schemes on February 2010 including one accredited scheme in New Zealand. Although the schemes were scattered across New Zealand, to reduce the sampling error and increase the reliability of the research, all of the PS schemes were included for semi-structured interview in the research. Later on during the data collection, one more scheme was included for interview because it received accreditation by the Ministry for the Environment in May 2010. So, all of the 16 PS schemes (see Appendix IV) managers were invited for participation in semi-structured interviews.

Therefore, the overall sampling methods used for this research was either whole sampling or purposive sampling, reducing possible errors from random or stratified sampling. It also reduced the chances of bias and any form of tendency induced during the research. The research samples are comprehensive and contain a wide range of stakeholders who were associated with PS schemes or policy-making either directly or in an indirect way i.e. providing financial, management or technical support to the PS schemes.

3.5 Data Collection

Ethics approval (see Appendix VII) was gained prior to data collection from the AUT Ethics Committee. The surveys were sent to all the local authorities, business organisations, and waste management organisations with the target participants, the personnel of those organisations responsible for environmental management or policy formulation. Semi-structured interviews were conducted with the managers of PS schemes. In this particular research, an online questionnaire survey (see Appendix V) was sent to the respondents from the local authorities, host business organisations and waste management organisations.

The online questionnaire survey method is more reliable and user-friendly. Besides online questionnaire survey has some significant advantages over other survey formats if it is conducted properly and in appropriate situations (Evans & Mathur, 2005). Any responsible person from the participant stakeholder groups is expected to have email address which makes the online questionnaire survey more effective and useful for data collection in this research. It is easy because once the online questionnaire survey is set up; the link can be emailed to the participant. When the participant clicks on the link, the questionnaire survey appears on the screen and the responses from the participant is transferred and stored in the online survey portal and the participant does not need to email or return the survey form. The average response rate in the survey was 40% and almost 73% (62 out of 85) of participants from the local authorities responded in the survey which could be due to some positive attributes of using online questionnaire survey method.

In addition to the online questionnaire survey, semi-structured interviews were conducted. Although managers of all the 16 PS schemes (see Appendix IV) of New Zealand were contacted by email and telephone, only 8 PS schemes provided representatives for interviews. Due to confidentiality reasons the names of the PS schemes participated in the interviews are not disclosed. The interviews were held in Auckland, Wellington and Christchurch and the interviewees were invited to select the time and place for the interview. All of the interview sessions were audio-taped and transcribed personally by the researcher who became familiar with the interview data in the process.

The interview sessions were lively. Though the guidelines from indicative questions (see Appendix VI) approved by the AUT Ethics Committee were followed, the beauty of the semi-structured interviews was that there were discussions over the issues that came out, supplementary to the formal questions which were asked. The participant information sheet helped interviewees to get a brief idea about the research. There was no incentive offered to the participants for the interview. However, their valuable comments would enhance the existing knowledge base on PS.

3.6 Data Analysis

Data analysis denotes the transformation of raw data collected through data collection methods into presentable statements or indices. Often, the analysed form of data argued to present another hypothetical statement for research (Neuman, 1997). Most of the research data acquired in raw states either in numerical or descriptive forms needs to be analysed systematically otherwise it can end up providing no value at all. The objective of analysing the data is to locate the evidence for research questions and hypotheses.

In this research both quantitative and qualitative types of data needed to be analysed. Both forms of data are valuable in terms of their role in accomplishing the objectives of the research. However, the survey data which is quantitative consists of multiple variables (see Table 8). So the desired output of the quantitative data was to get the 'percentage of respondents reporting'. However, there were some open ended feedbacks desired due to questionnaire design, which are presented either by quotation or amalgamated with the qualitative data.

The questionnaire (see Appendix V) survey was done online using the Survey Monkey web portal which provides percentages of respondents reporting on the questions of the survey. Here the online survey was designed as a multivariate questionnaire so the expected outcome of the survey was to plot graphs or tables which reflect the distribution of responses as percentages for each topic. For each question to give feedback in the questionnaire survey, there were several suggested topics or answers and a blank field to provide any additional comments. So any individual participant could select any or the entire suggested topic for each question. The objective of designing the questionnaire in such a pattern was to get the attributes on each topic based on the percentages of

responses from the participants. This percentage gives an idea about the importance of the topic which eventually guides the researcher in sorting out the answers for the research questions. In this research the Survey Monkey web portal used for the online questionnaire survey gives the output of the survey as the percentages so it was used for preparing the tables and charts. Tables and charts have been prepared with Microsoft Office 2007 software with the ‘percentage of respondents reporting’ processed by the Survey Monkey web portal.

The semi-structured interview data was analysed through content and thematic analysis. This is the core data to be analysed for the research. Here the qualitative data comprised of interview transcripts which contained the responses from the managers of 8 PS schemes. This research has combined the manifest and latent coding system for this content and thematic analysis. Some of the codes used for the analysis were directly extracted from the interview transcript which is often categorised as manifest coding. The rest of the codes used for this research were selected as latent coding using the underlying or implicit meaning of the text (Neuman, 1997). However, the guiding factors for selecting the codes were to extract the answers of the research questions or to meet the research objectives.

Table 8 Codes Used along with the Objectives and Variables of the Content and Thematic Analysis

Objectives	Themes/Topic	Code
Define Product Stewardship	Cradle to Grave	CD 1
	Recycling and Reusing	CD 2
	Producer Responsibility	CD 3
	Stakeholder Participation	CD 4
	Corporate Social Responsibility	CD 5
Status of the scheme	Growing	CS1
	Static or Shrinking	CS2
	Voluntary	CS 3
	Accredited (Y/N)	CS 4/5
Problems and Prospects	Finance/Capital	CP 1
	Logistics/Raw materials	CP 2
	Loopholes of Policies	CP 3
	Market Demand	CP 4
	Enforcement of Laws/Regulations	CP 5
	Stakeholders Participation	CP 6
	Environmental Benefit	CP 7
	Financial Benefit	CP 8

Objectives	Themes/Topic	Code
	Generates Demand for the Product	CP 9
	Proactive not Reactive	CP 10
Perception of Sustainability	Environmentally Sustainable (Y/N)	CSI1/2
	Financially Sustainable (Y/N)	CSI3/4
	Balance of Payment	CSI 5
	Income and Expenditures	CSI 6
Responsibility Sharing	Part of a Company	CR 1
	Individual Trustee	CR 2
	Managed by Consultant	CR 3
	Levy based	CR 4
	Consumer and Stakeholder bared	CR 5
	Government or Public Fund	CR 6
	Waste Minimisation Fund	CR 7
Motivation	Build a reputation /Leadership	CM 1
	Business Expansion	CM 2
	Environment Concern	CM 3
	Competition	CM 4
Recommendations for Policy Improvement	Establishing and Enforcing Environmental Standards and Restriction (Y/N)	CRP ½
	Positive towards Accreditation	CRP 3
	Negative or Neutral Towards Accreditation	CRP 4
	Pilot/model PS schemes (Y/N)	CRP 5/6
	Facilitate Information Sharing (Y/N)	CRP 7/8
	Tax Write Off for investment (Y/N)	CRP 9/10
	Development of Technology (Y/N)	CRP 11/12
	Promote Procurement of Recycled Products (Y/N)	CRP 13/14
	Provide Subsidy	CRP 15
	PS to be Voluntary (Y/N)	CRP 16/17
	PS to be Mandatory for Certain Products (Y/N)	CRP 18/19

Once the codes were finalised, the transcripts of the interview were scrutinised and marked with different colours and the respective code written on the marked area of the transcript. Sometimes single or multiple sentences were marked with a specific code. Then the entries of each code were counted manually and entered into a spread sheet for analysis. The spread sheet analysis generated the attributes of each of the codes along with the relative importance reflected by the participant's responses in the interviews. Then the codes were decoded which ultimately brings forth the actual wording and

themes articulated by the research participants. Here the relative advantage of using the coding-decoding technique was to make each of the themes usable for analysis.

The participants in the interviews were industry-leaders and some of them had long experience and international exposure regarding PS and sustainable waste management. Some of their valuable comments especially on defining the PS, citations for problems and benefits are quoted directly in the results and discussion of the thesis.

In conclusion the research is influenced from post-positivism paradigm and adopted the mixed-method of social science research. The data collection was done through online questionnaire survey and semi-structured interviews. The collected data were analysed by content and thematic analysis which is objected to yield sufficient evidence for answering the research questions which are reflected in next chapter.

Chapter 4 Findings and Discussion

This chapter summarises the information obtained through the questionnaire survey and semi-structured interviews. The findings of the research were designed to fulfil the research gap through answering the research questions. So the following research questions are broadly classified as the major guideline for this chapter.

- a) How are the PS principles or schemes implemented in New Zealand seen from the stakeholders' perspective or point of view?
- b) What are the major problems and benefits of the PS schemes as identified by the participant stakeholder groups?
- c) Are the PS schemes of New Zealand perceived by the respondents to be environmentally and economically sustainable?
- d) How are the responsibilities shared among the stakeholders and what are the expected reasons and motivations for implementing the PS schemes?

And finally

- e) What are the suggestions from the participant stakeholder groups for improving the existing policy framework for PS in New Zealand?

Although the average response rate for online questionnaire surveys is 40%, almost 73% (62 out of 85) local authority personnel have responded through the online questionnaire survey. The participants from host business organisations and waste management organisations were reluctant to respond to the survey. They were invited and reminded three times. However, only 15% (6 out of 40) of the host business and 30% (10 out of 34) of the waste management organisations personnel have responded to the online questionnaire survey. Although managers from 8 out of 16 PS schemes have participated, there was no participation from the telecommunication and computer accessories sector. The computer recycling sectors are operated globally by the multinational producers and, in this region; their recycling operations are managed from Australia.

Table 9 contains the statement of sectors, and the products of the PS schemes participated in the Research.

Table 9 Consumer and Recycled Products of the PS Schemes

Sector	Consumer product	Recycled product	Comments
White-ware(1): Operated by white-ware manufacturer;	Refrigerator, dish washer, washing machines along with any white-wares	Plastic, copper, electrical items reused or recycled and rest of the unusable items are dumped in specified stations	Industry-leader and considered as trend setter in this field; Funded by the host organisation and sale of recycled product.
Battery(1): Battery manufacturer	Any lead batteries	Lead alloy and plastics	Multinational organisation; Sale of recycled product
Paints (2): Paint and coating manufacturers	Unused paints, coatings	Replaced raw materials for paint production	Industry-leaders and possessed success stories in terms of innovation and business expansion; Funded by the host manufacturer and sale of recycled paints.
Agrochemicals (2): Operated by group of producers, manufacturers, and brand owners	Agrochemicals products like silage wrap, bales, chemicals, containers	Mostly recycled in approved use of plastics	These two schemes dispersed over the New Zealand are vital because agro-based industries are the main source of GDP in New Zealand; One scheme is funded from the host organisation and from levy on products; other one is from user-charge and fund from the host organisations.
Used oil(1): Operated by a cement manufacturer	Used lubricants, oils collected and reused	Replaced coal in production of cement	Considered as one of the innovative ideas for using alternative fuels in production; Funded by the host organisation as the replaced value of fuel for cement kiln.
Glass packaging (1): Operated by a group of glass producers, manufacturers, importers, users.	Glass containers	Used for raw glass production	Prominent for its success in finding alternative uses of crashed glass products collected for recycling and reusing; Funded from the subscription charges paid the member organisations.

So the research outcomes contain feedback from the management of eight PS schemes which represent six sectors mentioned in Table 9. The PS scheme in the white-ware sector is in recycling and reuse of the products from long time. The two agrochemicals and one glass packaging scheme included in this study showed how a group of stakeholders can implement successful PS schemes. The paint recycling schemes are good example of ensuring the consumer participation in PS schemes.

4.1 Features of the Waste Minimisation Act 2008

The online questionnaire survey contains a number of issues raised to probe the awareness level of PS concept. These issues are pertinent to the Waste Minimisation Act 2008 which is the legal framework for PS. This Act also contains some significant features for minimisation of waste; for example implementation of the waste disposal levy and the Waste Minimisation Fund. It was intended to measure the relative awareness among the participant stakeholder groups about the PS and waste minimisation as reflected in the Table 10 below.

Table 10 Responses to the Online Questionnaire Survey regarding Various Features of the Waste Minimisation Act 2008

Questions	Samples	Local authorities (%)	Host business organisations (%)	Waste management organisations (%)	PS schemes (%)	Average of response (%)
Do you know about the legal requirements of PS in New Zealand?	Yes	89.1	75	83.3	100	87
Are you aware about the accreditation process of PS schemes in New Zealand?		93.3	50	50	75	67
Do you agree with the government accreditation process?		66.7	75	80	75	74
Are you aware about the implementation of waste disposal levy?		100	75	100	100	94
Do you agree on financing PS schemes from the Waste Minimisation Fund?		26.1	50	50	37.5	41

Overall the awareness level among the participants regarding the legal requirement of PS is encouraging. Among them 87% were aware about their roles and responsibilities in relation to the Waste Minimisation Act 2008, whereas only 67% of them were aware about the accreditation process of PS schemes by the Ministry for the Environment. On the other hand, 94% of the participants were aware about the implementation of the waste disposal levy. Mostly the accreditation process is being conducted by the Ministry for the Environment whereas the waste disposal levy has been implemented at the stakeholders' level by the local authorities, waste management organisations like landfill and transfer stations. The results of the survey and interviews also indicates that there were probable positive impacts of the survey and campaign (3R, 2006; Product Stewardship Foundation, 2009b) conducted before the implementation of waste disposal levy on increasing the awareness level among consumers and stakeholders

In addition some general questions were raised among the respondents regarding their awareness about participation for minimisation of waste under the legal framework of the Waste Minimisation Act 2008. Figure 12 shows the responses of the participants in the online questionnaire survey about their awareness of the Waste Minimisation Act 2008.

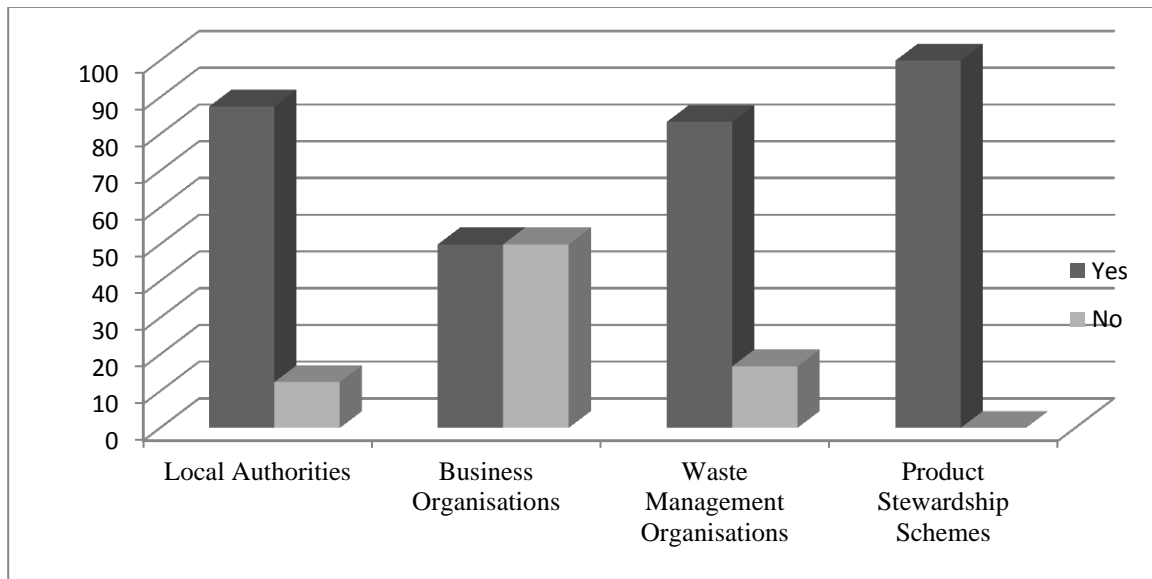


Figure 12 Awareness (in %) among the Participants regarding the Roles and Responsibilities under the Waste Minimisation Act 2008.

