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Sustainable Business: The New Zealand Plastics Sector

A thesis presented in partial fulfilment of the requirements for the
degree of Master of Resource and Environmental Planning at
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Abstract:

The usual approach to problem-solving is to identify and remove the cause of the problem. Sometimes this is not possible because the cause cannot be found; because there are too many causes; or because the cause is human and cannot be removed. In such cases we are usually paralysed. Most of the major problems in the world will not be solved by more analysis. There is a need for design. There is a need to design a way forward – leaving the cause in place (De Bono, 1999, p.140)

To make progress towards sustainable development sustainability must be translated into action. For the New Zealand plastics sector this will require significant change to existing business strategies, practices, procedures and products. These changes will need to be supported by government policies and consumers.

Society makes decisions in a complex and integrated way. This complexity is very apparent within the New Zealand plastics sector with its vast range of polymers, products, and markets, and its often conflicting consumer demands and expectations. The central issues the industry must address in working towards sustainable development are the use of non-renewable petrochemical resources, the use of toxic or hazardous chemicals and additives and the creation of solid waste and litter.

Existing sustainable business models tend to focus on problem solving at specific levels of business operation. There is a need to provide a more cohesive message to the business community. Integrating sustainable development with all three levels of business strategy at corporate, business unit and operational levels, with the full commitment of business owners and shareholders is required. To engage a higher proportion of the industry in such changes strong leadership and market support is required, alongside the provision of simple and effective ideas, tools and resources to improve the capability of industry to operate in a sustainable manner.

To reach a state of sustainable business a tipping point must be established – where environmentally sustainable business practices become standard business practice and environmental excellence is rewarded with market success. To move away from an image of unsustainable practices the New Zealand plastics sector will need to exceed expectations, to create products that are not just sustainable, but that improve the quality of our environment. The New Zealand Plastics Sustainability Initiative and Best Practice Programme have been developed by the New Zealand plastics industry, as a result of this research, to create an environment where the ideas, tools and capabilities required to achieve this state are able to be inspired, developed and reinforced.

Index of Terms & Abbreviations Used:

ACOR	Australian Council of Recyclers.
APME	Association of Plastics Manufacturer in Europe.
ARA	Australian Retailers Association.
Best Practice	Decisions and actions that are selected as the best available for sustainable development given current knowledge, skills, technology and resources.
Council	New Zealand's Local Government or local authorities.
Domestic Post Consumer Waste	Plastic products that has been used in the home, such as juice, soft drink bottles and shopping bags.
ECCA	Energy Efficiency & Conservation Authority.
EMS	Environmental Management Systems.
EPR	Extended Producer Responsibility.
EPS	Expanded Polystyrene.
ERMA New Zealand	Environmental Risk Management Association of New Zealand.
Extrusion	The process of melting and pumping plastics through a die to continuously produce products such as pipe; tubes, spouting, film and sheet.
Film	A thin sheet of flexible plastic commonly used for wrap or bags.
HDPE	High Density Polyethylene.
HSNO	Hazardous Substances & New Organisms Act 1996.
Landfill	Any waste disposal site used for the controlled deposit of solid waste onto or into the land (<i>Landfill Guidelines</i> , MfE, 1992).
LDPE	Low Density Polyethylene.
LCA	Life Cycle Analysis - method to identify and quantify the environmental performance of a process or product from 'cradle to grave' (Azapagic, 1999).
MSDS	Material Safety Data Sheets.
MfE	Ministry for the Environment.
Mobius Loop	Commonly known as the chasing arrows symbol, or the recycling symbol graphically represents the 3 steps of the recycling process: the first arrow symbolises the collection and processing of secondary materials, the next arrow symbolises the manufacturing of recycled content products and the third arrow represents the purchasing of those products.
NARGON	National Association of Retail Grocers of New Zealand.
NES	National Environmental Standard under the Resource Management Act 1991.
NGO	Non-Government Organisation.
NZAET	The New Zealand Agrichemical Education Trust.
NZBCSD	New Zealand Business Council for Sustainable Development.
PACIA	Plastics & Chemicals Industries Association Inc (Australia).
Packaged Goods Accord	The New Zealand Packaged Goods Accord is an agreement between the New Zealand Government and the Packaging Council of New Zealand to develop a sustainable packaged goods sector, the Accord is currently being renegotiated and was previously referred to as the Packaging Accord.
PacNZ	New Zealand Packaging Council.
PaMPITO	Plastics and Materials Processing Industry Training Organisation (previously PITO).
PCE	Parliamentary Commissioner for the Environment.
PET	Polyethylene Terephthalate.
PINZ	Plastics Institute of New Zealand (now Plastics New Zealand).
PITO	Plastics Industry Training Organisation (NZ) – (now PaMPITO).
PNZ	Plastics New Zealand Incorporated (previously PINZ).
PP	Polypropylene.
PS	Polystyrene.
PVC	Polyvinyl Chloride.
RONZ	Recycling Operators of New Zealand Incorporated.
SBN	Sustainable Business Network.
SMF	Sustainable Management Fund administered by the Ministry for the Environment.
Sustainable Development	<i>...is development that meets the needs of the present generations without comprising the ability of future generations to meet their own needs</i> (The Brundtland Report, United Nations, 2003).
TBL	Triple Bottom Line Reporting.
TNS	The Natural Step.
UNEP	United National Environment Programme.
WasteMINZ	Waste Management Institute of New Zealand.
WBCSD	World Business Council for Sustainable Development.

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CHAPTER ONE

1.1 Introduction

Many New Zealanders consider the New Zealand plastics industry unsustainable. In May 2000 Cabinet agreed that sustainable development meant *meeting the needs of the present generation without compromising the ability of future generations to meet their own needs* (MfE, 2002, 6). Articles relating to plastic tend to focus on the dangers of PVC, the strangling or suffocation of marine life in plastic litter, the piles of plastic rubbish sent to landfill or the difficulties faced recycling it (Leadbitter, 2002, Beston, 2003, Meltzer, 2003, Zero Waste, 2003b). This assessment of the plastics industry is usually based on three central issues:

1. The use of non-renewable petrochemical resources.
2. The use of toxic or hazardous chemicals and additives.
3. The creation of solid waste and litter.

This research examines how the theory of sustainable development can be put into practice by the New Zealand plastics sector. The research focuses on the development of a framework that enables the sector to identify and determine business strategies, operations and products compatible with sustainable development. This state is defined as best practice or sustainability. The New Zealand plastics sector is an exciting test case because of the unique challenges it faces and its direct relationship to so many other sectors as a major supplier of packaging, construction, agricultural and homeware products.

In 2000, Liu completed an assessment of the sustainability of plastic waste in New Zealand. This research emphasised the importance of stakeholder participation and government leadership in working towards sustainability. It also concluded that voluntary action, market incentives, partnerships and consensus building would be the driving forces towards achieving an end goal of sustainable plastics. An assumption of this research was that these changes would be both led and initiated by Government (Liu, 2000).

The New Zealand government has since published the *New Zealand Waste Strategy: Towards Zero Waste and a Sustainable New Zealand* (MfE, 2002). The Strategy does not specifically refer to plastics waste, though this has now been re-evaluated with the renegotiation of the New Zealand Packaged Goods Accord between industry and government (PNZ, 2002d). The current situation of voluntary action by industry, local government, environmental groups and recyclers has continued.

This paper will examine the changes required for the New Zealand plastics sector to become more sustainable and how the current social, political and economic context in New Zealand impacts upon this. The central objectives, scope and methodology of this research are outlined below.

1.2 Objectives of this Research

The objectives of this research are to:

1. Examine the sustainability of the New Zealand plastics sector.
2. Examine sustainable business and the effectiveness of sustainable business models.
3. Create an environmental profile of the New Zealand plastics sector.
4. Assess the impact of trends toward sustainable development on the sector.
5. Examine New Zealand's formal and informal structures for sustainable business.
6. Identify the key issues, drivers and barriers to becoming a sustainable sector.
7. Examine what sustainable development means in practice for the plastics sector.
8. Examine how existing knowledge of sustainability can be utilised more effectively to create a more sustainable industry and define sustainable best practice for the sector.
9. Develop and implement a model for driving more sustainable business practice.

1.3 Scope of Research

This research focuses on the New Zealand plastics sector within the following parameters:

- Raw material suppliers, manufacturers (who convert plastic into products) and recyclers.
- All plastic raw materials are imported to New Zealand – this research has therefore not addressed the polymer manufacturing process.
- Imported plastic packaging and products are addressed only indirectly.