Among them 87.5% of participants from the local authorities responded positively about their roles and responsibilities as stakeholders of waste minimisation. Besides, all of the

PS scheme personnel interviewed were found to be aware about the concept of stakeholder participation.

The accreditation process did not have an impact among the participant stakeholder groups. Specifically two out of eight personnel interviewed from the PS schemes were found to be unaware of the accreditation process. It seemed during the interviews with the scheme personnel that the information sharing about the accreditation process is not up to date and some of them were not encouraged about the process and outcome of the accreditation. The comment of a respondent from a scheme is as follows:

We have applied several times for grants and helps and it seems a waste of time. What they do is provide you a subsidy for employing a consultant. The stupid part of it is that why employ a consultant when I have all the ideas, I don't need to add extra cost by adding people around. If I could get a subsidy for working capital to purchase machinery that would be beneficial. I have tried several times but I don't think there is nothing available like this.

There were previous attempts conducted by the government to promote this sort of recycling scheme but the experience has not been positive; rather it has created a lack of trust towards government approaches among the stakeholders. Almost 50% of the participants from the host business organisations were not aware of the accreditation process which also indicated that there was a lack of information sharing regarding the accreditation process; and the Ministry for the Environment ideally has to overcome the rigidity and engage with the stakeholders to disseminate more information about the accreditation process and its outcome.

4.3 Defining the Concept of Product Stewardship

It is intended to define the concept of PS from the stakeholders' point of view. This question was raised to the participants from local authorities, host business organisations, and waste management organisations through the online questionnaire survey. The respondents of the PS schemes also provided their feedback about the concept of PS.

Figure 13 summarises the key elements mentioned by the stakeholders in portraying the PS concept in New Zealand.

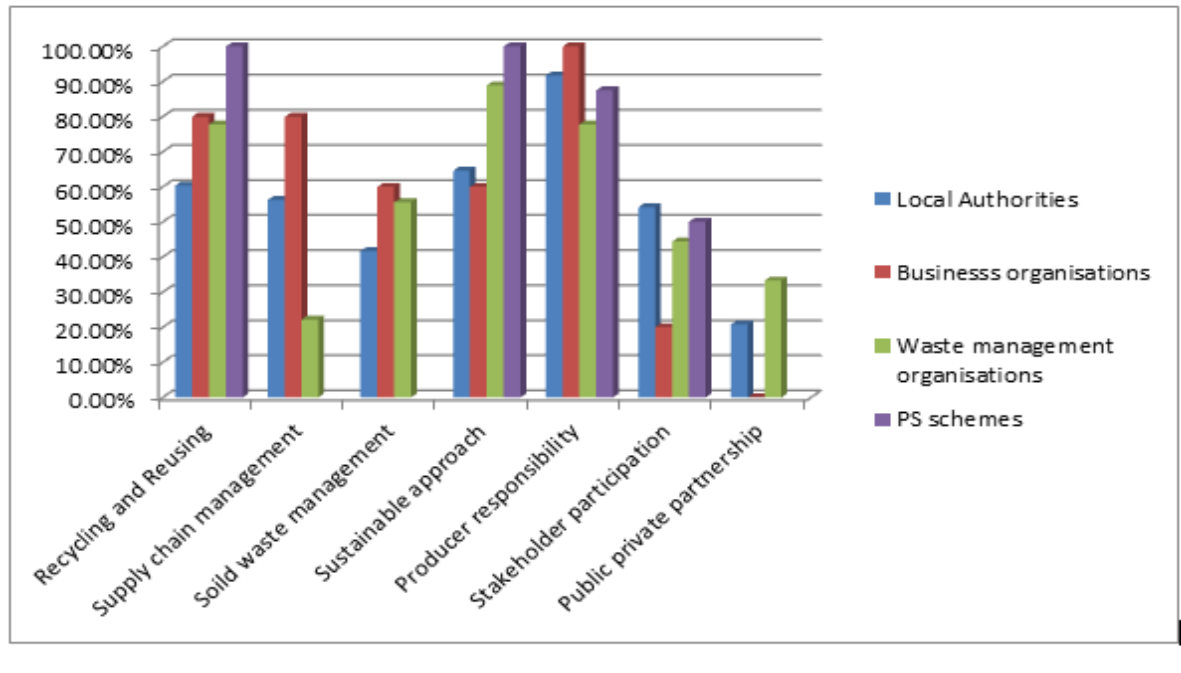


Figure 13 Charts Showing the Elements Preferred by the Stakeholders to define PS

The above chart shows that “producers’ responsibility” has been emphasised as the key element for defining the concept of PS by the participants. On average, 80% of the participants from the local authorities, host business organisations, waste management organisations and PS schemes are of the view that the producer should take the major responsibilities for implementing PS in New Zealand. On the other hand, most of the participants have placed less emphasis on ‘stakeholder participation’ for PS which was not expected because stakeholders like producers, brand owners, importers and consumers are supposed to share the responsibilities among them for reducing the product’s health and environmental impacts through PS (Cassel, 2010). There is a consensus among most of the participants regarding the roles of producers as stated in Cassel (2010: 37) that “with the greatest ability to reduce those impacts (e.g., manufacturers) shoulder the greatest responsibility. Producers and ultimately, consumers (to whom producers pass on cost) pay for collecting, recycling, or appropriately disposing of products consumers no longer want”. However, the principle of shared responsibility (Lewis, 2005) among the stakeholders and “the polluter pays principle” (MfE, 2009e: 1; Ferrao et al., 2008: 604) as adopted by the New Zealand Governments (MfE, 2009e) as

well, are not well expressed by the survey participants. Only 42.5% of the survey participants expressed stakeholder participation as one of the key elements for defining PS. So the concept of PS through stakeholder participation as adopted in New Zealand is not well understood; rather there has been more emphasis on producer responsibility by the participants.

The term “cradle to grave” was reiterated by the personnel interviewed from the PS schemes for defining PS concept. The analysis result of the semi-structured interviews showed that 5 out of 8 participants used the term ‘cradle to grave’ for defining PS. This term ‘cradle to grave’ is significant because it indicates the comprehensiveness of PS rather than simply recycling and reusing wastes through integrated waste management (McDougall & Hruska, 2000). The term ‘cradle to grave’ also indicates increased responsibility of the producers or manufacturers through management of their products from raw materials to the end of life-cycle (Lewis, 2005). A similar notion has been expressed by an industry participant who is engaged in manufacturing and recycling of batteries for the last twenty five years.

Pretty much it's cradle to grave, so that you take the raw materials, you build the product and you sell the product. So at the end of the product's useful life you bring it back and recover that. And you are responsible for the product all the way through cradle to grave

A similar comment was found in the interview with the managing director of a PS scheme which has been manufacturing paint products and recovering and recycling unused paints nationwide in New Zealand.

Stewardship I believe that I can handle the stewardship of a product from its manufacturing to final stages which is what do you deem rubbish and what don't you deem rubbish. To me stewardship is caring for the product from a raw material right through to its waste stream.

So it can be said that the concept of PS could best be defined as “cradle to grave” approach for managing the end of life of the product. It is worth noting that one survey participant mentioned as “cradle to grave, even better cradle to cradle”. And this comment is significant because while an industry is engaging itself with PS, it has to take care for its recycled product as well. The used oil recovery scheme of New Zealand has been considered as one of the sustainable practices for reusing the used oil as fuel for cement production instead of coal (Halliday et al., 2007). There is independent testing system established under the resource consent conditions to monitor the emissions from

the cement kiln. The following comment is stated by the participant demonstrates caring for the recycled product for PS scheme.

The big advantage of cement kiln is that it actually combusts the materials cleanly. So you get virtually no emissions because with high temperature in the kiln and with alkaline conditions, the gas goes under complete combustion. And we have a gas cleaner system there as well. So we have very low DOC's emissions at the kiln and also, another advantage is that any waste in the ash in the used oil is actually solved in the cement.

Based on the emission monitoring results for trace metals and dioxins from the kiln the operation of reusing used oil with coal has been considered environmentally and economically sustainable because the use of used oil as fuel has significantly reduced use of coal in that cement kiln (Halliday et al., 2007).

Farm plastic and paint stewardship schemes have been also identified during the interviews as also playing the role of 'cradle to cradle'. Sometimes the use of end products of the PS schemes needs to be monitored for ensuring the sustainability. The following comment from the participant of a scheme shows how they have to care for the recycled products.

In the container scheme we enable it to get in what we called a certified in use internationally. We have rules, they are voluntary but they are preferred by the companies to ensure that it only goes to approved use. Say we use it as underground cable cover is an approved use. Whereas putting it in to a child's toy is not an approved use. So they want safe, reliable, careful stewardship of their material. One of the things is that we are very determined about a chain of custody of the material so we know where it's ended up.

The term 'end of life management' has been widely used in different literatures for defining the concept of PS (Ferrao et al., 2007; Guerin, 2008; Ahluwalia & Nema, 2007). From used oil recycling scheme in New Zealand, a valuable comment was found which signifies the importance of PS for end of life management of used oil.

The product stewardship is really looking after the life-cycle of the product. I have got a product to sell, so how I am going to look after it? The life-cycle of the product for example for used oil as I sell it so I am going to look after its end effect. Used oil when it comes out of the engine, gear box, I would like to see it is disposed of safely. That's how you look after its life cycle.

In addition, the following comments in the interviews from participants of two schemes emphasised on end of life management for defining PS.

Product stewardship, that's the Act says the ownership should be shared among the importers, producers whoever gets the economic gain from the sale of the

product so they should take some responsibility. We also got a share from the user the consumer because we need them to take the ownership of the product and it's very important particularly with farm plastic.

Well how I would like to define product stewardship is different from what is happening. I mean what's about core product stewardship, for me product stewardship is about participation in the whole life cycle, responsibility for their product.

4.4 Problems in the Product Stewardship Schemes

The research aimed to locate the problems and challenges faced by PS schemes in New Zealand. The PS schemes studied in this research varied in their structure, financial management system and stakeholders' or consumers' participation criteria. So the problems or challenges reflected by those organisations or PS schemes also vary.

4.4.1 Financial Drawbacks

The host business organisations surveyed through the online questionnaire were asked about their perception of problems of the PS schemes. Some of these business organisations are patronising the schemes as part of the company, others are either part of the trust set up to manage the scheme, or patronised the schemes in its early stages.

Figure 14 shows the problems or challenges identified by participants from the host business organisations in the online questionnaire survey.

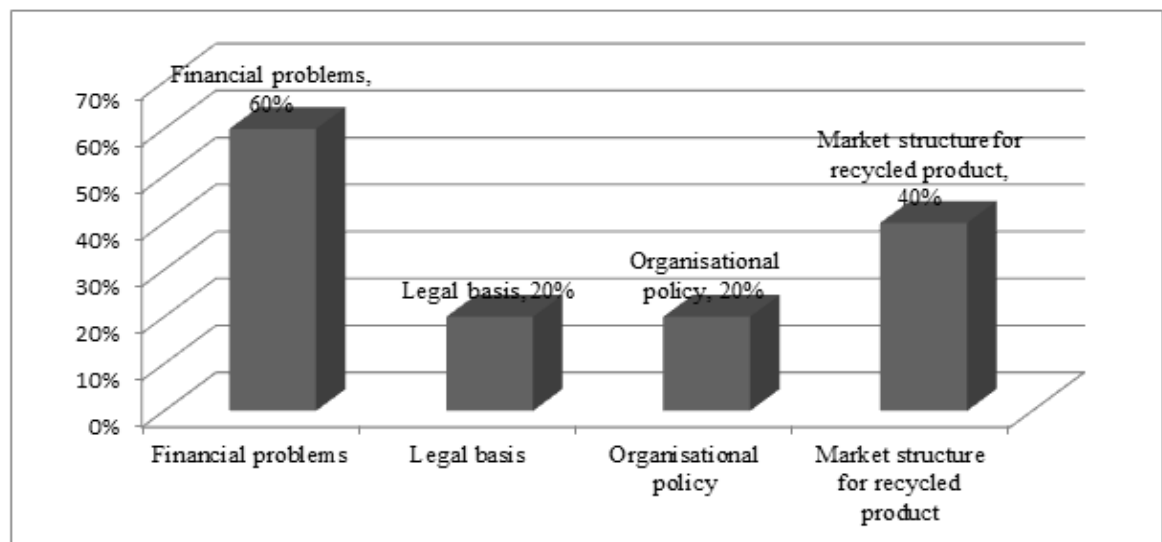


Figure 14 Problems and Challenges Identified by the Participants from Host Business Organisations.

The structure of the scheme and global economic crises were also proposed in the questionnaire as potential sources of problems. However, none was emphasised by the survey participants as problems or challenges for PS schemes in New Zealand. About 60% of the respondents emphasised on financial problems along with 40% considered that market structure for recycled product is one of the major challenges for PS schemes in New Zealand.

The lack of capital or financial problems was identified as one of the major concerns for the industry-led PS schemes. In this research, industry-led PS schemes are identified as those schemes operated as part of the host business organisations that are engaged in recovering and recycling of either their manufactured products or similar products irrespective of brand or model. In general, most of the industry-led PS schemes have emphasised on financial problems. The major source of income for those schemes is from the sale of recycled materials and the demand for, and the sale value of, the recycled products are not sufficient to cover the expenditures of the schemes as globally the demand and cost of recycled products are decreasing (Fishbein et al., 2000; MfE, 2009e).

The source of capital for further investment has been reflected by participants as one of their major concerns. The following statement from the manager of a recycling scheme indicates the frustration among the participants due to lack of capital for further investment.

Working capital, it's a problem for all those people who have entrepreneurial ideas. Lending institutions traditionally lend money only to positive schemes, but when you are being a forerunner they won't allow you to take risks. So you have to do it out of your own capital that stanches your growth. And you can't sometimes develop things as quick as you'd like.

The used oil recovery programme operated on a mixed-model. Here the participating oil companies used to share the transportation cost of the used oil. Respondents from the used oil recovery programme reported about recent financial constraints due to reduced participation by the oil companies. Some of the participating oil companies left the scheme and others also have reduced their share which has become drawback for the scheme as stated below.

The scheme is in very rough time for us because what has happened is that major oil companies are no longer supporting our scheme. They are supporting an alternative scheme so our volume is going down.

In this respect Veleva (2008: 31) proposed that “taking back old or unused products is expensive. Manufacturers typically do not do so, and tax-payers money is required to fund take-back programmes”. The issue was raised amongst the survey participants as to whether they support any form of subsidy being introduced for PS schemes. All PS schemes personnel interviewed rejected the concept of government subsidy to overcome the financial drawbacks or challenges.

4.4.2 Scarcity of Recyclable Materials

One big challenge for the PS schemes in New Zealand is the lack of materials for processing or the reduced source of materials for recycling. It is affecting the stability of some schemes. The white-ware scheme seems to be affected by the diminishing sale or trade due to the recent economic downturn. One major source of the input for the scheme is the traded-in white-wares in their nationwide stores. This view is supported by the following statement from the interview with the manager of the scheme.

It was growing, but obviously we are affected by the market. And the market is probably pretty static at the moment. And we are at the tail end of dog, if sales are going really well and then a lot of products are being traded in, disposed of in formal fashions, and that's the product that we get. If sales are not doing well then we don't get that flow then.

However, there was a positive indication that the reduction in trade-in for white-ware could be the result of reusing old products through popular online buying and selling of second hand products in New Zealand. These days people can sell their old products through on-line auction sale, ‘Trade me’, which has definitely reduces the number of products disposed of, and increases the life-cycle of the product (O’Sullivan, 2010).