These parameters have been used as the basis for research as outlined in the following section.

1.4 Methodology

The central methodology employed throughout this research has been action-based (or active) research. Action-based research is defined by Greenwood and Levin as a process where *professional researchers and stakeholders define problems examined, cogenerate relevant knowledge about them, learn and execute social research techniques, take actions, and interpret the results of actions based on what they have learned* (2000, p.4).

The use of active research methodology enables broad participation in the research process and supports action leading to a better outcome for stakeholders (Devito, O'Rourke & O'Neill, 2000). The three key elements of this process are research, action and participation. Active research generates knowledge for the express purpose of acting to promote social change and social analysis. The aim is to increase the ability of the community or organisation members *to control their own destinies more effectively and to keep improving their capacity to do so* (Devito et al., 2000, p.6).

The researcher has been employed as the Environmental Affairs Manager for Plastics New Zealand Incorporated working, on behalf of the New Zealand plastics manufacturing industry, on a full-time basis for the duration of this research. The role of the Environmental Affairs Manager at Plastics New Zealand includes the following responsibilities (PNZ, 2002b):

- Assisting and encouraging members to operate their businesses in an environmentally responsible manner.
- Promoting to Plastics New Zealand members, all relevant standards, by-laws, legislation and best practices relating to environmental issues.
- Obtaining and summarising raw material end-use information to ensure that timely and accurate industry production and recycling statistics are available to members and Government.
- Developing and maintaining relationships with key people in appropriate Government Departments and Ministries. For example the Ministry for the Environment, ERMA New Zealand, RONZ, and WasteMINZ.

- Acting as the industry's spokesperson on environmental issues and promoting the agreed Industry position to the media.

These responsibilities provided an opportunity to conduct research, identify issues within the industry, and to aid in the identification and implementation of potential solutions as they arise throughout the research period. Findings reported within this paper reflect observations from discussions held at regular meetings and in conversation with industry members and stakeholders, in addition to the more formal workshops and surveys outlined below.

The use of action based research has meant that other specific research techniques have evolved and developed as findings were made and in response to external events. For example, early research findings were utilised to demonstrate the need for a sustainability strategy to the industry.

The research was completed in two main phases:

1. Assessment of industry performance, external stakeholder perceptions, communication paths and information flows (Chapters 3-5).
2. Development and implementation of an industry strategy in response to initial findings (Chapter 6).

Findings have also been reported to the industry and stakeholders throughout the research via industry meetings, training seminars, presentations and papers. These have been utilised to ensure additional information and capabilities were built upon. This follows the premise of action-based research which aims to increase the ability of an organisation or community to control their own future more effectively and to continue improving their capacity to do so.

An outline of specific methods used to collect information follows.

1.5 Collection Of Information

1.5.1 Industry Role

As outlined above the researcher has been employed by the New Zealand plastics industry as the environmental manager for Plastics New Zealand Incorporated (PNZ).

PNZ is a trade body representing New Zealand plastic raw material suppliers, converters and recyclers. PNZ has 165 member companies representing approximately 75% of the New Zealand plastics industry.

1.5.2 Plastics Mass Balance Survey

All raw materials for the New Zealand plastics industry are imported, with the exception of some additives like calcium carbonate. Since 1995, PNZ have been conducting an annual Mass Balance Survey of New Zealand plastic production and recycling. There are two surveys conducted to compile these statistics, one for manufacturers and the other for recyclers. Individual responses to both surveys are confidential to the staff of PNZ, who collate results for the industry, the New Zealand Packaging Council and the Ministry for the Environment as part of the sectors commitment under the Packaging Accord.

The manufacturers survey requires data on the six main types of plastic including weight and type of product. It also identifies which products are sold within New Zealand, those that are exported and the amount of waste plastics created and recycled by the industry. A spreadsheet format is used to extrapolate these figures against imports of virgin raw plastic material - thus giving an overall picture of the industry and indicating what proportion of plastic has remained in the country. See Appendix 1: Mass Balance Survey Form.

PNZ also conducts a confidential telephone survey of New Zealand plastic recyclers. This survey focuses on the volume and type of plastic collected and recycled and the current issues, concerns and market conditions of the industry. Two variations to this survey have been trialed during this research in response to concerns about the accuracy of data and low levels of participation to a prior mail version of the survey. See Appendix 2: Recyclers Survey.

1.5.3 Telephone Survey of Local Authorities

All 86 local authorities were contacted for a brief telephone survey in the period from 22 to 31 July 2002. The survey identified current plastic recycling practice, current concerns and the source of information on plastics utilised by local authorities. Results of the survey are discussed in Chapters 3 and 5. Appendix 3: Local Authority Survey Questions.

1.5.4 Interviews with Plastics Companies

Informal interviews were conducted with twelve New Zealand plastic manufacturers in June 2002. Results of the survey are discussed in Chapters 3 and 5. Appendix 4: Company Survey Questions.

1.5.5 Plastic Manufacturers and Recyclers Workshop

On 12 March 2002, a three-hour workshop was held by PNZ for plastic manufacturers and recyclers to discuss product design, innovation, contamination problems and solutions. The workshop focussed on rigid household post-consumer plastic waste. The final portion of the workshop was run as a round table discussion. This is where information is shared, without any set pattern of who speaks when, with informal interaction between members contributing as they see fit (Devito et al, 2000). The researcher acted as the facilitator and note taker. See Appendix 5: List of Participants in Manufacturers and Recyclers Workshop.

1.5.6 Workshop to Establish an Environmental Strategy

In September 2002, a workshop was held with 21 plastic sector representatives to establish the future environmental direction of the New Zealand plastics manufacturing industry. Appendix 6: List of Environmental Strategy Workshop Participants. An independent facilitator was engaged by PNZ to run the workshop. The workshop commenced with a presentation from the Ministry for the Environment to set the scene with background on current policy initiatives. This was followed by a brainstorming session identifying all the environmental pressures and trends that were increasingly impacting on the industry. The final part of the session was used to determine short, medium and long-term strategic objectives for the industry in response to these trends. The researcher initiated, designed and participated in the workshop. A draft environmental strategy resulting from this meeting was then released for industry consultation through newsletters, sector group meetings and individual contact. The strategy was then amended based on comments received and a final version submitted for formal industry confirmation to the PNZ National Executive Committee in December 2002. PNZ members were then invited to formally commit to the Initiative as signatories. This decision was not taken lightly by the companies concerned with several indicating they were unable to commit to the targets specified until they had done further work to improve their performance. Helen Clark, Prime Minister of New Zealand, officially

launched the New Zealand Plastics Sustainability Initiative in February 2003. To date over 65 plastic companies have committed to the Initiative. Appendix 7: New Zealand Plastics Sustainability Initiative. Appendix 8: List of Signatories to the Plastics Sustainability Initiative.

1.5.7 Development of an Environmental Best Practice Programme

The first target under the Sustainability Initiative is to provide a simple and effective programme to improve environmental performance within the industry. Extensive consultation was undertaken with the parties listed in Appendix 9, in addition to a literature review to determine the best course of action. As a result a commitment was gained from PaMPITO to incorporate environmental content into the sectors Unit Standards as they are updated. The researcher also developed a Best Practice Programme for the sector and was granted over \$94,000 funding from the Ministry for the Environment's Sustainable Management Fund to support the first year of the programme (SMF, 2003). The programme commenced in July 2003. Refer Chapter 6.

1.5.8 National Plastic Recycling Target Workshop

In March 2003, PNZ held a workshop with representatives from raw material, manufacturing and recycling companies. The workshop was facilitated by the researcher in response to a request from the New Zealand Packaging Council to establish plastic recycling targets under the New Zealand Packaging Accord. The workshop again involved an informal round table discussion where existing trends and statistics were discussed and the likely capacity of the industry over the following five years was evaluated. The following targets were established for 2008 at this workshop:

- 40% PET Packaging
- 40% HDPE Packaging
- 25% LDPE Packaging

1.5.9 Environmental Key Performance Indicators Workshop

In July 2003 a workshop was held with representatives from the plastics industry, Ministry for the Environment and the New Zealand Packaging Council to develop environmental key performance indicators for the industry. These indicators were developed to provide formal measures of success for the Best Practice Programme and to create a simple survey able to be adopted by the sector. This measurement was part of the criteria requested by the Ministry for the Environment under the contract for

Sustainable Management funding of the Best Practice Programme the survey developed is also likely to be adapted for use by the sector to report on progress under the Packaged Goods Accord. The workshop was initiated by the researcher and facilitated by Greg Brown of EcoSense. See Appendix 10: Plastics Industry Environmental Key Performance Indicator Survey.

1.5.10 Working Parties

The researcher has also participated in working parties examining farm plastic waste and plastics contamination as a PNZ representative. These parties are briefly discussed in the relevant case studies contained in Chapter 7.

The following chapter reviews existing models for sustainable business development and considers the relationship of these to change, communication and environmental education.

CHAPTER TWO

2.1 Sustainable Business Development

*If sustainability is going to take hold in the corporate sector in a big way...,
It will happen because sustainability is a great business strategy.
And it is. (Gilding, 2003)*

Sustainable development is described as an holistic concept, a strategy that requires the integration of economic growth, social equity and environmental management (NZBCSD, 2003). The problems that affect the environment, [economy and society] are not simple or isolated, they are systemic and interrelated (Suzuki & Dressel, 2002). This complexity acts as a barrier to problem solving where the cause cannot be found; because there are too many causes; or because human nature is the cause of the problem (De Bono, 1999). While there is a growing understanding of the concept of sustainability, there is doubt about what it means in practice and how it can be communicated in simple terms (Suzuki et al., 2002, NZBCSD, 2003).

New Zealand's Parliamentary Commissioner for the Environment (PCE), in a 1998 report on progressing sustainable development from theory to practice, called for an increased understanding of sustainability as a journey of continual improvement. The following recommendations were made at this time for the future of the Resource Management Act, the research which follows illustrates that these are equally applicable to sustainable business (PCE, 1998):

1. Vision, leadership and direction.
2. Improved collection and use of environmental data and monitoring.
3. Redefined accountabilities and incentives.
4. Better partnerships across sectors.
5. Increased resources and empowerment.

There is debate about what drives a business owner, shareholder or manager to develop their business sustainably. Two stances are typically taken for promoting sustainable development to the business community: the moral argument and the business case.

The WBCSD for example favours a strong emphasis on improving the quality of life. This focus, they state, is becoming more widely accepted by government, companies,

civil society organisations and others. *A quality of life focus makes the concept more aspirational, and it changes the tone and content of the sustainable development debate so that the emphasis is more on solutions than problems* (NZBCSD, 2003).

This approach follows the moralistic argument often offered by environmental groups and NGO's that there is a moral or ethical obligation on business to operate in a sustainable manner. Research conducted in New Zealand places a significant value on our clean green image (MfE, 2001b). Other reports however illustrate that while significance is given to environmental values this does not readily translate into a corresponding change in behaviour (Bradshaw, 2003¹, McKenzie-Mohr, 2003). Gilding also maintains that the campaign for social responsibility does not work effectively, and while pressure from NGO's does affect business policies and programmes, it does not result in the significant changes necessary to advance rapidly towards sustainability (2003).

The NZBCSD states that the business case for sustainable development rests on the three pillars of economic growth, social progress and ecological balance (2003). Their corresponding business case for sustainable development includes the belief that operating within a well-defined framework of sustainable development helps companies:

- Be more efficient and competitive.
- Engage in responsible entrepreneurship.
- Increase their financial return and reduce risk for shareholders.
- Attract and retain employees.
- Improve customer sales and loyalty.
- Grow supplier commitment.
- Strengthen community relations.
- Contribute to environmental sustainability (NZBCSD, 2003).

Neither the moral nor the business case can be mutually exclusive. As illustrated in the model developed by Boyle (Fig. 6), society is extraordinarily complex, communication, and the exchange of resources and business decisions are influenced by all sorts of factors and parties (2003). Kelly describes an ecosystem-like model, where many small parts join

together to create a highly adaptive whole, and suggests this is gradually taking over as complex systems organise and adapt in coevolution with their changing environments (Hawkins, Lovins & Lovins, 1999). The complexity of systems as discussed in both Kelly and Boyle's models provide a demonstration of the non-linear process through which businesses, organisations and society make decisions.

A discussion paper produced by British Telecommunications (BT) questions whether the market or government should be responsible for sustainable development, but concluded that there is a moral case for all (2003). Therefore, the need arises to engage and empower a diverse array of individuals, groups and organisations. Research released by the Institute of Business Ethics (Business in the Community, 2003), shows companies with a clear commitment to ethical conduct can outperform those who do not. Research has revealed superior market value in companies that included their ethics' programmes in annual reports, in comparison to those who did not. Of fifty academic studies into the relationship of corporate ethics and financial performance, thirty-three have showed a positive relationship, thirteen were neutral and four negative (Stock, 2003). This illustrates that the arguments for sustainable business development are mutually reinforcing.

The question then becomes, how can we achieve a state where both business and society as a whole have adopted practices and behaviours which are consistent with sustainable development? The WBCSD states that to integrate environmental best practice into the day-to-day planning and operations of corporations (UNEP, 2003):

- **Government policies** must allow greater flexibility to reach national goals and provide incentives for commercial performance.
- **Business leaders** must champion behavioural change throughout their corporations.
- **Voluntary partnerships** between industry, governments, NGO's, and international organisations must be formed to achieve greater progress.

The complexities of sustainability can be daunting, both from a political perspective and to individual business owners and shareholders. Most businesses do have the ability

¹ New Zealand's Reduce Your Rubbish 2003 media campaign, resulted in 20% of those surveyed saying it had a positive effect on their awareness, attitudes or behaviour, while only 2% noted improved or changed behaviour (Bradshaw, 2003).

to make positive incremental shifts towards best practice if the right leadership, facilitation, direction and resources are provided (Business Care, 2003a). Lack of legislative support for these changes can however create inequities in the market and in some cases competitive disadvantage. In a deregulated global economy, the New Zealand plastics industry is very exposed to competition from imported products.

The research, which follows examines the sustainability journey for the New Zealand plastics industry. The research clearly illustrates that sustainable business is not legislated for in New Zealand. The New Zealand government is therefore reliant on voluntary action from the business community to shift beyond mandatory compliance.

Creating a voluntary system for sustainable development is highly dependent on businesses being able to find competitive advantage through the adoption of sustainable business practices. A strategy which marries a complex array of stakeholder objectives towards a sustainable outcome, is necessary to make substantial progress towards sustainability and to avoid the inertia that results wherein parties are overwhelmed by the complexity of the issues faced or are continuing to defer responsibility.

The following section examines models of sustainable business available to New Zealand businesses.

2.2 Creating Sustainable Business

Sustainable development like all areas is subject to changing trends, influences and a growing pool of information and resources. Our understanding of what makes a business sustainable has undergone rapid development over the last decade. A sustainable business must operate in a manner that maintains or improves our social, economic and environmental status. Businesses that extract resources faster than they are generated, use harsh chemicals which have an adverse effect human or ecosystem health, or create intractable wastes do not meet these basic conditions.

While definitions of sustainable business do not offer the detailed practical guidance businesses need, there is a growing wealth of resource materials available to guide businesses towards environmental best practice. The authors and philosophies behind these resources are often very different, from governmental departments to grass roots

environmental groups. The apparent complexity involved in selecting the best approach for identifying and adopting sustainable business practices can be confusing for business owners, shareholders and managers. What they do have in common however is a clear identification of the aspects of business practice that need to be considered and the nature of change required in order to improve the social and environmental impacts of business activities. The methodologies recommended also typically follow a strategic or rational decision-making process.

Environmental practitioners working with business acknowledge that the journey towards sustainability is rarely a linear one. Progress is very much determined by the specific circumstances of the business or sector concerned. Figure 1 below identifies the typical steps businesses take towards achieving sustainable development.