‘Trade me’ is a popular web portal of New Zealand where people can buy and sell new or used items easily and efficiently. As the online buying and selling becomes easier and more efficient, people in New Zealand are keen to sell used items and thus increasing the life-cycle of the products. Such used items sold through online web portals help people to have low cost products and allow less spending on consumer goods (O’Sullivan, 2010).

In the lead acid battery scheme, the source of guaranteed recyclable materials has been identified as the major problem. Before August, 2009 the scheme was able to import recyclable lead acid batteries from Australia. The government of Australia has banned the export of scrap batteries because there are now sufficient establishments for recycling of

batteries. On the other hand the New Zealand government allows export of scrap batteries to other countries which is the biggest hindrance to the operation of the scheme. The market of scrap batteries which depends on the London Middle Exchange value also has been stated by the participant from lead acid battery scheme as one of the hurdles for the PS scheme.

As I said, the main problem is getting a guaranteed supply of feedstock. The market is controlled by the commodities market. They are like middle exchange and when London middle exchange price is low, people stop collecting scrap and stock feeding in back to us and when high they will collect it and they will feed it back to us or they will feed offshore. So we do not have a guaranteed supply and for our operation; to be viable we need guaranteed supply.

In this regard, the policy-makers need to monitor every PS scheme to identify the loopholes of policies for ensuring the sustainability of the schemes. If the lead acid battery recycling scheme has to close its operation, New Zealand will be utterly dependent on exporting the scrap batteries to other countries. The metal lead generated from the PS scheme was reducing the amount needed to be imported for manufacturing of batteries.

The PS schemes which are suffering from lack of recyclable materials have been observed to include new products in their line of recycling. The following comment from the manager of a PS scheme shows how they are trying to cope with the situation.

Obviously we want to keep it growing and we are looking for alternative materials. We know that there is limited amount of lead acid battery scrap so we are looking to alternative types of materials. So we can run the operation to continue to recycle possibly processing non-recyclable primary material so that's we are looking forward to.

4.4.3 Lack of Participation

In a voluntary environment it can be difficult to ensure participation of the stakeholders. Mostly the PS schemes set up by the producers, brand owners, and importers suffered from the lack of participation of the stakeholders. For industry-led PS schemes in white-ware, paint, mobile phone, the nation-wide retailers and dealers work as the collection points so their participation is confirmed. The retailers of the paint manufacturing company work as the collection points for the unused paint for the PS scheme established for recycling paint and coating products. On the other hand the PS scheme for agrochemical products is governed by the board of trustee set up by producers and brand

owners and the consumers of the schemes are mainly farmers. The following two comments from managers of two PS schemes reflect the problems originated due to lack of participation of the stakeholders.

In a voluntary environment it's hard to bring brand owners over; it took a long process before the scheme (name omitted) began. It took 3 or 4 years of hard work to start with 12, now it is 52. The other challenge is about participation, if brand owners are going to make their product expensive in order for them to be in stewardship scheme. They wanted for whom it is made should participate. And that's a challenge, it's a challenge globally. We are going to meet global container management in Istanbul week after next and we will be talking about the same thing.

The scheme (name omitted) was different because it is a single company and it is vertically integrated. So they can tell their retailers because they own them, that they are going to participate. And their customers got stuck in to it. So that was easy two and a half years before another manufacturer came on board. So that's a challenge, a lot of talking.

So it can be a challenge for the PS schemes implemented by the producers, brand owners and importers, to ensure the participation of the consumers for whom the schemes are established. Similar challenges have been identified as a major concern for certain PS sectors in USA (Powell, 2009).

In order to make the PS schemes successful, the collection systems for the product have to be targeted for maximum participation by the consumers. In New Zealand there are two agrochemical schemes established by a group of producers and brand owners. One PS scheme has various collection points at different locations over the country. The other PS scheme on agrochemical products was collecting the wastes directly from the farms. Although a feasibility study showed that farmers are willing to travel for disposal of their farm plastics and containers to those collection points (3R, 2006), the initial attempt was not successful and now the scheme is introducing a farm level collection system. Other PS scheme which had on-farm collection system has proven to be successful as stated by the scheme manager as follows.

Right, what we have to do is to put in place the product stewardship scheme to recover the materials from the farms. They are our customers.

Now both of the schemes that are operating on a farm level collection basis have proven that there are ways to engage closely with the consumers to increase participation level.

An agrochemical PS scheme has been provided with the financial support from the Waste Minimisation Fund for launching TV and radio campaigns to disseminate knowledge and information among the consumers. It is obviously vital to increase knowledge about the PS schemes, specifically about the environmental benefits of the schemes. Similar observations by Atari, Yiridoe, Smale, & Duinker (2009: 1278) are included in their study on the motivation of farmers to participate in the Nova Scotia Environmental Farm Plan (stewardship programme for recovery and recycle of farm plastic) that “a substantial proportion of farmers were not quite aware and knowledgeable about the program. Thus, EFP program information packages (e.g. in the form of brochures) could be developed to educate producers about potential benefits of implementing the program”. The study on US cell phone take-back programme also indicated that sharing of information among the consumers is vital and needs to be promoted by the industries in order to improve the participation of the consumers (Inform, 2008). So the indication is that the managers of PS schemes have to identify the reasons for the lack of participation and proactively engage with the consumers to eradicate the problems identified.

4.4.4 Lack of Monitoring and Strict Environmental Control

Absence of strict environmental control and enforcement has been identified as potential problem for some PS schemes in New Zealand. There is evidence found during the study that stakeholder participation is adversely affected due to lack of strict environmental control over the farms burying and burning of plastics and burning of used oil in boilers in New Zealand. The participants from the two agrochemical schemes have expressed how the traditional practices of burying and burning of farm wastes have hampered the level of participation of the farmers. The following comments are identified as the evidence of reluctance concerning environmental controls expressed by the participants from two PS schemes.

The main problem is that farmers are still allowed to burn plastic or bury. Again this is another key area of product stewardship. The government once removed the costly disposal from the end user to the producer. This is all very well. But you’ve got to engage the end user as well and I think that needs to be enforced. Because it’s an old story you can take your horse to water, but you can’t make him drink.

There are regulations in place but there is nobody to enforce it. There is no benefit for compliance and no stick for non-compliance. Like the large drum scheme was

not successful because of non-compliance and lots of casual practices took place. There are lots of good rules but there is nobody to look after it.

In this respect, participants have indicated (as stated below) their support towards the imposition of ban on farm level burning of waste by different local authorities of New Zealand.

Yes, like at the moment farmers still have the option to burn or bury and that's obviously cheaper than the New Zealand recycling scheme. So they will continue to do that. Now what's happening here in New Zealand various councils and local authorities are moving to ban burn or bury on the farms.

For the used oil recycling scheme, strict management control is important specifically when you are dealing with third parties for collection and transportation of used oil.

Similar observations were found by Guerin (2008:264) in a study on the used oil sector which stated that;

The liability issues become increasingly complex because of contractual issues, as the number of activities and sub-contractors involved increase along the lubricant's life-cycle or supply chain. Businesses seeking to establish themselves in used oil handling need to be fully aware of these liability issues and ensure they have management and governance controls in place so they can demonstrate due diligence in the case of a used oil spill or leak.

The used oil recovery programme has provided more emphasis on maintaining strict environmental control through establishment of "standard operating procedures (SOPs)" for managing the schemes as stated in the following comment.

We already had which we call a process; we managed the collectors and so on. We have written outline of how the scheme is managed and standards that set for collection and managing the scheme. We have got a scheme that already has SOPs.

For used oil recovery programme, it has been found that the lack of environmental control over burning used oil in boilers is also a challenge for the schemes. Used oil recovery and reusing is particularly sensitive and needs to be monitored carefully because it can impact a wide range of consumers as well as the environment (Guerin, 2008). From 2007 after the increase of fuel oil price, used oils are used as fuel for boilers. This practice of burning used oil in boilers impacts the stability of the scheme. There are no strict controls and monitoring of emission level when burning used oil in those boilers. If the used oil is not burned properly, the exhaust gas might contain of high level of trace metals and dioxins that could have carcinogenic effects (Halliday et al., 2007). The

following comments shows how lack of environmental control and proper monitoring could reduce the stability of PS schemes and pose threats to the environment also.

We do have a problem with the regulation of waste. Regulation of waste like used oil is not carefully managed. For example our system is regularly monitored, outcomes for the used oil. Every year twice we monitor the emissions which are quite a cost, the metals, DOCs etc. I don't think anybody actually in New Zealand has done this, for used oil combustion. And that's always a question we have always asked. Like others are using used oil are not monitoring the emissions. So the monitoring of the regulation is monitored or actually controlled. We have found this from our experiences that our collectors who have good standards and which are monitored but not enforced for others. So you can have another company with low standards, take the business away and you can do nothing about it. You can call up the Ministry for the Environment, or Occupation Safety and Health (OSH), New Zealand. Those are the people involved in that particular area but nothing happened. What happens is that one will say it's not my job, it's his job. It's nobody's job and nobody looks after it, and it goes around in circle. Nobody is going to stand up and say I am the one who is going to make a decision about it.

The above stated comment symbolises the general views and ideas expressed by the schemes personnel interviewed and there was frustration seen among the respondents regarding the monitoring and environmental control for products such as agrochemical products, used oil, white-ware and batteries.

4.4.5 Problems with Free-Riders

In New Zealand some of the producers, brand owners, importers and mostly the retailers are not participating in the PS schemes, creating a lot of problems for those who voluntarily engaged in PS. In response to the online questionnaire survey, participants suggested to provide support for existing schemes by regulation to stop free-riders underpinning an industry stewardship approach. Free-riders are producers or suppliers who sell goods into the market place but who choose not to be inside a PS scheme. The first point is that these free-riders are financially benefiting because their products are not levied as identified in agrochemical and glass packaging recycling schemes. So their product is gaining an advantage compared to those of the producers or brand owners who are participating in PS schemes. In the glass packaging scheme it has been found that major producers, importers, supermarkets, manufacturers, wineries and breweries are involved in the scheme and they are levied on the basis of their sale volume whereas some of the importers and major retailers are still out of the scheme and do not have to

contribute. The following comment shows the evidence of lack of participation of the manufacturers, and retailers in a recycling scheme.

If you look at it in three stages: the empty containers, the guy who fills and the guy who sells it and the guy who collects it. We have about 80% of the product glass sold in New Zealand covered under the initial sector of production oriented container. The filling side of it we got much less, we got the major brewery, winery, but it's probably about 60%. When you talk about retailers, like the little corner stores, we haven't got any of them. We've got supermarket chains and major wineries so I think if we have an issue is to convincing the whole supply chain that they should all perform at the same level. So there is an unfair amount of responsibility among the glass importers. But it's a quite a growing thing, we just want everybody to get into the tent and are still working in that.

Large oil companies which have large volumes run the PS scheme directly. Other small companies, who import oils directly, and don't support the product stewardship scheme, are creating problems because large companies have to spend to promote product stewardship and small companies are bypassing that. In that way they are in a better position compared to large oil companies. Thus they could clearly sell the oil cheaply. Therefore the answer there is to regulate Say used oil providers have to go through the PS schemes.

In addition, some PS schemes are collecting and recycling all sorts of product irrespective of brand and model which is obviously a challenge for them and the manufacturers or importers who do not have PS schemes, are gaining advantage from it. The PS schemes for white-ware and lead acid battery have been struggling to recycle because of a wide variety of products collected and these old products are not easy to recycle. They have expressed that it would be easy for them if they were recycling their own products only. Some of the old white-ware products are not labelled properly so are very difficult to recycle.

I think it would be good if everybody was doing their own product. Because if we were doing only our (name omitted) products we would have done it more efficiently. We know what the material is. Plastic is one of the big examples. Early product had no identification on it. Any clue about what the material is, like if are looking at white plastic, it could be any material from Analin to Anaural, or poly prep , high impact polystyrene, ABS and the list goes on. Unless you've got any identification, what the material is it is difficult and near impossible to recycle it.

Yes we collect any sort of lead acid batteries. The biggest problem is that we get these from scrap merchants and dealers which include product that is not recyclable, that is not lead acid battery particularly Nickel-cadmium and Nickel-hydride lithium iron. We have to separate those out. Any lead acid batteries we can process.

During the interviews it was found that most of the manufacturers and producers are labelling the components of their product so each part or component could be identified, reused and recycled effectively. So caring for the product from the early stage as Kwak & Kim (2009:785) stated in their study is the root of true PS.

Product recovery has become a field of rapidly growing interest for product manufacturers as a promising solution for PS as well as economic viability. As product recovery is a process highly dependent upon the way a product is designed, it should be considered at early the design stage so that the product may be designed to facilitate efficient and effective recovery at its end of life stage.

4.4.6 Logistics and Freight of Materials

Transportation of collected goods for recycling and cost of freight are the biggest hurdles for some of the PS schemes. New Zealand is formed of two long strips of island from north to south separated by a strip of sea which makes the road network lengthy. Besides it is not economically viable for the PS schemes to establish recycling plant in various regions. In most of the cases the recovered products have to be transported to a central location from different parts of the country for processing or recycling. Usually carriers or freight companies are contracted to collect and transport the goods from the collection points to the centralised location. This is the main area of expenditures which can be very difficult to recover from the cost of the products only.

The biggest costs say in the (name omitted) scheme are in having the infrastructure in place. New Zealand is a long skinny country so we have 70 collection sites and it's having the process and capacity to collect, aggregate and in some way gets it to the end users. That's where majority of the costs go. And it's very similar for the paint recycling scheme.

I think if you are looking at white-ware one of the biggest problems that you got if you can get the product into a central location to your operation, at no cost then you will be fine out of it. Transportation basically is the biggest hurdles we have. It's ok when the value of the recycled materials is high and you can override the transportation cost out of it. It's good, but like at the moment price of processed steel is quite low. So it's bit of struggle to try to keep ahead of those. And in any business like you've got to try to make it cost effective if you can.

In addition, some PS schemes are facing challenges from costly operations for recycling. The lead acid battery recycling scheme in New Zealand has to spend huge amount to recover lead from old batteries. In most of the cases the PS schemes have to set up a number of warehouses at different central locations over the country. Costs of maintenance for these warehouses are burdensome for some of the PS schemes.

In general the industry-led PS schemes seem to be more cost-sensitive because they have to depend on the overall cost to be recovered from the selling of recycled materials. The PS schemes in agrochemical, glass packaging, used oil sectors where consumers are sharing the costs, are found to better overcome the problems from costly operation and transportation. So sharing the responsibility among the producers, brand owners, importers and the consumers is the most viable solution for overcoming the challenges of PS schemes (Lewis, 2005).

4.5 Product Stewardship and Sustainability

Although the objectives are clear and noble, we have to critically verify whether the PS schemes implemented here in New Zealand are operating in a sustainable manner. There has been an attempt to focus on environmental and economic stability and specifically on management of the end products of the PS schemes.

4.5.1 Environmental Sustainability

The environmental sustainability of the PS schemes is of utmost importance because the objectives of implementing the schemes are to reduce the environmental impacts of the products. The PS schemes studied in this research are perceived to be environmentally sustainable by the respondents and they argued to implement the best practices for reducing the environmental impacts of their products. In addition some schemes have shown their aspirations for further improvement in their product management. Table 11 depicts the perception of the participants from different PS schemes in relation to environmental sustainability.