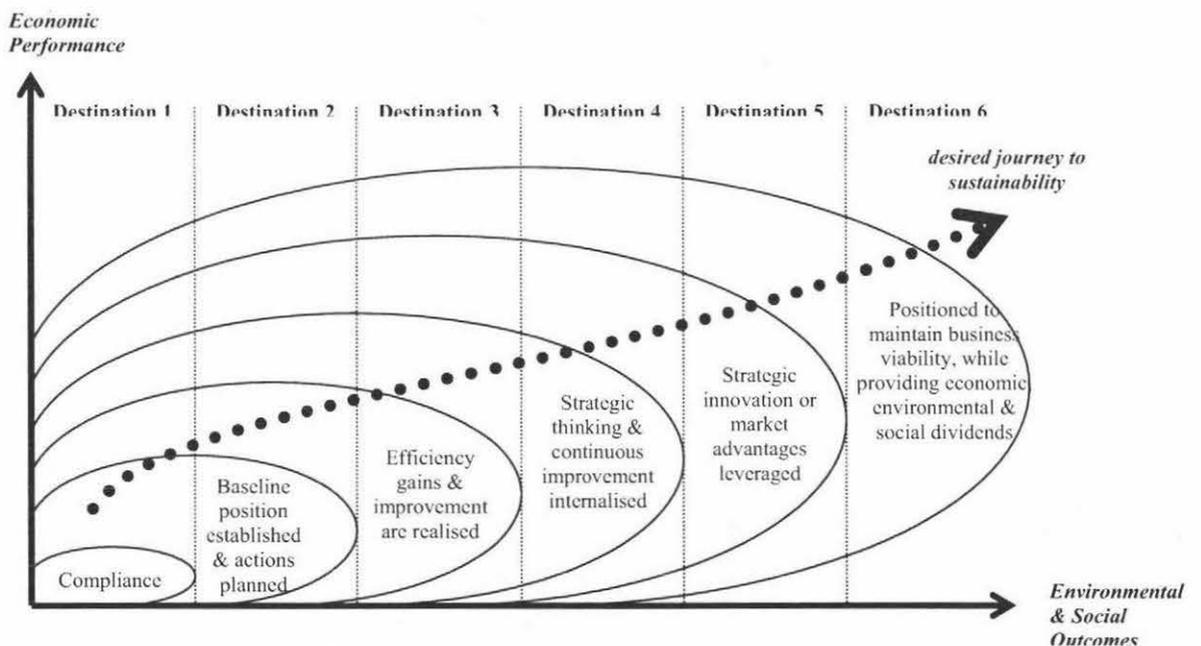


Figure 1. *The Sustainability Journey, (Business Care, 2003b, Queensland EPA, 2000).*

A review of existing UNEP and WBCSD eco-efficiency and cleaner production programmes reveals a framework similar to the changes recommended by New Zealand's PCE, for supporting sustainable business development (UNEP, 2003). This model is also starting to emerge in New Zealand (Adapted from UNEP, 2003):

1. Capacity building.
2. Creating networks linking stakeholders at all levels.
3. Providing training, technical and managerial assistance.

4. Adapting existing methodologies to specific industries and/or cultures.
5. Demonstrating economic and environmental benefits of actions.
6. Working with governments to establish an effective policy framework.
7. Involvement of academics, educational and research institutes.

The following section outlines models for sustainable development. The models are mechanisms used for progressing towards sustainable development. These are then drawn together in an analysis of the relationship of change, communication, and environmental education to business strategy.

2.3 Models for Sustainable Business

The following models provide philosophies, techniques and methodologies for implementing sustainable development within business.

2.3.1 Eco-efficiency & Cleaner Production

The term 'eco-efficiency' was developed in the early 1990's. In simple terms, eco-efficiency means creating more goods and services while minimising resources consumption, waste and pollution (NZBCSD, 2003b). Eco-efficiency was defined at the first Antwerp Workshop on Eco-efficiency in 1993 as being (NZBCSD, 2003b): *...reached by the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life while progressively reducing ecological impacts and resource intensity throughout the life cycle to a level at least in line with the earth's estimated carrying capacity.*

The WBCSD has identified seven success factors for eco-efficiency (UNEP, 2003);

1. Reduce the material intensity of goods and services.
2. Reduce the energy intensity of goods and services.
3. Reduce toxic dispersion.
4. Enhance material recyclability.
5. Maximise sustainable use of renewable resources.
6. Reduce material durability.
7. Increase the service intensity of goods and services.

The concept of Cleaner Production was introduced by UNEP Industry and Environment in 1989 (UNEP, 2003). UNEP and WBCSD define cleaner production as the continuous application of an integrated preventive environmental strategy to processes, products and services to increase eco-efficiency and reduce risks for humans and the environment (UNEP, 2003).

Cleaner production applies to:

- **Production processes:** conserving raw materials and energy eliminating toxic raw materials and reducing the quantity and toxicity of all emissions and wastes.
- **Products;** reducing negative impacts along the life cycle of a product from raw materials extraction to its ultimate disposal.
- **Services;** incorporating environmental concerns into designing and delivering services.

The main difference identified between these two concepts is that eco-efficiency starts from issues of economic efficiency, which have positive environmental benefits, while cleaner production tends to start from issues of environmental efficiency which have positive economic benefits (UNEP, 2003).

Case studies in both eco-efficiency and cleaner production reveal significant opportunities for businesses to not only save money, but to develop employees' skills and increase job satisfaction (Business Care, 2003, Linkages, 2003).

2.3.2 Continuous Improvement

The journey of continuous improvement required by businesses is frequently referred to. The NZBCSD asserts that assessing environmental impacts for cleaner products and processes can assist companies in their quest for continuous improvement (2003). It does this by identifying ways to maximise profits by reducing waste and liabilities, increasing productivity and demonstrating the company's sense of responsibility towards its customers and the environment. The continuous improvement process is summarised as (NZBCSD, 2003):

1. Gain the commitment of the key parties in organisation.
2. Review businesses operations to identify key issues to address.
3. Establish baseline data against which to measure progress.

4. Analyse data gathered to establish priorities.
5. Generate initiatives to meet these.
6. Prioritise initiatives and implement.
7. Monitor and review initiatives to establish effectiveness and to measure progress.

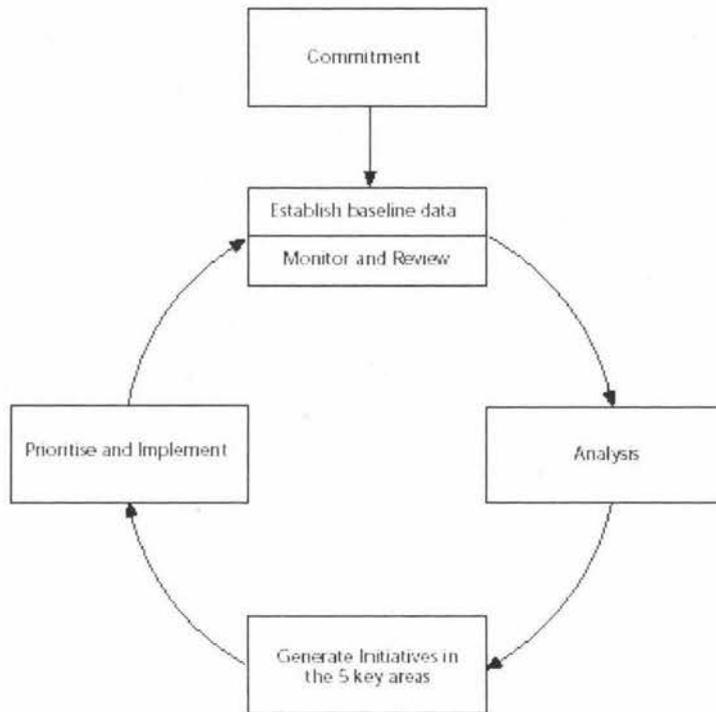


Figure 2. *Continuous Improvement (NZBCSD, 2003).*

2.3.3 Zero Waste

The aim of the Zero Waste New Zealand Trust is to; eliminate, rather than ‘manage’ waste. Advocacy and policy development are described as major functions of the Trust which are actioned by promoting the vision of a zero waste society where all materials are valued as resources (Zerowaste, 2002). Zero Waste New Zealand list their objectives as (Zero Waste, 2002):

1. Industrial designers designing products that can be reused, disassembled or; recycled at the end of their lives;
2. Manufacturers creating products with minimal waste and reducing packaging to a minimum;
3. Retailers stocking products that are recyclable and repairable;

4. Secondary materials handlers providing a high quality service that out-competes waste disposal services;
5. Local authorities providing the incentives and support infrastructure for recycling and resource recovery;
6. Central government creating policy that favours waste minimisation and recycling over disposal to landfill; and
7. Consumers making responsible buying decisions, buying products with minimal packaging and made from recycled materials and recycling at home and work.

Zero Waste is a philosophy that has gained significant support in New Zealand from local authorities, community groups and government. Proponents of the philosophy claim that it is more than eco-efficiency as it removes waste entirely from the system.

Eco-efficiency, cleaner production and zero waste call for business to achieve more value from lower inputs of materials and energy, with reduced emissions (NZBCSD, 2003). This is an obvious selling point for businesses with immediate savings, but many have already completed the actions required for short-term gains.

While many businesses claim that they have always been focused on efficiency the NZBCSD refute this with reference to the 55% of New Zealand solid waste land filled from industrial sources (NZBCSD, 2003). Overseas studies report similar statistics. It is estimated that smaller businesses in England and Wales generate about 60% of commercial waste and are responsible for as much as 80% of pollution incidents (New Business Magazine, 2003).

Business has proven to be extraordinarily efficient in some ways – such as its ability to deliver goods and services to consumers – but it has so far been extraordinarily inefficient in its use of resources. The business model in use today evolved with the assumption that the earth provides an infinite source of raw materials and an unlimited capacity to absorb the waste products that we generate (NZBCSD, 2003).

2.3.4 Sustainable Development Reporting

The development of sustainable development or triple bottom line reporting provides businesses with an opportunity to measure and report on social and environmental issues

alongside their financial statements. In the modern corporate environment there are increasing demands for greater transparency and accountability by management, investors, [insurers, consumers] and regulators (ICANZ, 2003). Research has shown that New Zealanders have an inadequate knowledge of the state of the environment (PCE, 1998). A major advantage of sustainable development reporting is the increased understanding of the environmental impact we are directly responsible for.

The measurement and reporting of businesses environmental performance has been an area of much research in recent years (Tycea, 2003). To date lack of standardisation in methods and procedures has been a major issue (Tycea, 2003).

Approach	Orientation	Drivers	Measurement focus	Metrics
Production	Engineering	Efficiency	Mass/energy balance	Efficiency Resource use
Regulatory	Legal	Compliance	Management systems Risk, Non compliance	Emissions/waste Risk
Ecological	Scientific	Impacts	Impact assessment Life cycle assessment	Emissions/waste Impacts Resource use
Accounting	Reporting	Costs Accountability	Liabilities	Emissions/waste Monetary
Economic	Welfare	Internalising externalities	Environmental valuation	Monetary
Quality	Management	Pollution prevention	Emissions/waste generation	Emissions/waste Monetary

Figure 3. Frameworks for Environmental Performance Measurement (Tycea, 2003).

This is now being overcome with a growing number of standardisation initiatives including the ISO 14031 guidelines on environmental performance evaluation, the CERES Global Reporting Initiative (GRI) template for sustainability reporting and the AA1000 framework (ICANZ, 2003).

The WBCSD guide to reporting company performance states that environmental indicators should (Verfaillie & Bidwell, 2000, p.11):

1. Be relevant and meaningful with respect to protecting the environment and human health and/or improving the quality of life.
2. Inform decision making to improve the performance of the organisation.
3. Recognise the inherent diversity of business.
4. Support benchmarking and monitoring over time.

5. Be clearly defined, measurable, transparent and verifiable.
6. Be understandable and meaningful to identified stakeholders.
7. Be based on an overall evaluation of a company's operations, products and services, especially focusing on all those areas that are of direct management control.
8. Recognise relevant and meaningful issues related to upstream (eg. suppliers) and downstream (eg. product use) aspects of a company's activities.

Disclosing information on sustainable development ensures businesses communicate with their stakeholders. It also provides a tool for assessing and developing strategies, defining projects, and setting targets to measure and improve performance in an holistic manner. Companies listed on the Dow Jones Sustainability Index, are being rewarded for providing the right information, as they consistently outperform those on the standard index (ICANZ, 2003).

A major weakness of tools like Sustainable Development or Triple Bottom Line reporting as a framework for business strategy is that financial value creation has an immediate self-reinforcing feedback loop, while the feedback loops for social and environmental value are much slower and less direct (Gilding, Hogarth & Reed, 2002). The public has also become more critical of these reports, which in some instances have had a strong marketing focus. Such critical review of these reports however illustrates the importance of undertaking the reporting in the first place.

Sector representatives have stated during this research that they will only measure something where they can see value in it. Creating or clearly expressing that value is required before measures will be readily undertaken by businesses. Fortunately there are now a growing number of programmes nationally and internationally with case studies clearly demonstrating just this.

2.3.5 Social Responsibility

Grayson & Hodges (2001) report the growing importance of social issues that business must respond to: health, wellbeing, diversity, human rights and community objectives. Two of the four overarching goals within the New Zealand government's Sustainable

Development Programme of Action for New Zealand have a strong social directive (DPMC, 2003):

- Sustainable Cities – our cities are healthy, safe and attractive places where business, social and cultural life can flourish.
- All children and young people have the opportunity to participate, to succeed and to make contributions that benefit themselves and others, now and in the future.

Business for Social Responsibility (BSR) is an organisation that has been working with companies of all sizes and sectors to achieve success in ways that demonstrate respect for ethical values, people, communities and the environment through the design and implementation of successful, socially responsible business policies, practices and processes (BSR, 2003).

In New Zealand the Business for Social Responsibility group recently amalgamated with the Environmental Business Network, forming the Sustainable Business Network. This amalgamation acknowledged the strong interrelationship between social and environmental issues in the business environment and the increasing overlap developing between these two groups.

In the New Zealand business environment human resource issues are increasingly regulated. Within the manufacturing sector, health and safety policies and programmes have become an increasing focus. Social responsibility calls businesses to look beyond the immediate issues of shareholders and staff to a broader spectrum of stakeholders. This reflects the increasing emphasis on full-life cycle effects of processes, products and services when assessing the costs and benefits of businesses from a sustainability viewpoint.

2.3.6 Life Cycle Approach

Life Cycle Assessment (LCA) is a method designed to identify and quantify the environmental performance of a process or product from cradle to grave (Azapagic & Clift, 1999). The main advantage of this approach is that it enables a broader set of boundaries to conduct the environmental assessment of both processes and products within. These boundaries include all burdens and impacts and do not focus on just those of emission and waste generation by the plant or manufacturing site (Azapagic et al,

1999). The impacts of a plastic product during its use and upon disposal are viewed very critically by society. Incorporating these facets into the decision-making process of industry is becoming increasingly critical to respond to pressure from environmental pressure groups, Councils, recyclers and the government in New Zealand.

Azapagic observes that most government schemes while promoting the use of life cycle approaches in decision making are concentrating only on a limited number of burdens and usually in only one or two stages of a life cycle (1999). An end-of-life focus within governments internationally has seen the development of waste levies, container deposit legislation and take back schemes. These are the areas typically focused on by governments under a life cycle approach to packaging and plastics.

The methodology set by the SETAC Foundation for Environmental Education and the International Standards Organisation for life cycle assessment both contain four main phases (Azapagic et al, 1999):

1. Goal definition and Scoping.
2. Inventory Analysis.
3. Impact Assessment.
4. Improvement Assessment (or Interpretation).

New Zealand has adopted the life cycle principle under its Waste Strategy and states that, *products and substances should be designed so all environmental effects are accounted for and minimised during generation, use, recovery and disposal* (MfE, 2002, p.20).

2.3.7 Extended Producer Responsibility

Extended product responsibility (EPR) is another strongly emerging concept that follows the life cycle approach. Overseas there have been resolute moves to regulate EPR, especially within Europe. The NZ Waste Management Strategy released in March 2002 adopted the principle of EPR. This is defined as putting *the onus on business to look for, and capitalise on, opportunities for resource conservation and pollution prevention throughout a product's life cycle, including disposal* (MfE, 2002, p.20).

This definition places a strong focus on business as the responsible party. Other references to EPR have also highlighted the crucial impact of consumer needs and preferences, government procurement, and the role played by those further down the chain of production and distribution (UNEP, 2003).

The United States President's Council for Sustainable Development identified EPR as a means to improve a fragmented approach to waste reduction, resource conservation, and pollution prevention (UNEP, 2003). This approach means that manufacturers, suppliers, users, and disposers of products all have a role to play in minimising the negative environmental effects of products and their resulting waste streams with shared responsibility. Ensuring greater responsibility is taken by the business sector is a central link in achieving sustainable development.

Europe has the strongest formal EPR policies, with legislation for control of material use, identification and responsibility to take back products at the end of their useful lives.

2.3.8 The Natural Step

The Natural Step (TNS) is an international non-profit environmental education organisation founded in Sweden in 1989 by Dr. Karl-Henrik Robèrt (TNS, 2003). In the early 1990s, Robèrt defined a set of system conditions for sustainability, based on the laws of thermodynamics and natural cycles. The four system conditions are the foundation of the TNS framework which states that in order for a society to be sustainable, nature's functions and diversity are not to systematically ...