Table 11 Environmental Management Statement from different Sectors of PS in New Zealand

Schemes	Environmental management statement (from semi-structured interviews)	Comments
White-ware scheme	<p>“When we started we had a 20 ft bin we used for rubbish bin and now we have one that’s 3 metres. And we are lucky that we empty that once in fortnight. So you know over the time we have changed a lot. So it’s obviously effective for environment”.</p> <p>“You know from anything we do, from our</p>	<p>This white-ware recycling scheme has been operating since 1993 and started as an attempt to take-back or trade-in old white-ware units as reverse supply chain management. Though there were multiple objectives</p>

Schemes	Environmental management statement (from semi-structured interviews)	Comments
	grounds for instance everything is done to certain standards. The environments people are working in, we are very keen to make sure that it is good and safe. The factory environment is good and safe. So even down to our reports are on recycled papers, so there is complete flow on”.	identified like economic gain, supply chain management, comply with legislation or policies however, the prime reason was to care for the environment.
Lead acid battery	“I think it is absolutely essential, we collect scrap batteries, unless London Middle Exchange (LME) affects our viability and I believe we have been doing this for years when LME has been very low and never stop collecting batteries even in high price. We continue to do so, though the viability is questionable because it’s part of PS particularly when we are manufacturing in New Zealand. And if we stop doing that there will be a lot amount of lead going to environment particularly in landfill”.	This scheme is also working as reverse supply chain management as if manufacture of batteries and sells roughly around 25% of total batteries sold in New Zealand. It collects and buys all scrap lead acid batteries and recycles lead, plastic and other metals. If these metals were not recycled they would have been gone to landfills and their economic value would be wasted.
Paint and coatings	“For paint recycling scheme (name suppressed) our role there was to find a home for everything. So the steel cans are quite straight-forward, the plastic materials are little more complicated. We are now finding regular uses for the material and the company is asking their manufacturer to incorporate the scheme into the next phase. And the paint is going into graffiti cover and into concrete, it’s an additive for the concrete and it’s a whole new development”.	Two paint and decorative coating schemes have been studied and it was found that New Zealand has been attaining 100% recovery and reuse of unused paints. Before that all of these unused paints were thrown to landfills which used to render detrimental effects on the environment. These two schemes have definitely induced the consumers to care for the environment and ensure returning the unused paints to the recovery points set up nationwide in their retail outlets.
Agro-chemical scheme	“We do the life-cycle assessment for our scheme (name omitted) and it was quite clear that recycling was much better rather than burning, burying etc. so we know that we are doing the right thing but it quite	Both the schemes are found to be careful about environment and proactive. In addition it has been found that how much they care for their recycled

Schemes	Environmental management statement (from semi-structured interviews)	Comments
	<p>modest, let's be honest in terms of environmental impact overall. I keep coming back to this point it's actually more important for New Zealand exports that people and farmers are actually doing the right thing, showing evidence of doing the right thing than the thing itself. It's critical to underpin our brands otherwise people will not see the clean and green".</p> <p>"In the container scheme we enable it to get in what we called a certified in use internationally. We have rules, they are voluntary but they are preferred by the companies to ensure that it only goes to approved use. Say we use it as underground cable cover is an approved use. Whereas putting it in to a child toy is not an approved use. So they want safe, reliable, careful stewardship of their material. One of the things is that we are very determined about a chain of custody of the material so we know where it's ended up"</p>	<p>product. It is very important to monitor that which sectors are potentially reusing the end products of the scheme. They consider that that the uses of recycled products for the PS schemes have to be environmentally sustainable otherwise the objectives of implementing the scheme would be in vain.</p>
Glass packaging scheme	<p>"We have worked with Transit New Zealand that is responsible for management of roads, highways in New Zealand. Now we had the specification for roading altered, so glass can be put in with substrate with the roading. We have worked with people on filtration scheme, so glass can be used as filtration medium for water purification. We are working with New Zealand sports institute on using glass as a drainage medium in the sports field. Like 4000 tons of glass are gone under the Rugby Park in Nelson. And we also supply infrastructure for people who want to recycle glass back into new bottles and jars".</p>	<p>The statement shows how industries are trying to engage with other sectors for introducing more and more sustainable end product management of the schemes. This attempt shows the evidence of how the PS schemes could innovate through sustainable end product management.</p>
Used oil recycling	<p>"Right what happen is that in New Zealand, the used oil is mainly used as fuel. So the end product for us is actually heat which is applied in a cement kiln at</p>	<p>The used oil scheme also adopted sustainable end product management through burning of used oil in cement</p>

Schemes	Environmental management statement (from semi-structured interviews)	Comments
	Westport. We have three kilns in Westport over on the west coast of South Island. And that's where the used oil, we called it co-processing in the kiln".	kiln as fuel. They have set up emission monitoring system which ensures the sustainable management of used oil.

Although, in general, the PS schemes studied are perceived to be environmentally sustainable by the respondents, there were some practices observed that need to be carefully considered. For example some major oil companies have taken themselves out of the used oil recovery programme. They are now operating their own scheme and no information was found about those schemes. There should be sufficient information available about how and where these used oils are being utilised. Besides, anybody in New Zealand can collect and use oils especially in boilers in place of fuel oil. These practices of burning used oil in boilers need to be monitored. The emitted gases from those boilers need to be examined to determine the amount of metals and dioxins. So recycling or reusing the product is not the optimum, rather you have to ensure that the end products of the schemes need to be managed sustainably. Otherwise the whole objective of sustainable waste minimisation would not be fulfilled.

4.5.2 Economic Sustainability

In conjunction with environmental stability the PS schemes have to be economically viable and should have a positive balance of payments. If a scheme is not economically sustainable it cannot survive meaning therefore the end products are not looked after. Industry-led PS schemes are more fragile in terms of their economic stability because their major sources of finance are from the cost of recovered materials. The PS schemes operated by stakeholders are found to be more stable and in most of the cases these are on a levy or user pay basis.

Table 12 gives the status of the existing PS schemes studied during the research.

Table 12 Economic Status of the Schemes in New Zealand

Schemes (Status)	Economic stability statements (from semi-structured interviews)	Comments
<p>White-ware (Moderate: It was growing but now there is dilemma about its financial stability)</p> <p><u>Source of income:</u> Sale of recovered materials.</p> <p><u>Major expenditures:</u> cost of freight and wages</p>	<p>“It’s ok when the value of the recycled materials is high and you can override the transportation cost out of it. It’s good, but like at the moment prices of process steel is quite low. So it’s bit of struggle to try to keep ahead of those. And in any business like you got to try to make it cost effective if you can”.</p>	<p>At present the financial stability is questionable because the income depends on the amounts of product traded-in. Due to recent economic down turn the amount of products traded in has been reduced significantly which also makes the scheme unstable.</p>
<p>Lead acid battery (Poor: It’s shrinking)</p> <p><u>Source of income:</u> Income is obviously the sale of the recovered products so that’s the lead and plastic.</p> <p><u>Major expenditures:</u> The major expenditures are the purchase of raw materials, conversion cost which is to convert the raw materials into saleable products. That is very high about \$900.00 for a tonne.</p>	<p>“We are now limited to where we can get as raw materials. As a consequence we had to reduce our seven day operation 24/7 to five day work operations which obviously affect the viability”.</p>	<p>During the interview two major hurdles observed for the scheme. One big hurdle for them was the scarcity of recyclable materials which was hampering the operations. Another big hurdle was to get consent from the council which will be due in next year. If the consent is not approved it would be impossible for them to continue the recycling operation for batteries.</p>

Schemes (Status)	Economic stability statements (from semi-structured interviews)	Comments
<p>Paints and Coatings (1) (Good: Financially stable and operating for 25 years) <u>Source of Income:</u> Sale of manufactured paints <u>Major expenditures:</u> “Major expenditures of recycling paint are to collection from the public to the factory, freight and sorting the product into colour groups”.</p>	<p>“If you recycle a product people think that it should be cheaper than the virgin product, which in fact a lot of the time is dearer. What we have to sow in the minds of public out there is the fact that by recycling their being a conscience of what is happening in your country. And sometimes you got to pay for that, our industry that is one you have to pay because it is not cheap. To handle paints and buckets it’s a dirty job, it’s a selective job. There is a high cost in recycling paints”.</p>	<p>This paint recycling scheme seems to be innovative but has been suffering for lack of capital because it has to collect the unused paints to its central location using a third party carrier.</p>
<p>Paint and coatings (2) (Very Good: It is growing and other brand has joined in the scheme recently. We are intending to grow across all brands). <u>Source of income:</u> levy from the consumer and sale of recycled materials <u>Major expenditures:</u> Collection of unused paints from the retailers and dealers, recycling cost is high</p>	<p>“The paint recovery scheme will be a whole of industry approach, we are already talking about that and that material will have beneficial uses. And that’s a really exciting area for us because of the quality is being developed”.</p>	<p>The scheme is growing and more and more brands are incorporating into the scheme. It could be referred to as a model PS scheme.</p>
<p>Agrochemical (1) (Good: The scheme is growing and accredited by the Ministry for the Environment) <u>Source of Income:</u> Users have to pay a subscription based on the disposal amount and from sale of</p>		<p>This scheme was suffering due to lack of participation of the farmers. It is economically stable but there exists a debate whether it is on polluters pay principle because the farmers who are not participating in the scheme are not levied or</p>

Schemes (Status)	Economic stability statements (from semi-structured interviews)	Comments
collected plastics, wraps to the recycling company. <u>Major expenditures:</u> Collection cost, management fee.		responsible though they are polluting the environment.
Agro-chemical (2) (Good: The scheme is growing and accredited by the Ministry for the Environment). <u>Source of Income:</u> Consumers are levied so participating brand owners are also contributing and from sale of collected plastics, wrap etc. <u>Major expenditures:</u> Collection cost, management fee.		This scheme was suffering due to lack of participation by the farmers because the collection points were located in central locations mostly in retail outlets. They are introducing an on farm collection system. It was found economically stable and argued to be a true PS scheme as the consumers are paying irrespective of participation in the scheme through a levy and brand owners are collecting the levy and contributing to the scheme. Thus it is argued to be a true representation of the principles of “polluters pay” and “producers’ responsibility”.
Glass packaging (Good: The scheme is growing and more sectors are being developed for alternative use of glass packaging waste. Accredited by the Ministry for the Environment) <u>Major Income:</u> Subscription fee and levy. <u>Major expenditures:</u> Education campaign, research and product development, engagement with the industry for further development of alternative use of glass as roading	“To join us you do pay us a standard subscription fee, but you use 500 tonnes of glass you pay the levy for that, if you use 5 tonnes of glass you pay accordingly. So we get from everybody a relative financial support based on the amount of glass in their industry. The rationale is that the more glass you used greater the income from that products, so therefore the greater the contribution from your part to the scheme”.	This glass packaging scheme is growing and major glass producers and users are participating and contributing through levy but the main problem is with the imported glass which goes directly into retail sectors where the participation is very low. The scheme is managed by a small proactive team who used to work from home, and meet in meetings occasionally in their members sponsored premises. This shows how management could reduce

Schemes (Status)	Economic stability statements (from semi-structured interviews)	Comments
materials		the administration cost for the schemes.
Used oil (Poor: Was doing well but recently suffering and may be shrinking. Accredited by the Ministry for the Environment) <u>Source of income:</u> Contribution from the oil companies, Indirectly the used oil is an income because it is used for cement production in place of coal. <u>Major expenditures:</u> Transportation and management cost, treatment and monitoring of emitted gas and precipitation at the stakes of cement kiln.	“The condition of the scheme is that it was going well. But now the scheme is in very rough time for us because what has happened is, major oil companies are no longer supporting our scheme. They are supporting alternative scheme so our volume is going down”.	The scheme operates on a mixed model and suffering due to lack of participation from the oil companies. Economic viability of the scheme is questionable at the moment.

From the above table we could identify that the economic stability of some of the PS schemes is in jeopardy. Some of them are suffering from lack of recyclable material, some due to lack of participation. The cases for the used oil recovery and lead acid battery need to be reconsidered carefully because if these schemes do not continue there will be no facilities available to look after used oil and scrap batteries in New Zealand. However, the positive feature of PS in New Zealand is that most of the PS schemes implemented by the group of producers, brand owners, importers and retailers appear to be economically viable. The participants from the business organisation were asked about their perception of the sustainability of the PS schemes. Figure 15 provides responses from the host business organisations about the perception of efficiency of PS schemes in New Zealand.

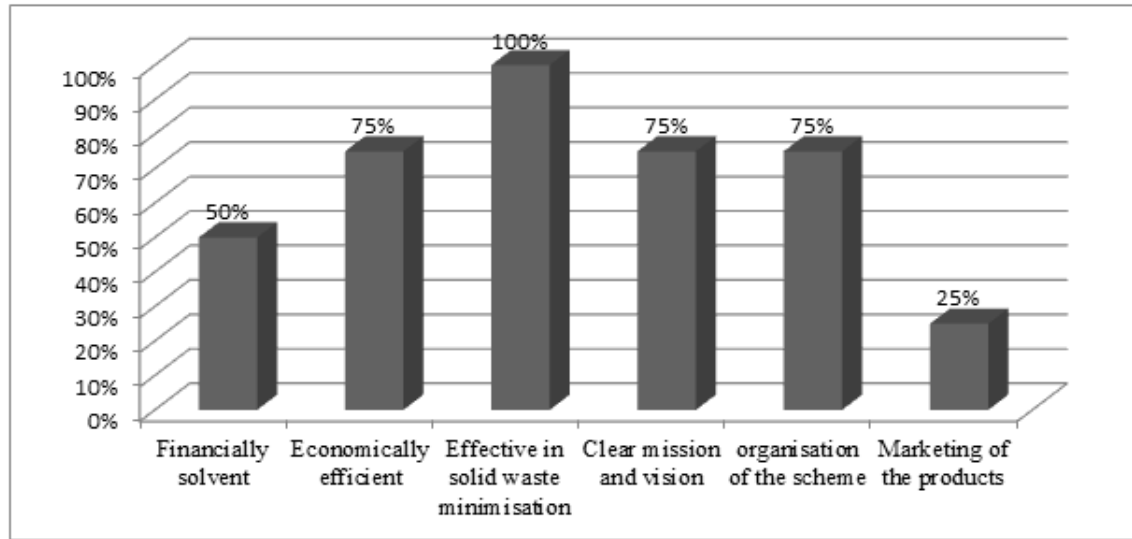


Figure 15 Efficiency of PS Schemes as Expressed by the Survey Participants from Host Business Organisation.

All of the participants consider that the PS schemes are successful in minimising solid waste and 75% of the participants from the host business organisations considered that the PS schemes are well organised, economically efficient and have clear mission and vision. Whereas only 25% of the participants were of the view that the PS schemes marketing strategies are efficient.

4.6 Responsibility Sharing among the Stakeholders

Stakeholder participation in the management of the PS schemes of New Zealand is varied. Schemes are following different and appropriate sets of rules for sourcing finance and management styles. The Waste Minimisation Act 2008 did not set up any framework for stakeholder participation, rather it is left voluntary and industries are independent in selecting rules for establishment and management of the schemes (MfE, 2009e).

The white-ware and lead acid battery recycling schemes have been operating for around 25 years in New Zealand as part of the manufacturing company. These schemes are established as part of the companies and intended to take care of the end products.

Anyone can return or trade-in the white-ware appliances to the outlets of the company at free of cost. The scheme has to pay for the freight cost of these materials to the warehouse for recycling. In addition the white-ware scheme is engaged with local authorities for recycling of any products. Then the collection cost is paid by the local authorities. The government wants to get rid of old white-ware from the market because

those appliances are not efficient in energy and water use. The following comment from the manager of the scheme shows the evidence of public-sector funding to discard old appliances out of use for increasing energy efficiency.

Well we are working with the government with ECO; we are doing a take-back programme of refrigeration product. They are obviously paying to get off the old refrigerators from power. So we are working with them. They pay for the transportation to get the product. If you have a refrigerator, you want to get rid of it. You could contact their call centres and we will arrange to pick up the product. When we get any product we gave them a report how much power that would consume in a year. And the way we look at is the condition of that product. The seals on the doors make a lot of impact. If seals are not proper then refrigerators will keep running and running, try to keep the area cold and the reason why the product is recycled. Then we feed the information back to the government. And at the end of the day are going to have a spread-sheet shows that how much power that would have been used by those old refrigerators. Overall total of how much power they are saving by recycling of those products.