1.subject to increasing concentrations of substances extracted from the earth's crust
2. ...subject to increasing concentrations of substances produced by society
3. ...impoverished by over harvesting or other forms of ecosystem manipulation
4. (and) ...human needs are met worldwide. (TNS, 2003).

The approach is based on systems thinking, and uses back casting to develop strategic approaches for companies attempting to work within these conditions. The Natural Step's strategy encourages dialogue and consensus building in association with leading scientists, through training and as consultant advisers, working in companies and organisations, providing a forum for dialogue, particularly for decision-makers capable of

influencing ideas and becoming world-leading role models in the field of sustainable development (TNS, 2003).

Gehrke (2000) recommends using the Natural Step as an overarching strategy for a more coordinated national approach to move New Zealand businesses towards sustainable development practice, as it allows for a degree of freedom to be tailored to the specific requirements of an industry and its operations. In 2000 Hydro Polymers, a major UK manufacturer of PVC polymer, embarked on a major assessment of the sustainability of the industry in response to concerns mounted by Greenpeace and major retailers (Leadbitter, 2002). The resulting assessment saw the use of TNS as a framework for the industry to progress towards a state of sustainability. The four system conditions were used to develop the following future objectives for the industry (Leadbitter, 2002):

1. Carbon neutrality.
2. Closed-loop recycling.
3. Elimination of Persistent Organic Pollutants.
4. Sustainable additives.
5. Raising awareness of Sustainable Development

These five objectives identify areas that are critical to the wider plastics industry.

2.3.9 The Interface Model

Interface Corporation has developed a business model to achieve a shift from a linear supply chain focus to a cyclical eco-system model with both biological and technical cycles (Anderson, 1998). The model follows a seven step process:

1. Zero waste.
2. Benign emissions.
3. Renewable energy.
4. Closing the loop [technical and biological resource cycles].
5. Resource efficient transportation.
6. Sensitivity hook up [social responsibility].
7. Redesign of commerce [adoption of full costs and governance supporting sustainability].

The model follows a natural progression from issue to issue and an overall sense of direction and challenge for a company to achieve. A central component for the success of this model is top management drive and commitment.

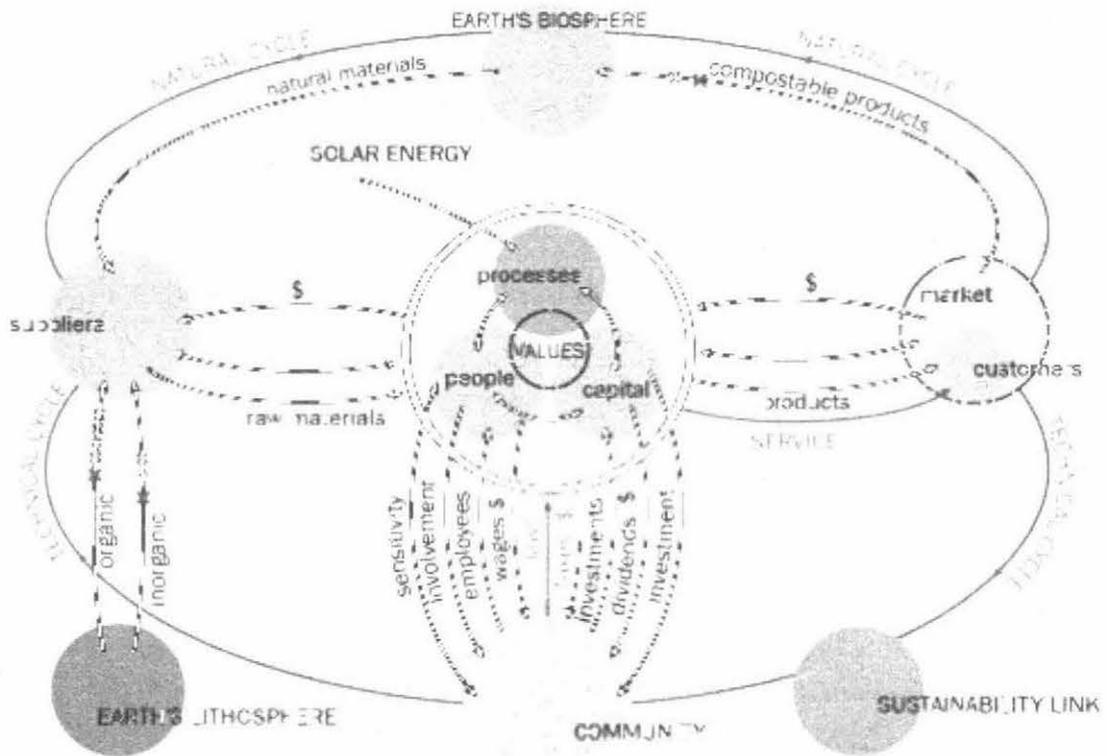


Figure 4. The Interface Model (Anderson, 1998, p.127).

2.4 Linking Sustainability Models with Business Strategy

The differing models and approaches summarised above when approached by companies with no background in environmental issues can be very confusing, with each tending to focus on similar issues from different perspectives. Shareholders, managers and business owners consequently perceive environmental actions as an additional compliance-cost, consuming time, resources and money. While supporters of each philosophy would debate this, each of the models has its own specific focus and strength. Changing these perceptions is perhaps the biggest challenge facing sustainable development practitioners within industry. Achieving better recognition of the similarity

and integration, between these models will aid a more holistic approach and more sustainable business practices as a result.

To do this sustainable development needs to be translated into the strategies, processes, and procedures followed within businesses and environmental jargon into business terms and approaches. The moral and business arguments often present sustainable development as an external concept to adopt, rather than as something that can be integrated into existing business practices. Developing strategic business direction by creating competitive advantage, utilising resources effectively and efficiently, coping with external factors affecting competitors and the values and expectations of stakeholders is critical to the ongoing success and functioning of a business (Tutor2, 2003).

To create an environment where businesses have stronger incentives to operate in a sustainable manner, all three levels of business strategy; corporate, business unit and operational need to be engaged. Currently models for sustainable development tend to focus on one of three levels of business strategy. A more integrated approach is needed to ensure that all levels of a business are engaged to ensure a long term commitment to any positive changes undertaken at each of these levels. Integrating these models as tools applicable to the different levels of business strategy enables a more effective and holistic approach. It also alleviates the problem of environmental or social issues being specific areas to address independently by integrating them into standard business strategies, practices and procedures. Using this approach reinforces the need for clarity in the nature of requests made to industry by sustainable development practitioners at industry, governmental and NGO level. It also reinforces the need for leadership and commitment in the business sector.

Business strategy	Environmental model/tool
1. Corporate Strategy	TBL, EMS, Natural Step
2. Business Unit Strategy	EPR, Sustainable Design, LCA
3. Operational Strategy	Eco-efficiency, Cleaner Production, Compliance, Health & Safety

Figure 5. *Linkage of Sustainability Models to Business Strategy.*

There are several different levels of sustainable development apparent within New Zealand businesses (Gehrkes, 2000):

- International companies driven by risk management.
- Businesses reliant on overseas customers or markets where customers are starting to demand that environmental criteria be met as part of product specifications or business relationships.
- Companies acting where direct cost savings are perceived from eco-efficient decisions, typically areas like waste minimisation, energy efficiency and product light weighting or downgauging.
- Businesses that restrict their efforts to regulatory compliance only.
- Non-compliant businesses.

These levels are highly evident within the New Zealand plastics sector, and strongly reflect corporate strategy or market conditions. Business Care, who facilitate a network of cleaner production practitioners in New Zealand, have recently reported a fall off in participation from companies where there is a lack of continuing top management support (Business Care, 2003a). While a company may have been engaged at an operational level there has often been no integration of this sustainable development work with overall strategic corporate direction, planning or resourcing. Consequently, many environmental programmes only enjoy short-term success with companies stopping their involvement as a result of staff changes, restructuring, other major projects or completion of a specific project. If benefits are not perceived by shareholders or senior management sustainable development programmes are unlikely to gain long term support.

Within every organisation, there is a continuous interplay between informal networks and informal structures (Capra, 2002):

- **Formal Structures:** organisational charts, by laws, [procedures], budgets, [position descriptions], formal policies, strategies and procedures.
- **Informal Structures:** fluid and fluctuating networks of communication.

Formal policies are filtered and modified by informal networks, which allow workers to use their creativity when faced with unexpected situations (Capra, 2002). An industry and each company within it has self generating social networks and structures. Sustainable development must be reflected at both levels of an organisation.