The white-ware scheme is running on the income generated from sale of recovered materials. However, there is very little involvement of consumers, with partial contribution from public fund. The battery recycling scheme follows a similar style. However, it has to buy the scrap batteries from local and international dealers and there is no involvement of any public fund. So the shared responsibility through polluters pay principle is not adopted in these two PS schemes (McKerlie et al., 2006).

The used oil recovery programme is also operated and managed by a unit which is part of a cement manufacturer. Here the major oil distributors were members of the programme and paid for the cost of freight for used oil. From 2007 some major oil companies have left the scheme and only three remain in the scheme. As a result now the cement manufacturing company has to contribute almost half of the transportation cost which is strictly limited by the amount of coal replaced by the used oil as fuel for cement kiln. Though this is the first accredited scheme in New Zealand, there is no financial involvement from government into the scheme. So sharing responsibility among the stakeholders does not represent the polluters pay principle because the consumers are not levied though it represents a form of producers' participation through involvement of oil distribution companies.

The two paint and paint products recycling schemes operated in New Zealand follow a similar approach to manage and involve the stakeholders. Among them the large paint

recycling scheme is governed by an individual board of trustee and managed by an individual management consultant. The consumers pay for the scheme through a levy imposed on the paint product and the unused paints are collected by the retail outlets and dealers of the paint manufacturing company. More producers and brand owners are joining the scheme. There is no involvement of any public funding for the scheme. This scheme is argued to be truly representing the PS concepts which highlight the ‘consumers or polluters pay principle along with the producers’ responsibility as stated in the study by Nicol and Thompson (2007).

On the other hand, the second paint recycling scheme is managed by the paint manufacturer individually. They have collection bins all over New Zealand in different retail outlets and supermarkets. Once the bin is filled up, contractors collect and transport it to the processing plant. The major costs are from the transportation and the recycling operation and these have to be recovered from the sale of recycled paints or other products like steel and plastic. This scheme does not also reflect the sharing of responsibility among the consumers though it represents producers’ responsibility.

There are two agrochemical PS schemes established in New Zealand. These recently established schemes are accredited by the Ministry for the Environment. The first agrochemical scheme established in 2005 is governed by a board of trustee set up by the producers, brand owners and representatives from the local authorities. There is a mix and match rule followed for different products included in the scheme. In general, the participating brand owner’s products are levied so their products are collected free of cost and sold for recycling. The rest of the products like wrap, nets, and drums are operated on a user-pay basis. Local authorities funded for the establishment of the scheme however, there is no involvement of public fund at the moment. This scheme represents public-private partnership and stakeholder participation on the basis of ‘polluters pay’ and ensures ‘producers’ responsibility’ principles as stated in various literatures (Sujauddin et al., 2008; Nicol & Thompson, 2007; McKerlie et al., 2006).

The second PS scheme for agrochemical products was set up by a multi-national manufacturer and some producers and brand owners have joined the scheme. From the very beginning the scheme has operated on the basis of user-pay. The major costs are the collection and management costs for the scheme and the sources of income are from user

charges and the sale of materials for recycling. There was no involvement of public fund in the scheme. However, this year the scheme received a grant from the Waste Minimisation Fund which will be used for education campaigns on TV and radio. Both the schemes are accredited and adopted the principle of shared responsibility among the stakeholders. However, there is a debate between the preferences for implementing a levy or operating on a user-pay basis. The scheme management is in favour of the system either to levy the product or charge consumers and this debate is also found in the discussions over the comparative study of PS and extended producer responsibility (Nicol & Thompson, 2007).

The glass packaging scheme is governed by the forum of producers, brand owners, importers, wineries and supermarkets who manufacture, import, use and sell glass packaged materials. Here the scheme is financed from the levy imposed on the glass containers. The sellers used to collect and pay the levy based on their sale or use of glass products. There is no permanent establishment for the scheme and the fund is utilised for different educational campaigns and collection of glass containers in different national programmes. The scheme used to work with local authorities during the winery tours, concerts, and games for collecting used glasses. It spends on research and development of further sustainable use of recycled glass. Recently the scheme received a large grant from the Waste Minimisation Fund for co-working with local authorities for the management of glass and other packaged products during the upcoming Rugby World Cup 2011 (MfE, 2010b). Except for the involvement of the Waste Minimisation Fund, this scheme could be seen as a perfect sharing of responsibility among the stakeholders on the basis of the polluters pay principle and of producers' responsibility.

Although the personnel from the schemes, who responded in the research, postulated that their schemes are substantially PS schemes, they are following different approaches for stakeholder participation. This issue brings forth several policy implications and debates which need to be further researched or evaluated. After examining the challenges, benefits and sustainability issues of the schemes it can be said that industry-led schemes, where there is less stakeholder participation, are suffering whereas the PS schemes widely participated in by the stakeholders are growing, and these schemes seem to be a better model for PS in New Zealand.

4.7 Suggestions for Policy Improvement

The research intended to identify the problems and challenges faced by the PS schemes of New Zealand in order to locate any possible policy suggestions from the stakeholders. The views and ideas expressed by the participants create a knowledge base for further study in this field. During the research it has been identified that stakeholders who have participated in the survey and interviews are aware of the policy implications for PS.

4.7.1 Product Stewardship to be Voluntary or Mandatory

The respondents prefer the ‘voluntarily implemented mandatory PS schemes’. The respondents from the PS schemes prefer to keep the option of voluntary engagement of the stakeholders in establishing PS schemes for their products. Once the PS scheme is established for a particular product that should be mandatory for all the producers, manufacturers, and importers. And the consumers of that product also have to participate into the PS schemes mandatorily. In the Waste Minimisation Act 2008, there is an option to declare any product as ‘priority product’, and then the stakeholders mandatorily have to implement PS scheme for that product. Until now Ministry for the Environment has not declared any product as ‘priority product’ (MfE, 2009e). Interview respondents unanimously agreed that PS schemes should be implemented and managed by the producers, manufacturers, brand owners and importers and participation of the stakeholders have to compulsory. So, the principle supported by the respondents is that anybody who has economic gain from different stages of the product should pay for the end of life management, which is the basic principle of end of life-cycle management (Polli & Cook, 1969).

The PS schemes of New Zealand are voluntarily established, managed by certain manufacturing companies or associations of producer or brand owner. Some of the schemes were established by the manufacturer for recycling or reusing the products either for economic gain, environmental concern or to build reputation. Although some of these schemes are facing challenges, the respondents prefer them to remain voluntary because they believe that businesses should be operated independently with minimal intervention from the government. In addition, they consider that they have the expertise to solve the problems rather than involving others who would compel them in a particular direction.

We are doing that because we knew that government is going to target farm plastics as priority product. We knew product stewardship is going to come out as part of the Waste Minimisation Act 2008. And we had two choices; we could either outsource our responsibility to other people or we could deal with the problem ourselves. We choose to do the latter; dealing with the problems ourselves is much cheaper rather than outsourcing the responsibilities to other people. So it's cheaper for us to run our own scheme and when we talk about product stewardship, that's the Act says the ownership should be shared among the importers, producers who ever get the economic gain from the sale of the product so they should take some responsibility. We also got a share from the user the consumer because we need them to take the ownership of the product and it's very important particularly with farm plastic.

Yes we are essentially product stewardship scheme. It would be an easy situation if we are doing our own product. But we do everything. Yes, absolutely, we are looking at ways to manufacture appliances that are easy to disassemble. So those are the things coming in, power consumption, water consumption, and so all sorts of environmental things we are looking into.

Yes the scheme is part of the company. I don't believe the economics there, unless you have prior knowledge in manufacturing facility to paint. To start up a recycling in New Zealand, and manufacture recycle paint without subsidiary or virgin raw material and like a standard brand of paint, financially I don't think it would be viable.

Though the PS schemes of New Zealand have been sustained voluntarily, the respondents in the interviews from the schemes would prefer to restructure the policy framework for ensuring the participation of the stakeholders. Here in New Zealand the participating brand owner's products are levied so that free-riders are having a comparative advantage on their product price because they do not have to pay for the scheme. One possible solution for this problem has been introduced by an agrochemical scheme in New Zealand. It collects the participating brand owner's products for recycling free of cost and the cost is recovered from the levy. For other products the users have to pay for the collection of waste to the scheme. This is not feasible if the user or consumer do not want to participate and dump illegally. Another agrochemical scheme operates on the basis of a user-pay system which is also not feasible if there is no compulsion to participate in the scheme. Most of the respondents have preferred a certain form of enforcement for the stakeholders when it is implemented voluntarily by a group of producers, manufacturers, brand owners and importers.

The other challenge is about participation, if brand owners are going to make their product expensive in order for them to be in stewardship scheme. They wanted for

whom it is made should participate. And that's a challenge; it's a challenge globally.

As I said earlier we need farmers to take ownership of their product. It does cost us to run the scheme. But it's cheaper for us to ourselves rather than outsourcing.

In addition, the respondents in the online questionnaire survey were asked to provide their suggestions on further improvement of existing policy framework for PS. Most of the respondents vehemently claimed that PS had to be mandatory for certain products and the producers, brand owners, importers, and finally the consumers should take the entire responsibility for the products. Some of their comments are stated below.

Government should take a stronger approach to product stewardship identifying priority products and rather than depending on voluntary product stewardship these should be made mandatory. Without a level playing field there will be low-to-no movement by industry (Local authority).

Possibly allow industry schemes to apply for mandatory status if a percentage of the industries are involved in order to stop free riders (Local authority).

More direction from government regarding initiating PS schemes, also provision for stakeholders other than industry to have input into which products need schemes (Local authority).

Include a new provision for compulsory PS status if a majority of an industry agree to it i.e. if 75% of the industries (by sales) agree to a scheme becoming compulsory - make it easy process to allow that. This is the only way responsible industry participants can avoid being penalised by free riders taking advantage of a scheme without contributing to it (Local authority).

For product stewardship to be successful it should be mandatory and not voluntary. (Local authority)

The Government should take a pro-active approach and initiate mandatory product stewardship schemes. (Local authority)

Make sure that the products that are identified as priorities actually get product stewardship schemes in a reasonable timeframe i.e. within the next financial year. Stop government lobbying by the forums, trying to prevent product stewardship. Remove the onus on the rate payer to pay for product stewardship; it should be the manufacturer / consumer. Take the step to force schemes like container deposit legislation and penalise manufacturers using products that are cheap but cannot be recycled or reused (Local authority).

The above comments were quoted from the participants of the online questionnaire survey and indicate their desire to see a review of the legal provisions for PS in New Zealand. Each PS scheme should be reviewed along with an engagement with the stakeholders to formulate suitable regulative frameworks, in order to uphold the principle

of polluters pay and producers' responsibility. The following comment from an interview participant emphasised on engagement with the consumers of the products.

I think they need to be a bit more engaged with the consumer. As I said earlier to put on the producer, owner, the persons who gets a gain, we can put as many scheme but if farmers do not have to use it. So there should be an engagement.

4.7.2 Environmental Monitoring and Control

Stakeholders of PS in New Zealand are cynical about the environmental monitoring and restriction over traditional waste management practices. Certain practices, though legal, have been identified as barriers for the PS schemes. Traditionally, farmers in rural areas were burning or burying farm's wastes which are not perceived as environmentally sustainable. This practice of burning and burying farm's products or wastes emits greenhouse gases. Besides, the possible value addition from the end of life management of the products is unnecessarily ignored. Agrochemical schemes in New Zealand have to face a lot of challenges to bring in more consumers and producers.

The main problem is that farmers are still allowed to burn plastic or bury. Again this is another key area of product stewardship. The government once removed the costly disposal from the end user to the producer. This is all very well. But you have got to engage the end user as well and I think that's need to tighten enough.

The schemes are growing, you know it's quite early days for the (name suppressed) scheme, there's a quite a lot of behaviour change to go on. So the schemes are in place but not all the farmers and growers are using it. It takes quite a bit to tackle the behaviours particularly in farming sector. There has been a long time of burning, burying or doing something alternative with the material so changing behaviour takes time.

While there have been some attempts undertaken by the local authorities or the government, there should be a uniform direction implemented with a possible ban on burying or burning of wastes in the rural farms in places where PS schemes are implemented by the stakeholders. The following comment from the participant of a scheme indicates the lack of control on environmental monitoring.

Yes, like at the moment farmers still have the option to burn or bury and that's obviously the cheaper than New Zealand recycling scheme. So they will continue to do that. Now what's happening here in New Zealand, various councils and local authorities are moving to ban burning or burying wastes in the farms. So that will be great. That's going to be a driver for growth rate. Having said that darkness falls every night, farmers will still say am I going to recycle rather burn at night? You never get to have 100% participation.

PS schemes have to be more vigilant in terms of their association and engagement with the farmers with awareness-building programmes. There could be the potential impact of education and awareness building campaign on TV and radio. Lack of participation and spatial variation among the consumers has been reported by Atari et al. (2009:1278) who also emphasised that “environmental farm plan programme information packages (e.g. in the form of brochures) could be developed to educate producers about potential benefits of implementing the programme”.

In addition, the burning of used oil in boilers instead of fuel oil has been considered a potential threat for the used oil recovery programme. The practice of burning used oil in the boilers has to be carefully examined to confirm that the emitted gases from the boilers do not pose any threat to the environment.

The stakeholders of PS seemed to be confused about the implementing authority for environmental monitoring and some of the respondents expressed urgency for establishing a one-stop service centre where they can raise their issues regarding the PS. There is provision for setting up a Waste Advisory Board under the framework of the Waste Minimisation Act 2008 (MfE, 2009e). In general, the board is supposed to provide independent advice to the Minister for the Environment regarding the waste minimisation. So this Waste Advisory Board could be empowered to look after the policy-framework and the broad challenges or issues raised by the stakeholders. Besides, the Act has the provision for the local authorities to enact by-laws and to appoint enforcement officers for taking actions against any offence violating the by-laws, or regulations implemented under the Waste Minimisation Act 2008 (MfE, 2009e). So there are provisions for implementing strict environmental control under the Act. However, to make this effective the regulations and by-laws need to be enacted and implemented. It is vital to engage with the stakeholders before implementing the regulations and by-laws so that there is a fair playing field established for all. The following comment from the respondent of a scheme also raises the lack of coherence between the actors of waste governance.

If you have so much legislation you frighten people often and they won't do it. So if central government really wants these things to stand, they should be in agreement with local bodies so the policies are fair and equitable to all business people they want to be in it.

Similar observations were stated by Davies in her study on waste governance in New Zealand. The following two comments from the participants of the study by Davies (2009:168) show evidence of the lack of coherence and proper direction from the actors of waste governance.

We have tried for years to get the government to have a central directive, but New Zealand has had a hands-off style of government for years on everything (waste network)

The MfE, I think, have just tagged along. That's all they've done. They keep producing this guff, but at the end of the day I believe they have done very little to promote waste minimisation in New Zealand. There is no legislation that they have managed to put in place that has assisted us (Local public sector).

Though there is enacted legislation for waste minimisation, it has been found that the stakeholders especially the local authorities are still not involved actively and the management of the PS schemes are pointing to a lack of proper guidance and control from the central government.

4.7.3 Other Issues Raised to Improve Policy Framework

Some questions related to improvement of policy framework, were directed to the respondents of the online questionnaire survey and the semi-structured interviews. These questions were raised among the respondents to get their views and ideas on some policy implications in order to create a knowledge basis for improving policy-framework of PS. Respondents from both the online questionnaire survey and semi-structured interviews, have showed their positive attitude towards some policy suggestions like providing support for technological development of PS, promoting procurement of recycled products in public sector. Whereas proposal like establishing pilot scheme did not receive much attention from the respondents. Responses in the online questionnaire survey and semi-structured interviews are detailed in the following Table 13.

Table 13 indicates the percentage of respondents of highest rating and the average of rating (1 most effective; 5 least effective).

Table 13 Comments from Online Questionnaire Survey for Improving Policy Framework

Issue	Local authority		Host business organisations		Waste management organisations	
	Percentage (highest rating)	Average rating	Percentage (highest rating)	Average rating	Percentage (highest rating)	Average rating
Establish pilot or demonstration project	38.5(2)	2.72	40(2)	2.6	40(3)	2
Facilitate information sharing of PS options/benefits	29.3(3)	2.61	40(1)	2	40(3)	2.2
Provide tax write off for investment in PS schemes	38.5(2)	2.18	60(1)	2.4	40(3)	2.8
Support development of technology for PS in New Zealand	42.5(2)	2.3	40(2)	2.2	66.7(1)	1.33
Promote procurement of recycled product in public sector	31.6(2)	2.45	75(3)	2.5	50(1)	1.5
Provide subsidy for the PS schemes	38.7(2)	2.81	60(4)	4.0	33.3(2)	3
Establish strict environmental standards	40.5(1)	2.05	75(3)	2.75	60(1)	1.8

Around 30% of participants from local authorities and 40% from waste management and business organisations consider that information sharing among the consumers could be effective in increasing participation in PS. The participants emphasise establishing strict environmental control, providing tax write-off and support development of technologies for PS.

In response to the above questions some of the respondents from local authorities provided the following comments which hold significance in terms of policy implications.

If the government provides tax write-offs, or supports PS schemes financially in any other way either for research or subsidies then it is not product stewardship. PS is where the manufacturer takes responsibility for his product from cradle to grave. Only the manufacturer is in a position to design his product to make it easily reusable, recyclable or disposable. These costs need to be built into the purchase price of the product so that when someone buys one of your widgets, they pay for the disposal costs up front. Otherwise the tax-payer pays for the subsidy by “tax write off”, and “development support” etc. Why should people who don't use the product pay for its disposal? Place a tax on the product (most effective). (Local authority)

For some industries, the only way a scheme can work is via a levy at the wharf or airport. Government needs to look at these options i.e. placing an importation levy that is passed on the consumer. This works well for fully imported materials such as oil. (Local authority)

In addition, the following comments and views were obtained from the semi-structured interviews with the management of PS schemes of New Zealand.

Table 14 Comments from Semi-structured Interviews for Improving Policy Framework

Issue	PS Schemes (%)			Comments
	Yes	No	No comment	
Establish pilot or demonstration project	37.5	12.5	50	
Facilitate information sharing of PS options/benefits	37.5	25.0	37.5	
Provide tax write-off for investment in PS schemes	75	25	--	
Support development of technology for PS in New Zealand	87.5	--	12.5	
Promote procurement of recycled product in public sector	62.5	--	37.5	“well that’s how actually it starts”
Provide subsidy for the PS schemes	12.5	62.5	25	“Not really, my belief that business should be sustainable by their own, without getting any help (Because in the long run it will go back to tax-payers) yes, that’s not a good option”.
Establish strict environmental standards	75	25	--	“Yes, but it’s difficult in practice. Especially in our industry some other industry it may not be, we got a whole variety of products from different manufacturers so that is little bit harder to establish”.
				“Yes that one is particularly important to us

Issue	PS Schemes (%)	Comments
		because we are under very strict environmental control but there are lot of business operating they don't have the same".
		"There are regulations in place but there is nobody to enforce it. There is no benefit for compliance and no stick for non-compliance".
		"I think number one for us to implement strict environmental standards. I believe because the whole thing about the product stewardship is to care for the environment".

It could be understood that stakeholders of PS placed more emphasis on facilitating information sharing, providing tax write-off for investment, establishing strict environmental control and supporting the development of technology for PS. Providing subsidies and establishing pilot schemes have been considered less significant in relation to policy improvement.

There is scope for the establishment of PS schemes in some other sectors in New Zealand. More and more products have been included in extended producer responsibility programmes in USA, and Canada. Mostly the factors of economic gain and concern for the environment are being considered as the reasons for implementing these programmes (Powell, 2009). In order to develop PS schemes in different sectors manufacturers and producers have to be motivated for investment. One possible step to encourage producers and manufacturers in setting up new PS schemes could be to give an amount of tax write-off by the government on the spending on importing machinery or investment for establishing the schemes. This is particularly significant because once the PS schemes are established then the burden of responsibility could be shared among the stakeholders. So it is required to provide incentives by the government to the producers or manufacturers through the policy framework (Cassel, 2010). Some of the respondents consider that there should not be any form of public funding in the PS scheme because it will then divert from the polluters pay principle. However, the tax write-offs for investment into the schemes will not be direct spending from public fund. Rather it would be an incentive for better intervention in improving the environment. Around 75% of respondents from PS schemes, 60% from business organisations, 40% from waste management organisations

and 40% of participants from local authorities are in favour of providing tax write-off for investment in PS schemes. In addition, most of the stakeholders supported investment or grants for developing more sustainable technology for PS schemes. With more improved technology, PS schemes would be able to reduce the cost for operations and also would reduce the amount payable by the consumers. This could induce more consumers in the scheme and would bring in more products for recycling. Thus it could generate more income for the schemes also. 7 out of 8 respondents from the PS schemes emphasised on increased contribution from the government on the development of further sustainable technologies for PS schemes.

Some of the issues put to the participants during the research are not accepted as effective policy suggestions. Most (62.5%) of the PS schemes personnel, along with 44% of survey participants did not consider that providing subsidy for the PS schemes would be an effective policy approach for New Zealand. This is a positive indication that they agree with the polluters pay principle adopted by the policy makers in New Zealand (MfE, 2009e). However, almost half of the participants have indicated that government should encourage more procurement of recycled products in New Zealand. The procurement of recycled product in public sectors would definitely help this sector to face the challenges from the recent economic downturn and consequential devaluation for recycled products over the world. Quoden as cited in Powell (2009:34) stated about similar challenges that “the global economic crisis has been a ‘big challenge’ for stewardship programmes. During the economic meltdown, at the same time that recycling prices dropped, stewardship-fund payment from obligated companies, which are based on sales volume, fell. As a result stewardship programmes were forced to raise fees on brand owners and retailers, some by as 50%”. In order to overcome this situation one possible solution could be to identify more sectors where procurement of recycled products can be increased.

4.8 Benefits of the Product Stewardship Schemes

The research participants were asked about the benefits of the PS schemes. The survey participants from host business organisations were asked about their views on benefits of the PS schemes in New Zealand. Figure 16 shows the potential benefits mentioned by the respondents from host business organisations.

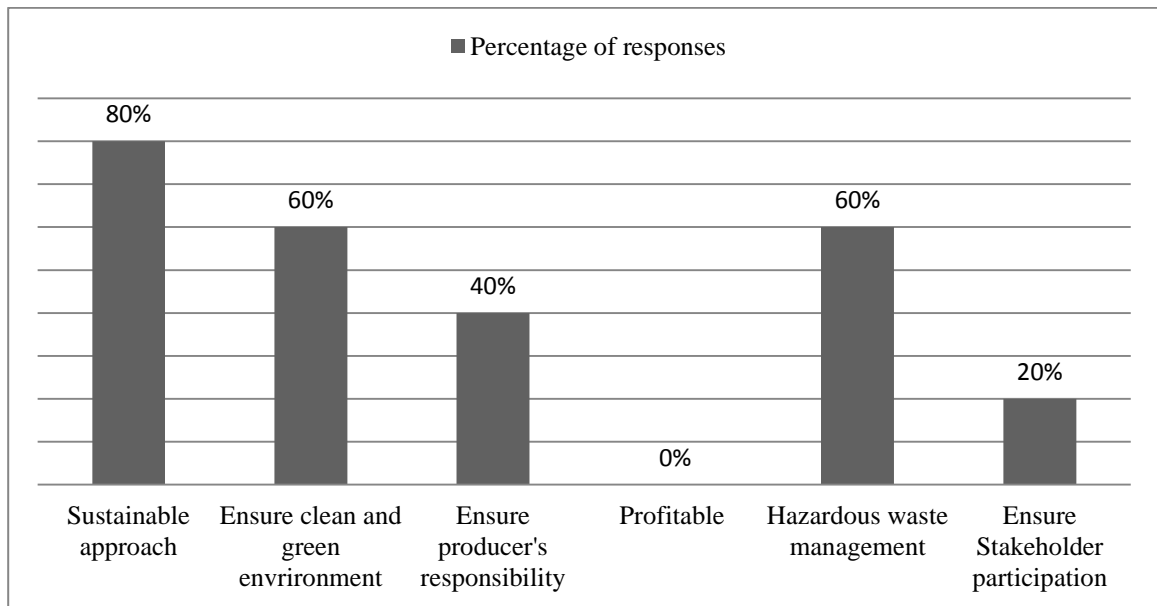


Figure 16 Benefits of PS Schemes in New Zealand.

Most of the stakeholders participating in the research considered PS schemes as a sustainable approach for minimising solid waste. The PS schemes of New Zealand such as white-ware, agrochemical products, paints, glass containers, used oil, lead acid batteries, and refrigerant products have separate collection systems across the country. In the white-ware sector, most of the plastic and metals recovered from the PS scheme are recycled and reused and the remainder of unusable products are dumped in landfills. Paint recycling schemes reused and recycled 100% of the collected unused paints and decorative coatings. The used oil recovered by the scheme is fully utilised as fuel for cement kiln. The agrochemical PS schemes also recycled and reused silage wraps, and containers. However, the recovered chemicals are disposed of as per the required standard. The following comments from interview participants show how the PS schemes are contributing to reducing the amount of solid waste disposal.

Per annum we are saving nearly 300,000.00 litres of paints being pushed into landfills and it's no doubt that the liquid paint and it's also the buckets and tins; we recover the paints, tins and buckets and all that's recycled.

Though the viability is questionable because it's part of PS particularly when we are manufacturing in New Zealand and if we stop doing that there will be a lot amount of lead going to environment particularly in landfill. So we typically collect 10 to 12 thousand tons of scrap Lead.

In the first year we collected just 9 ton of plastic when we started in the year 2005. The second year 18, third year 130 ton and in last year we collected 300 ton of plastic.

The PS schemes of New Zealand are also having some monetary benefits which in turn are helping the national economy. The white-ware recycling scheme has been operating as a recycling scheme and it is part of the manufacturing company. They collect all forms of white-ware irrespective of model and manufacturer. These old unusable white- wares are recycled and a major portion of the components (including the copper, plastic and metals) are recycled and reused in manufacturing their own products. This reduces the purchase and import of raw materials and should reduce the manufacturing cost of the products. There has been a significant issue raised by the white-ware sector participants that every unit of white-ware taken out from the market and recycled would create a demand for a new product. This concept is particularly important for white-ware, mobile phone and computer equipment sectors because mostly these products are unusable when they become faulty or old fashioned and people keep upgrading these products often especially in developed countries (Ahmed & Ali, 2006; Seadon, 2006).

In 2005-2006 calendar years an annual volume of approximately 15 million litres of used oil was transported and was used as fuel in cement kilns in place of coal in New Zealand. So the amount of coal replaced by the used oil is an added advantage and reduces the manufacturing cost of cement also (Halliday et al., 2007). The following comment shows how the cement manufacturing company is benefiting from the used oil scheme.

We have cement ships in Dunedin, Lyttleton and Auckland. To get the used oil in Westport is that we have back loading, the logistic cost is very low to get the oil from the source back to Westport. So of course the scheme became a local scheme, we don't have to run trucks to get the oil from Auckland port to Westport. Ships are going back anyway and put it back to Westport. We have a lot of advantage with the scheme. So when the scheme started oil companies paid for the collection of used oil to our ships and we look after it from there.

The scenic natural beauty and the clean and green environment of New Zealand are always major sources of attraction for migrants and tourists. The implementation of PS through the Waste Minimisation Act 2008 is another achievement of the government to promote clean and green New Zealand. It has been found that these PS schemes are not only bringing in economic benefits for the stakeholders, they are also helping to preserve the sanguine natural beauty of the country. The glass packaging scheme has been found to be effective in ensuring the clean and green image of the country.

Glass itself when it is in earth will cut your foot and it is hazardous. But I think part of this is psychological, I mean a visitor comes from your country here and

there is glass lying here and there, those sorts of things don't help the country. I think it's too far, we deal with the problem and we are trying to develop an ethos, a way of thinking, so members of the community we deal with follow our line of works, if you do the right thing for glass then you will do right for paper, plastic, everything. I am sure that everybody will take care of their products.

The agrochemical schemes have also been very effective in reducing the amount of farm burning of plastics, containers which reduce the impact on the environment. As noted earlier, New Zealand farms are still allowed to burn in their backyard under certain restrictions. However, the schemes are successful in reducing the practices of farm burning. Because one of the agrochemical schemes runs on the basis of a levy, which farmers are paying for the end products, so they should not be unwilling to dispose of their wastes through the scheme. Besides, both the schemes have established nationwide on-farm collection systems which should reduce the difficulties for the farms to travel to collection depots or retailers for disposing the farm plastics, containers etc.

The PS schemes are identified as growing entities for some sectors like agrochemicals, paints, mobile phones, computer accessories, and glass packaging. While some of the schemes have been in business for a long time, however, most of them are recent and still growing. These schemes also support a number of associated companies like freight, carriers, recycling plants. So in general, the PS sector is trying to grow as an industry which eventually creates more job opportunities in the local market. It has been observed during the research that some of the schemes are well established and have been operating for a long time. Some schemes are still growing so would generate more job opportunities in future as expected from the PS industry which is obviously a prospect for this sector.

4.9 Contribution for Theoretical Perspective of End of Life Management

The prime concern among the participant stakeholder groups identified is how producers' responsibility and stakeholder participation are ensured through the PS concept in New Zealand. There were two ways for the end of life management of these products. One plausible approach could be that traditional waste management systems would continue collecting wastes like glass containers, paints, white wares, agrochemical products and a general levy on those products would be imposed on the product value. The dealers and retailers would collect the levy and return it to the government and then it would be

distributed among the local authorities on the basis of population and geographic conditions. Here the main concept of “polluters pay” would be fulfilled but the responsibility of the producers would remain unaccounted for.

In New Zealand the stakeholders have taken a proactive role and set up PS schemes voluntarily operating on the basis of the “mix and match” rule. Some of the schemes are running on levy and some are on user-pay. Industry-led PS schemes do not receive any form of levy. Sometimes they charge for collection of the goods either from the consumers and producers. Here the underlying principle is that stakeholders need to shoulder their own responsibility.

In this research the theoretical framework adopted suggests that there have been certain factors and motivations identified as the prime reasons for implementing voluntary environment programme such as PS schemes. Respondents from host business organisation were asked about their motivations for implementing the PS schemes.

Figure 17 shows the summary of responses from the respondents.

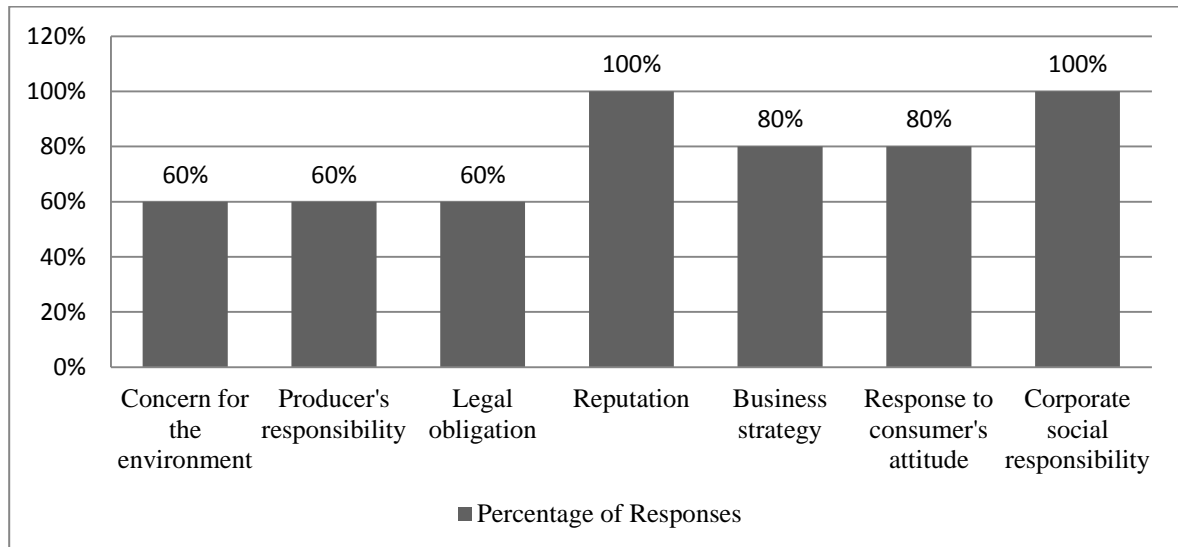


Figure 17 Source of Motivation for the Businesses to Establish PS Schemes.