During the 1990's sustainable development within the New Zealand business-community focused mainly on cleaner production and eco-efficiency and has therefore been focused

at an operations level. More recently, there has been a greater emphasis on environmental management systems and sustainable development reporting which has shifted the focus of companies to more formal sustainable development mechanisms. Companies investing in these systems tend to be larger businesses or those where a major shareholder, owner or manager is driving this commitment.

The major challenge now facing businesses, particularly in the plastics sector, is to integrate these two levels by examining and investing in environmental issues at the business unit level. This is the level of business strategy where issues affecting product design, sales and market direction are addressed. Tougher international legislation and calls for life cycle analysis and extended producer responsibility demonstrate that this is a growing issue the plastics sector needs to plan for now.

WBCSD's recommendations to industry provide a good example of the type of model needed to integrate change at a sector level (UNEP, 2003). These recommendations are adapted based on the above discussion and summarised as follows:

1. **Cooperation:** partnerships or alliances between business, governments, NGOs and others to develop the economic, regulatory and political frameworks that enable innovation.
2. **Industry training.**
3. **Company culture:** top management policies easily translated into action, full employee involvement, and promotion to suppliers and customers.
4. **Personal responsibility:** each shareholder, employee and consumer takes full product responsibility and considers the entire life cycle in all decisions.
5. **Research and development:** focus on reducing material intensity of goods and services for higher-value products with reduced environmental impacts.
6. **Risk management:** identifying and responding to future threats and opportunities that may affect business.
7. **Management tools:** integration of tools for life cycle assessment, environmental assessment, sustainable design, eco-efficiency in purchasing, processes, production, products, marketing, sales and services.
8. **After-sales service:** Adoption of extended producer responsibility throughout life cycle ensuring total product and service stewardship.

Government and leaders in sustainable development need to question whether sustainable business practices can create competitive advantage. Experience indicates that there needs to be a clear business case for action. At an operational level, there are often clear cost savings, beyond this environmentally superior alternatives need to be financially viable. A pragmatic model for business sustainability needs to provide an explicit linkage between the goals of business, social and environmental excellence. This model needs to create a bridge between business behaviours, consumer decisions and sustainable development objectives, and to integrate economic growth with environmental performance.

This implies the need to create a climate of change within business; some argue that this need is urgent and should be accelerated. New Zealand needs to consider whether existing levels of incremental change are sufficient to meet the objectives of sustainable development. The following sections briefly address the mechanics of change, communication and education in sustainable business development.

2.4.1 Change

In 'The Tipping Point' Gladwell examines the ability for relatively minor resources to create an epidemic of change (2000). Gladwell cites examples of events and changes in behaviour that have reached epidemic proportion and explains that the factors that created these incidents can be replicated to create similar results. Concentrated resources for change are available through individuals in society who act as connectors, mavens² and sales people. These individuals or groups have the ability and connections to start word of mouth epidemics that result in dramatic behavioural change. Tightly focused and targeted intervention is recommended, where time or resources are limited in relation to projects requiring significant behavioural or societal change. Minimum time, effort and cost are cited as key benefits of this theory.

Gladwell remarks that there is a certain level of distain involved towards the proposal of this kind of solution because there *is something in all of us that feels that true answers to problems have to be comprehensive, that there is virtue in the dogged and*

² A maven is an expert or connoisseur of the market defined by Gladwell as one who collects detailed information on different products, prices or places and actively passes this on to help others make decisions (2000).

indiscriminate application of effort, that slow and steady should win the race (2000, p.257). Society has difficulty explaining dramatic exponential change, but this is commonly experienced with rapid shifts in fashion and technology occurring all the time.

Eco-efficiency and other sustainable development models are more commonly associated with incremental change and improvements. If more than incremental change is necessary to achieve sustainability, drivers to establish a 'tipping point' also need to be identified. Anderson (1998) describes our current journey towards sustainability occurring simultaneously at three different levels:

1. Understanding sustainability.
2. Achieving sustainability.
3. Influence.

If sufficient mass or media is gained by sustainable business development practices eventually a 'tipping point' will be created and a new business paradigm established. This will see sustainable development practices adopted by a majority of businesses and demanded by their customers. In order to get to the point at which this level of change can occur, connectors, mavens and sales people at an industry and stakeholder level need to be actively engaged and involved. (Chapters 5 and 7 profile some examples of the influence of external stakeholders on the performance of the plastics sector).

Hendron & Kreps (1993) state that if organisations are to survive and prosper they must actively resist the inevitable threat of entropy by continually adapting, improving and ultimately enhancing the effectiveness of organisational processes. The same scenario applies to ecosystems. Success is largely dependent on how well organisation members are able to communicate and adapt by using important information. Organisation members depend on their use of communication channels to elicit cooperation from others and coordinate the accomplishment of organisational activities promoting a level of order, stability and predicability (Hendron et al, 1993). Similarly, organisational actors are also dependent on their use of external communication channels to adapt and influence their organisation, environment, identifying external constraints and opportunities and directing organisational innovation (Hendron et al, 1993).

The need for adaptation is in striking contrast to the related need for order in organisations. Although organisational change occurs naturally, it is not necessarily positive if it is haphazard or undirected. Innovation usually creates change that is planned and directed to address specific problems and improve organisational life due to emergent internal and external constraints and challenges to the accomplishment of organisational goals (Hendron et al, 1993). The demands of stakeholders on the plastics sector make the need for strategic innovation even more significant.

Capra (2002) cites organisational theorist Etienne Wenger's description of 'communities of practice' as self-generating social networks, referring to the common context of meaning, rather than to the pattern of organisation through which the meaning is generated. *As people pursue any shared practise over time, Wenger explains, they develop a common practice, that is, shared ways of doing things and relating to one another that allow them to achieve their joint purpose. Over time, the resulting practice becomes a recognisable bond among those involved* (Capra, 2002, p.94).

Wegner defines a community of practice characterised by three features: mutual engagement of its members, a joint enterprise and, over time, a shared repertoire of routines, tacit rules of conduct and knowledge (Capra, 2002).

On this basis, best environmental practice within an industry – as a community of practice - can become accepted practice. Creating this platform to engage plastic manufacturers, to develop and implement behavioural changes reflecting sustainable development in pragmatic terms is the focus of Chapter 6.

The broad definition of sustainable development should not be a barrier to taking immediate action based on best current knowledge. Effective communication and education are central factors to the promotion of such action. These factors are examined in the following section.

2.4.2 Communication for Change

The coordinated use of internal and external channels of communication enables members to create and maintain an ongoing state of organisation, balancing the interdependent, yet often contradictory, organisational needs for stability and innovation. (Hendron, 1993, p.7)

Communication is defined by Devito et al. as *the process or act of communicating or the actual message or messages sent and received, and the study of processes involved in the sending of these messages* (2000, p.532). Devito et al. define a communication network as the pathways of messages and the organisational structure through which the messages are sent and received (2000).

Existing communication networks for the plastics sector are both inter-and-intra organisational. Communication networks and the strength of these ensure the flow and sharing of information and more importantly consistency in the nature of the information being sent and received. This is particularly vital to the plastics sector in achieving sustainability where the success or otherwise of resource cycles is dependent on the participation of the public, local and central government, and business.

There are three central streams of communication that can be identified in the New Zealand plastics sector. These are between:

1. Manufacturers and customers.
2. Recyclers and territorial authorities.
3. Territorial authorities and the public.

Secondary streams of communication exist between:

1. Sector group organisations and government eg. Plastics New Zealand, PaMPITO, Local Government New Zealand, RONZ, Packaging Council, WasteMINZ.
2. Sector Group Organisations and the public eg. education and information resources.

Existing levels of communication between these parties are highly informal and very fragmented. Frustration appears to exist within all sectors with the lack of understanding, information and responsiveness of the other parties. Each group holds its own, often strong, opinion about the direction that should be taken and where responsibility lies. These groups do not regularly meet to resolve issues together and have no agreed strategic direction specific to plastics.

At the launch of the New Zealand Plastics Sustainability Initiative, Prime Minister Helen Clark stated that the New Zealand plastics industry holds a unique position to lead the move to sustainability, as one of the few industries which impacts on so many others. There is an opportunity for the Plastics sector to create an impact across other industry sectors. The current renegotiation of the Packaged Goods Accord provides a valuable opportunity to create a more formal strategic approach to communication with key stakeholder groups. It is very apparent that each of the eleven sectors involved in the latest Packaged Goods Accord in isolation has limited ability to enact change. Acting cohesively however has the potential to create significant outcomes.