Participants from the host business organisations were also asked through the online questionnaire survey about the key actors who are playing vital role for formulating environmental policies for their organisations. Figure 18 shows the responses regarding the actors who have been effective in inducing innovation in the environmental policies of their organisations.

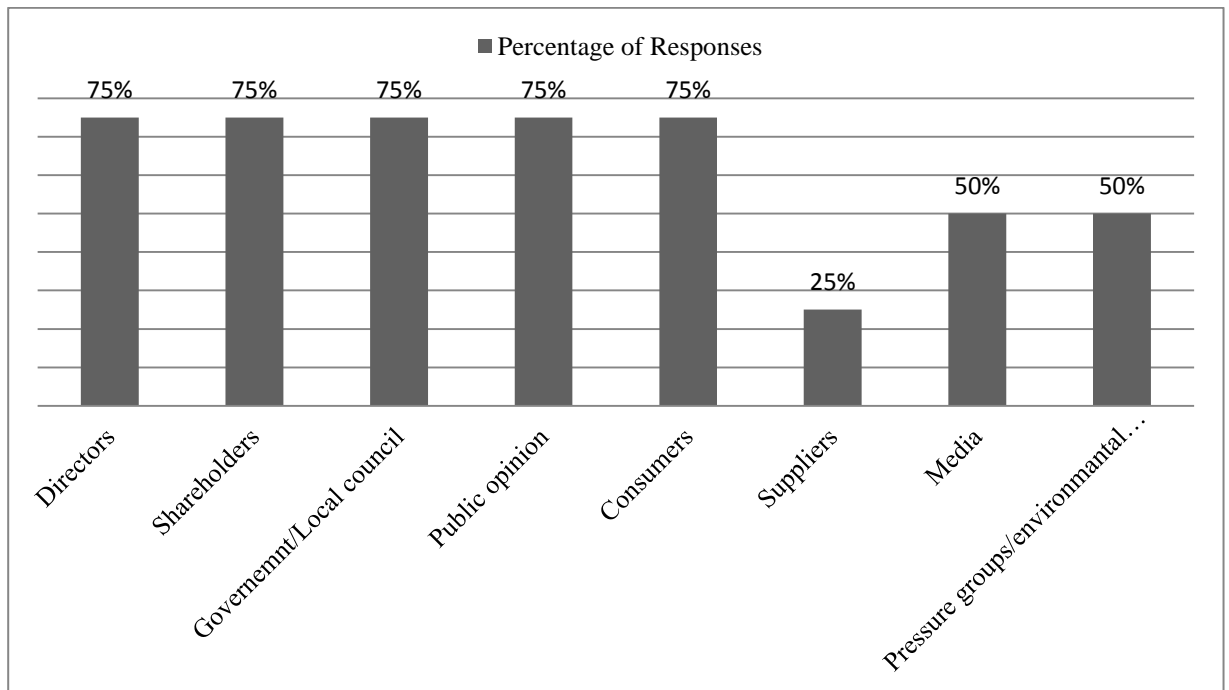


Figure 18 Actors Playing Key Role for Shaping Environmental Policy of the Company. So the respondents from the host business organisations consider that building a reputation and the corporate social responsibility are the prime factors to motivate organisation's plan towards engagement in environmental programme like PS. In addition, they agree about the influence from public opinion, regulatory framework of the government and consumers' satisfaction playing vital roles to generate internal environmental policy towards a clean and green New Zealand. Similar notions have been expressed in the study of Collins et al., (2007). In that study participants from large business organisations in New Zealand expressed that 'reputation' and 'brand name' are vital factors for adopting environmental practices in their production and management. The consumer survey before implementing the waste disposal levy also stated that a large number of people in New Zealand prefer the products that adopt more clean and green technology and leave no harmful impacts at the end of their life (3R, 2006). So the overall motivational framework for end of life management is argued to be the concern for the environment, reputation, consumers' satisfaction, legal-obligations and stakeholders' attitude towards clean and green environment. This notion is also supported by various studies on end of life management for different products and countries (Ahluwalia & Nema, 2007; Guerin, 2008; Ferrao et al., 2008; Funk, 2004; Bulkeley & Watson, 2007; Lewis, 2005; Khanna et al., 2007; Harvie & Jaques, 2003).

In addition, there is debate over the issue of stakeholder participation in PS schemes. Some of the industry-led PS schemes have been operating for a long time and their principle motive is identified as economic gain from the end of life management. These schemes are operating in the absence or in minimal participation from the consumers. For example white-ware, lead acid battery schemes of New Zealand collect all products irrespective of brand for economic gain, and environmental concerns. This is part of their reverse supply chain management. In agrochemical schemes, a difference in view has been found among the respondents whether to implement 'levy' or operate on 'user-pay'. There are views for and against both the approaches for stakeholder participation. As the PS schemes run on the basis of levy and the participation from the producers, brand owners is not ensured, then those who are not participating in the scheme could get financial advantage in terms of value of their product. Although a 'user-pay' system is argued to be effective by the research participants however, it needs to be enforced. If any farmer does not want to participate and continue burning in the backyard would be financially advantaged compared to the farmers who are participating in the schemes. In that way, the principle of 'polluters pay' will not be ensured which might ruin the objectives of implementing PS schemes in New Zealand. In response to similar debates, researchers are of the view that mandatory PS programmes that target specific recovery and recycling rates are effective (Nicol & Thompson, 2007). However, there has not been any comprehensive study found that specifies over the debate of either to impose 'levy' or to run on 'user-pay'. So there is scope to examine all PS schemes especially the agrochemical schemes of New Zealand to find out a comprehensive framework for responsibility sharing that would ensure the 'polluters pay' principle along with stakeholder participation.

Chapter 5 Conclusion

New Zealand is one of the developed countries in the world which promotes a clean and green image. PS, in the form of stakeholder participation, is considered as a dynamic strategy for minimisation of waste. New Zealand introduced the Waste Minimisation Act 2008 for institutionalising the voluntary practices of PS by producers, brand owners and importers. In addition, the Act allowed implementation of a waste disposal levy, creation of a Waste Minimisation Fund and setting up of a Waste Advisory Board. Government has implemented waste disposal levy from July 2009 and the Ministry for the Environment has allocated from the Waste Minimisation Fund for 2010-2011 round. The Waste Advisory Board has been appointed which is independently working to provide suggestions to the Minister for the Environment on issues related to waste minimisation. All of these policy tools aim to reduce the generation of waste and to encourage stakeholders to recycle and reuse products.

This research found that stakeholder participation in the management of the PS schemes in New Zealand is varied. The Waste Minimisation Act 2008 did not set up any framework for stakeholder participation; rather it is left voluntary. While awareness of the requirement and value of stakeholder participation was high, the actual participation rates were identified as a problem to be addressed. Likewise, awareness of the accreditation process could also be improved. Awareness of the implementation of the waste disposal levy was high. It could be suggested that as the accreditation process is mostly the responsibility of the Ministry for the Environment and the waste disposal levy is the responsibility of local authorities. So there may be opportunities for improvement by comparing differences between the ways each of these agencies address these issues.

Stakeholder awareness, participation and adequate information campaigns seem to be the key and the apparent lack of trust in the Ministry/government created through previous attempts to promote such schemes needs to be overcome. The findings suggest that the Ministry for the Environment ideally has to overcome its rigidity and engage with the stakeholders to disseminate more information about the accreditation process and its outcome, and to dialogue on the problems of implementation and how they might be resolved.

The principle for PS of “cradle to grave”, or as one survey participant mentioned as “cradle to cradle”, is significant for industries engaging themselves in PS as is the term ‘end of life management’ and these concepts provide opportunities to promote the scheme. There are debates about the sharing of responsibility among the stakeholders; however, all of the respondents unanimously emphasised principles of “polluters pay” and “producers’ responsibility” for defining the concept of PS implemented in New Zealand. In relation to the concept of PS, stakeholder participation in New Zealand is not well understood, and this is another area for additional emphasis. The consensus among respondents regarding the roles of producers suggest that those “with the greatest ability to reduce those impacts (e.g. producers, manufacturers) should shoulder the greatest responsibility”.

As the PS schemes studied in this research varied considerably, so the problems or challenges reflected by the participants from those organisations or PS schemes also varied. Industry-led PS schemes were found to be more fragile compared to the PS schemes implemented by individual producer, brand owner and importer.

Financial drawbacks were the most mentioned and theoretically the easiest to improve. The question is where does the money come from? The major source is from the sale of recycled materials and the demand for, but the sale value of, the recycled products is not always sufficient. All PS scheme personnel interviewed rejected the concept of subsidy to overcome the financial drawbacks or challenges.

Another challenge for the PS schemes of New Zealand is in general, the lack of raw materials for processing or the reduced source of materials for recycling and collection challenges through a dispersed geography. Other issues identified as potential barriers for the existing PS schemes include the cost of collection and freight which comes back to overall financial implications. Sharing the responsibility among producers, brand owners, importers and consumers appears to be the most viable solution for overcoming the challenges of PS schemes.

It is important to ensure that PS schemes are monitored to identify loopholes in policy to ensure the sustainability of the schemes. Absence of strict environmental control and enforcement has been identified as a potential problem for some PS schemes in New Zealand. According to the participants of the research although there are regulations in

place, there is nobody to enforce it and no 'reward' for compliance or 'punishment' for non-compliance. This is another area that can be addressed in more detail in subsequent research and policy. In common with most voluntary schemes there are also problems with so-called free-riders. That these free riders benefit from those actively involved is a source of irritation and concern to the latter.

The sustainability issue is also critical and until now there has been no attempt by the government to consolidate all the factors involved in PS schemes. Although, in general, the PS schemes studied are perceived to be environmentally sustainable or at least less unsustainable than the single use or disposal alternatives, general information about how various schemes are operating and their actual impacts (beyond landfill and hazard reduction) is scarce. It was shown from this study that the economic stability of some of the PS schemes is in jeopardy; however, there is an opportunity to learn from the PS schemes implemented by the group of producers, brand owners, importers and retailers most of which are economically viable. These are other areas for further research and funding.

The Ministry for the Environment as the policy-maker has been found to be proactive in various instances to upgrade and improve the strategies for minimisation of waste in New Zealand. The Ministry has undertaken a number of steps, like the accreditation process for PS schemes, allocating funds from the Waste Minimisation Fund for the projects to promote waste minimisation etc. However, these attempts may be in vain if information on them is not widely disseminated among those concerned. During the research it was found that there has been a wide gap between the stakeholders and the policy-makers in relation to information sharing of PS.

The concept of PS adopted in New Zealand required producers, brand owners, and importers to shoulder their responsibility. However, the policy-makers have to create a free and fair platform for all. Otherwise it will be difficult for the PS schemes to be sustained in the long run. In this regard, the Waste Advisory Board could be the best platform for initiating and engaging with the schemes more to understand their problems and should suggest policy improvement needed for PS in New Zealand.

The principle supported by the respondents is that anybody who has economic gain from the different stages of the product should pay for the end of life management, which is

the basic principle emphasising end of life management. The PS schemes of New Zealand are voluntarily established, and although some of these schemes are facing challenges, the respondents preferred them to remain voluntary because they believed that businesses should be operated independently with minimal intervention from the government. In addition, they considered that as managers they had the expertise to solve their own problems rather than involving others who would compel them in a particular direction. Though the PS schemes of New Zealand have been sustained voluntarily, the respondents in the interviews from the schemes would have preferred a restructure of the policy-framework to ensure greater participation by other stakeholders and consumers.

The respondents have provided a number of suggestions for improving the policy-framework. Most of the respondents vehemently claimed that PS had to be mandatory for certain products and that the producers, brand owners, importers, and finally the consumers should take the entire responsibility for their products.

The PS schemes in New Zealand are found to have a number of benefits in terms of their environmental and economic contributions. Most of these schemes are associated with hazardous products like white-ware, paints, agrochemical, plastic containers, batteries, and glass containers. The PS schemes have established separate systems for the collection, recycling, reusing and disposal of the products at the end of their useful life. Some of the schemes like white-ware, paints, lead acid batteries, agrochemical products are found to impart economic gain from the end of life management of the products. And these schemes have developed as an industry which necessarily induced economic gains for a number of associated industries such as the freight companies, collection contractors, recycle plants.

The responsibility sharing of the consumers has been identified as a growing concern of the participant stakeholder groups that needs to be addressed. Sharing of the responsibility by consumers is still a dilemma, and the difference of views among the participants on the issue of either imposition of a levy or user charge, created a basis for further study. As it was beyond the scope of this research to include the consumers of the PS scheme, it would be necessary to get feedback from the consumers in order to develop an ideal model of PS that would ensure their participation.

Ideally, PS schemes should be sustainable and self-funding and not subsidised by the waste disposal levy. However, the research participants were of the view that there should be support through providing tax write-offs for investment in PS, public funding for research and development in technology for PS and increasing procurement of recycled products in public-sector. Government should take a proactive and uniformly directed approach for identifying priority products, rather than depending on voluntary PS. These products should be made part of mandatory schemes to create a level playing field. Another possibility is to allow the industry schemes to apply for mandatory status if a percentage of the industries are involved in order to stop free-riders. That is there could be a new provision for compulsory PS status if a majority of stakeholders in an industry agree to it so that responsible industry participants can avoid being penalised by free-riders taking advantage of a scheme without contributing to it. It is intended to present this study in conferences or publish an article based on this research so the practitioners especially the policy-makers in New Zealand might have an enhanced sense of the problems and benefits of the PS schemes and can advocate for policy improvements based on the outcomes of the research.

In conclusion, PS schemes in New Zealand were found to be proactive through setting up separate collection and management systems for certain products. If these products were not managed separately that would be an added pressure for the traditional waste management system. PS schemes were also found to have resulted in some economic gain through recycling and reuse of the products. In general, some of these PS schemes have been effective in building reputation for the producers and brand owners. In addition, they have contributed for the pioneer role of New Zealand in enacting relatively comprehensive legislation for PS, to ensure stakeholder participation in solid waste management.

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Appendix I: Local Authorities (Approached for questionnaire survey)

- | | |
|--|---------------------------------------|
| 1. Ashburton District Council | 25. Hawkes Bay Regional Council |
| 2. Auckland City Council | 26. Horizons Regional Council |
| 3. Auckland Regional Council | 27. Horowhenua District Council |
| 4. Buller District Council | 28. Hurunui District Council |
| 5. Carterton District Council | 29. Hutt City Council |
| 6. Central Hawke's Bay District Council | 30. Invercargill City Council |
| 7. Central Otago District Council | 31. Kaikoura District Council |
| 8. Chatham Island Council | 32. Kaipara District Council |
| 9. Christchurch City Council | 33. Kapiti Coast District Council |
| 10. Clutha District Council | 34. Kawerau District Council |
| 11. Dunedin City Council | 35. Manawatu District Council |
| 12. Environment Bay of Plenty Regional Council | 36. Manukau City Council |
| 13. Environment Canterbury Regional Council | 37. Masterton District Council |
| 14. Environment Southland Regional Council | 38. Matamata Piako District Council |
| 15. Environment Waikato Regional Council | 39. Mackenzie District Council |
| 16. Far North District Council | 40. Marlborough District Council |
| 17. Franklin District Council | 41. Napier City Council |
| 18. Gisborne District Council | 42. New Plymouth District Council |
| 19. Gore District Council | 43. North Shore City Council |
| 20. Greater Wellington Regional Council | 44. Northland Regional Council |
| 21. Grey District Council | 45. Nelson City Council |
| 22. Hamilton City Council | 46. Opotiki District Council |
| 23. Hastings District Council | 47. Otorhanga District Council |
| 24. Hauraki District Council | 48. Otago Regional Council |
| | 49. Palmerston North City Council |
| | 50. Papakura District Council |
| | 51. Porirua City Council |
| | 52. Queenstown Lakes District Council |
| | 53. Rangitikei District Council |
| | 54. Rodney District Council |

55. Rotorua District Council
56. Ruapehu District Council
57. South Taranaki District Council
58. South Waikato District Council
59. South Wairarapa District Council
60. Stratford District Council
61. Selwyn District council
62. Southland District Council
63. Taranaki Regional Council
64. Tararua District Council
65. Taupo District Council
66. Tauranga City Council
67. Thames Coromandel District
Council
68. Tasman District Council
69. Timaru District Council
70. Upper Hutt City Council
71. Waikato District Council
72. Waipa District Council
73. Wairoa District Council
74. Waitamo district council
75. Wanganui District Council
76. Wellington City Council
77. Western Bay of Plenty District
Council
78. Whakatane District Council
79. Whangarei District Council
80. Waimakariri District Council
81. Waimate District council
82. Waitaki District Council
83. West Coast Regional Council

84. Westland District Council
85. Waitakere City Council

Appendix II: Host Business Organisations of the Product Stewardship Schemes (Approached for questionnaire survey)

- | | |
|---|---|
| 1. Aggram Inc | 20. Refrigerant Recovery NZ Ltd |
| 2. Federated Farmers of New Zealand Inc | 21. BOC Ltd |
| 3. Horticulture New Zealand Inc | 22. Patton NZ |
| 4. Fonterra New Zealand | 23. Redcold Group |
| 5. Adria Crop Protection | 24. Donaghys New Zealand |
| 6. Agrisea New Zealand | 25. Elliot Technologies |
| 7. Agronica | 26. Fruitfed Supplies |
| 8. BASF Chemical Company Ltd | 27. Grochem Horticulture |
| 9. Bell Booth | 28. Mantissa Corporation Ltd |
| 10. BioAg | 29. Nufarm New Zealand |
| 11. New Zealand Avocado Growers Association | 30. Orion Crop Protection Ltd |
| 12. Black Currents NZ | 31. Pacific Bio Fert |
| 13. New Zealand Fresh Vegetable Industry | 32. Pfizer New Zealand |
| 14. New Zealand Boysenberry Council | 33. Ravensdown Fertilizer Cooperative Ltd |
| 15. New Zealand Citrus Grower Inc | 34. Intervet Ltd |
| 16. Olives New Zealand | 35. Syngenta Crop Protection Ltd |
| 17. Bio Start NZ | 36. Venco Ltd |
| 18. Valvoline | 37. Virbac Ltd |
| 19. Paintwise | 38. New Zealand Potato Industry |
| | 39. Pipfruit New Zealand |
| | 40. Zespri Kiwifruit New Zealand |

Appendix III: Waste Management Organisations

(Approached for questionnaire survey)

- | | |
|--------------------------------|------------------------------------|
| 1. Envirowaste | 18. Astron Plastic Recycling |
| 2. Metrowaste | 19. Computer Recycling Co NZ |
| 3. Absolute Waste Services | 20. 3R Business Group |
| 4. 0800 Junk Run | 21. Mr Binz |
| 5. Transpacific Industries Ltd | 22. Dangerous Goods Management |
| 6. Mastagard | 23. Dynamic Recycling Ltd |
| 7. Clean New Zealand | 24. Clean Earth Ltd |
| 8. Green Environment Ltd | 25. Tarash Palace |
| 9. International Waste Ltd | 26. Product Stewardship Foundation |
| 10. Chemwaste industries | 27. Plasback |
| 11. Combus Tech | 28. Huggies & Envirocomp |
| 12. Trash Control Ltd | 29. Metalman |
| 13. Smart Environment | 30. Mount Metal Recyclers |
| 14. CMA Corporation Ltd | 31. Materials Processing Ltd |
| 15. The Timber Recycling Co. | 32. JBL Environment Ltd |
| 16. Ward Group | 33. Envirocom NZ |
| 17. CRTNZ Co NZ | 34. Agpac/Plasback |

Appendix IV: Product Stewardship Schemes of New Zealand
(Approached for semi-structured interviews)

1. Agrecovery
2. Agpac (Plasback)
3. Dell Recycling
4. Enviropaints Ltd
5. Exide batteries Ltd
6. Fisher & Paykel
7. Hewlett Packard
8. IBM New Zealand
9. New Zealand Packaging Accord
10. Refrigerant Recovery NZ Ltd
11. Resene (Paintwise) Ltd
12. Telecom New Zealand
13. Tyre Track Industry
14. Holcim Geo-Cycle
15. Glass Forum Packaging
16. Vodafone New Zealand

Appendix V: Questionnaire for the Survey Participants



Questionnaire Survey Form

1. What are the key elements for defining “Product Stewardship”? (Please select as many you consider fit).

- ☐ Recycling and Reusing
- ☐ Supply Chain Management
- ☐ Solid Waste Management
- ☐ Sustainable Approach
- ☐ Producer Responsibility
- ☐ Stakeholder Participation
- ☐ Public Private Partnership

Other please specify _____

2. Are you aware of concepts of Stakeholder participation and Product Stewardship for Solid waste management in the Waste Minimisation Act 2008?

Yes ☐ No ☐

If yes please answer the following:

a) Are you aware of the legal requirements of product stewardship scheme in New Zealand?

Yes ☐ No ☐

b) Have you heard about the accreditation process for product stewardship schemes?

Yes ☐ No ☐

c) Do you agree with the Government accreditation process for Product Stewardship schemes?

Yes ☐ No ☐

d) Are you aware of the waste disposal levy?

Yes ☐ No ☐

e) Do you agree that “the product stewardship schemes” should be financed from the Waste minimisation fund created from the waste disposal levy?

Yes ☐ No ☐

f) What are your suggestions for improving the provisions of product stewardship schemes under the Waste Minimisation Act 2008?

3. Who should be most responsible for implementing, monitoring and financing the product stewardship schemes in New Zealand? (Please select as many you consider fit).
- ☐ Brand owner, Producer, Importer
 - ☐ Government
 - ☐ Consumers
 - ☐ Local Authorities
 - Others (Please specify) _____
4. Of the policies listed below, please rank the top five which you think would be most effective in promoting “product stewardship” in Solid Waste Management? (starting from 1, most effective to 5 least effective)
- Establish pilot/demonstration project
- Facilitate information sharing of product stewardship option/benefits
- Provide tax write-off for investment in product stewardship schemes
- Support development of technology for product stewardship in New Zealand
- Promote procurement of recycled materials in public sector
- Provide subsidy in the cost of production
- Establish strict environmental standards
- Others (Please specify)
5. Does the organisation have comprehensive environmental policy?
- Yes ☐ No ☐
- If so, who was responsible for developing the policy?
- External Consultants ☐
 - Internal Consultants ☐
 - Directors ☐
 - Senior Management ☐
 - Middle Management ☐
 - Committee ☐
 - Environmental Manager ☐
- Does your organisation incorporate environmental issues in:
- Advertising/Marketing ☐
 - Policy statements ☐
 - Reporting ☐
 - Planning development ☐
 - Investment ☐
6. Which groups exert an influence on your organisations’ environmental performance/ motivation towards participation in sustainable environmental management?
- Directors ☐
 - Shareholders ☐
 - Parent Company ☐
 - Government/ Local Government ☐
 - Public opinion ☐
 - Consumers ☐
 - Suppliers ☐

Media ☐
Pressure groups/ Environmental organisations ☐
Other (Please specify) _____

7. Do you consider that environmental issues can be used to gain competitive advantage?

Yes ☐ No ☐
If so how? _____

8. Does your organisation maintain communication regarding environmental concerns with?

Environmental groups ☐
Civic organisations ☐
Politicians ☐
Government officials' ☐
The media ☐
Other (Please specify) _____

9. Do you have any further comments about the environmental and economical sustainability of these product stewardship schemes?

A. Local Authorities

1. Does the City/District council have a comprehensive Solid Waste Management Plan?

Yes ☐ No ☐

2. Is 'Product Stewardship' as stakeholder participation incorporated in the solid waste management plan?

Yes ☐ No ☐

3. Are there any plans for facilitating any form of product stewardship schemes undertaken by any community or group of producers?

Yes ☐ No ☐

4. What are the responsibilities of the Council for solid waste management under the legal framework of the Solid Waste Minimisation Act, 2008? (Please select as many you consider fit).

☐ Have a solid waste management plan
☐ Promote solid waste minimisation
☐ Undertake projects to reduce solid waste
☐ Community awareness
☐ Patronise product stewardship schemes

Other (please specify) _____

5. What are the types of projects being implemented by the Council to promote solid waste minimisation? (Please select as many you consider fit)

☐ Improvement of collection system
☐ Community awareness building
☐ Community involvement

- ☐ Recycling and reusing
- ☐ Product stewardship
- ☐ Hazardous waste management
- ☐ Landfill development
- ☐ Others (please specify) _____

B. Host Business Organisations

1. What are the products included in the product stewardship scheme affiliated with your company (if applicable)?

Please specify any other of your products that should be included in product stewardship schemes:

2. What are the important motivational factors for “Product Stewardship” schemes in New Zealand? (Please select as many you consider fit)

- ☐ Concern for the environment
- ☐ Producers’ responsibility
- ☐ Legal obligation
- ☐ Reputation
- ☐ Business strategy
- ☐ Response to consumers’ attitude
- ☐ Corporate social responsibility

Other (please specify) _____

3. How do you evaluate the effectiveness of product stewardship schemes (you are aware of)? (Please select as many as you consider fit).

- ☐ Financially solvent
- ☐ Economically efficient
- ☐ Effective in solid waste minimisation
- ☐ Clear mission and vision
- ☐ Organisation of the scheme
- ☐ Marketing of products

Other (please specify) _____

4. What are the major problems of the product stewardship schemes?

- ☐ Financial problems
- ☐ Legal basis
- ☐ Organisational structure
- ☐ Organisational Policy
- ☐ Market structure for recycled product
- ☐ Global economic crisis

Other (please specify) _____

5. What are the prospects for product stewardship schemes in New Zealand? (Please select as many you consider fit).

- ☐ Sustainable approach
- ☐ Ensure clean and green environment
- ☐ Ensure producers’ responsibility
- ☐ Profitable

- ☐ Hazardous waste management
- ☐ Ensure stakeholder participation
- ☐ Promote recycling and reusing

Other (Please specify) _____

C. Waste Management Organisations:

1. Do you consider that 'product stewardship schemes' would be able to reduce the environmental impacts from hazardous wastes like electronic, clinical wastes?
Yes ☐ No ☐
2. Is your company/ organisation undertaking recycling/ reusing systems in solid waste management?
Yes ☐ No ☐
3. Which sectors of the 'Product Stewardship' schemes could be benefited from the expertise of your company?
 - ☐ Waste collection
 - ☐ Waste recycling
 - ☐ Organisational management
 - ☐ Design and implementation
 Other (Please specify) _____
4. What are significant contributions of the Waste Minimisation Act 2008?
 - ☐ Waste levy
 - ☐ Product stewardship
 - ☐ Waste Minimisation Fund
 - ☐ Stakeholder participation
 - ☐ Promote solid waste minimisation
 - ☐ Legal obligation
 - ☐ Define responsibilities of local authorities
 - ☐ Waste Advisory Board
 - ☐ Reporting and auditing
5. What are the suggestions for improving the sustainability of the Product Stewardship schemes?
 - ☐ Increase community involvement
 - ☐ Government involvement
 - ☐ Introduce strategic management
 - ☐ Reduce administrative cost
 - ☐ Improve legislation
 - ☐ Improved technology
 - ☐ Produce cheap products
 - ☐ Ensure stakeholder participation
 Other (please specify) _____

Appendix VI: Indicative Questions for the Interview Participants

Indicative Questions for Interview



(Please read the attached Information sheet and Consent form before the interview session)

Project Title: Product Stewardship and Stakeholder Participation in Solid Waste Management: A New Zealand Study.

Researcher: Mohammad Nasir Uddin Mia.

Supervisor: Professor Charles Crothers

1. What are the products included in the scheme? What are the final products of the scheme?
2. Is the scheme currently: Experiencing growth
Static
Experiencing decline
3. How is the scheme arranged?
4. What do you understand by “Product Stewardship”?
5. Would you call the scheme you are associated with a product stewardship scheme? If yes, why do you consider it as product stewardship scheme? If no, briefly explain your reasoning.
6. Is your scheme voluntary? Are you currently considering to apply for accreditation of the scheme?
7. Any suggestion for improving existing legislative framework for “Product Stewardship” in New Zealand?
8. What are the problems experienced?
9. What are the benefits of the scheme?
10. What are the sources of income and the areas of major expenditure of the scheme?
11. Is your scheme economically sustainable? What has been its status over the last five years?
12. What impacts does your scheme have on the environment of New Zealand?

13. Are the technologies involved in the scheme sustainable? Do you consider that the scheme promotes the clean and green New Zealand?
14. What recommendations do you have for improving the environmental and economic sustainability of such schemes, nationally?
15. Who are the major shareholders of the scheme? Does the scheme get any funding from Waste Minimisation Fund or considering to apply for fund?
16. Is there any involvement of Government in the scheme? If yes what is the percentage of share of government in the scheme?
17. What policy do you think the Government should adopt to encourage this product stewardship schemes?
18. Of the policies listed below, please rank the top five which you think would be most effective in promoting “product stewardship” in Solid Waste Management? (starting from 1, most effective to 5, least effective)

Establish pilot/demonstration project
 Facilitate information sharing of product stewardship option/benefits
 Provide tax write-off for investment in product stewardship schemes
 Support development of technology for product stewardship in New Zealand
 Promote procurement of recycled materials in public sector
 Provide subsidy in the cost of production
 Establish strict environmental standards
 Others (Please specify)

19. What is the vision for the scheme? What plans are there for upgrading or enhancing it?

Appendix VII: Ethical Approval



MEMORANDUM

Auckland University of Technology Ethics Committee (AUTEC)

To: Charles Crothers
From: **Madeline Banda** Executive Secretary, AUTEC
Date: 14 May 2010
Subject: Ethics Application Number 10/65 **Product stewardship and stakeholder participation in solid waste management: a New Zealand study.**

Dear Charles

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by a subcommittee of the Auckland University of Technology Ethics Committee (AUTEC) at their meeting on 22 April 2010 and that I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTEC's *Applying for Ethics Approval: Guidelines and Procedures* and is subject to endorsement at AUTEC's meeting on 14 June 2010.

Your ethics application is approved for a period of three years until 13 May 2013.

I advise that as part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/research/research-ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 13 May 2013;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/research-ethics>. This report is to be submitted either when the approval expires on 13 May 2013 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this. Also, if your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply within that jurisdiction.

When communicating with us about this application, we ask that you use the application number and study title to enable us to provide you with prompt service. Should you have any further enquiries regarding this matter, you are welcome to contact Charles Grinter, Ethics Coordinator, by email at ethics@aut.ac.nz or by telephone on 921 9999 at extension 8860. On behalf of the AUTECH and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely

A handwritten signature in black ink, appearing to read 'M. Banda', with a stylized flourish at the end.

Madeline Banda

Executive Secretary

Auckland University of Technology Ethics Committee

Cc: Mohammad Nasir Uddin Mia myw9278@aut.ac.nz, AUTECH Faculty Representative, Applied Humanities