An inevitable outcome of sustainable development is the need for diverse groups of people to work together more cooperatively. Boyle's system model components illustrate the transactional links, constraints and drivers within today's society (2003), Figure 6.

System and Subsystems	Link	Transaction	Constraints	Drivers
Environment	Formal	Material	Physical	Existence
Human society	Informal	Energy	Chemical	Effectiveness
National govt.	Combined	Knowledge	Biological	Freedom of action
Regional govt.		Emotion	Technical	Security
Municipality			Legislative	Adaptability
Community			Economic	Co-existence
Family			Political/Management	Reproduction
Corporation			Education/Communication	Psychological needs
NGOs			Religious/Cultural	Ethical reference
			Individual Ability	

Figure 6. System Model Components (Boyle, 2003).

The adverse environmental effects created by the plastics sector can be perceived as a social problem. People produce, use and dispose of plastic products. The waste generated is perceived as a problem. The option taken to reduce, reuse, recycle, repair or dispose of these products is dependent upon personal and collective decision making and resulting behaviours. Behavioural change is therefore required to remedy the problem of plastic waste. Inertia and frustration develops when a party is not willing or able to take their desired course of action.

There are two core approaches adopted for sustainable development projects designed to change behaviour (McKenzie-Mohr, 2003):

1. Attitude = Behaviour, and
2. Economic Self Interest.

The first is where environmental educators attempt to change attitudes with the objective of a resultant change in behaviour. The second is where choices are systematically evaluated and actions determined based on self-interest. Numerous research projects show that the weakness of these approaches is that attitudes and knowledge have a weak correlation to behaviour (McKenzie-Mohr, 2003). Attitudes are important but attitudinal change is not usually sufficient to result in significant behavioural change (McKenzie-Mohr, 2003)

Two other major problems faced in creating sustainable development are the focus of current initiatives, which are (Huisingsh, 2003):

1. Project orientated – and therefore short term.
2. Focused on a small group of participants – the balance of society is not participating.

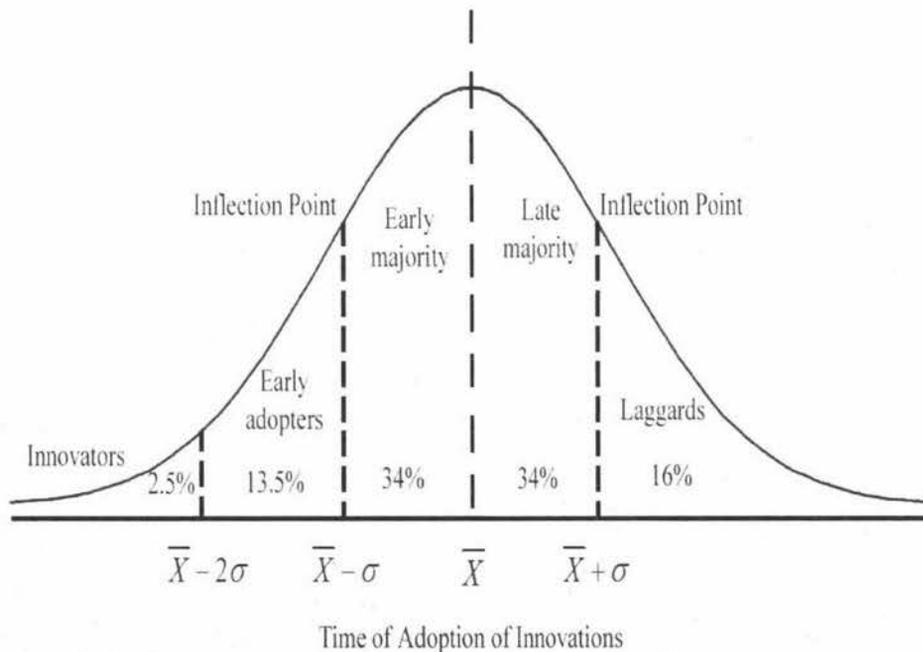


Figure 7. Rate of Innovation Adoption (Huisingsh, 2003)

Shifting to a long-term strategic approach, requiring formal reporting mechanisms, public commitment, regulatory back up and public disclosure are important mechanisms to consider in alleviating these issues. The adoption of more effective approaches to

behaviour change need to be examined by all those involved in sustainable development programmes and education. McKenzie-Mohr recommends the use of community based social marketing methods where projects have resulted in greater levels of desired behaviour change (2003). Using this method (McKenzie-Mohr, 2003):

- Behaviour(s) are selected.
- Benefits and barriers to behaviour(s) are uncovered.
- A program is designed to overcome barriers.
- Programmes are piloted, and revision is then carried out before the full programme.

Tools such as public commitment to actions, and prompts rather than slogans have been found effective using this approach. Ensuring that findings from international research such as this is adopted within New Zealand will be important for the future. Organisations such as MfE, SBN, WasteMINZ are important conduits for ensuring that continual learning is adopted by environment related practitioners in all sectors.

2.4.3 Environmental Education

Environmental education is defined as *a multi-disciplinary approach to learning that develops the knowledge, awareness, attitudes, values and skills that will enable individuals and the community to contribute towards maintaining and improving the quality of the environment* (Environment 2010 Strategy (MfE, 1998, p.9)).

What is taught and practised in schools, homes and workplaces affects the sustainability of plastics and the perception of the industry. At the 2002 Environmental Educators conference keynote speaker Jason Clarke presented the case that marketer's are effective as they focus directly on behaviours, moving straight to action not intellectualisation. Consumers avoid the need for thinking when they are consistently presented with a solution or action to solve their problem. As discussed above sustainable development practitioners or educators often focus on communication that intellectualises the reasoning for sustainable best practice. From a business perspective this is repeated where environmental groups, Councils and governments refer to moral obligations to act, rather than on the specific actions required, and the business case for these. The New Zealand plastics sector needs to develop the skills and capabilities to make both strategic and practical decisions around sustainability issues.

Key roles in New Zealand's environmental education are held by: central and local government, schools, teachers, tertiary educational institutions, iwi, NGO's, media, industry and industry groups (MfE, 1998). In 1998 the Ministry for the Environment published *Learning to Care for Our Environment: A National Strategy for Environmental Education*. In this strategy the New Zealand government identified the promotion of environmental education in business education and training as one of the priority areas (MfE, 1998). The strategy suggested that a better-coordinated approach to environmental education could improve opportunities for (1998):

- Sharing experience by practitioners
- Identifying gaps in current activities
- Pooling resource material
- Improving the effectiveness of activities
- Setting clearer priorities
- Providing resources for activities

Sector	Method	Current	Strength	Weakness	Recommendation
Manufacturer	Tertiary training Unit standard In house training	Theory based Reference to in-house recycling	High industry uptake Proactive industry training organisation	Not material specific Lack of environmental content Operator or lower levels only	Creation or integration of design for sustainability, waste minimisation and recyclability can be built into existing or added with specific unit standards or sector level courses
Recycler	In house training	Visual product recognition	Industry specific, practical	High staff turnover, no technical skill recognition	Development of unit standards and career pathways Provision of consistent material specific information from RONZ & PNZ
Territorial Authority	Various, Tertiary, in house training	Theoretical waste minimisation, sustainability principles	Understand need for waste minimisation & recycling	Lack of technical material knowledge Lack of practical competency based training for waste exchange operators	Better provision of consistent material information from plastics & recycling industry through WasteMINZ forums, workshops and newsletters and static material As above for recyclers

Figure 8. Environmental Education for the NZ Plastics Sector

Figure 8 summarises the current level of environmental education available to the New Zealand plastics industry and the current weaknesses that need to be overcome to develop a more sustainable sector.

New Zealand's Parliamentary Commissioner describes our progress in implementing sustainable development education as slow (PCE, 2002). Environmental education within New Zealand industry is still in its infancy. The government recommendations outlined above do not appear to have been gaining the weight of attention that is required to result in significant change. This is especially so within the business sector where the uptake of environmental education is currently very limited.

At an operational level sustainability issues are not currently provided for by on the job training or through unit standards. Training at this level does however indirectly promote best environmental practice via quality assurance, efficiency and health and safety issues. Most existing programmes and resources relating to sustainable development are directed at higher tertiary levels. Education at this level tends to focus on the theoretical underpinning of sustainable development rather than the practical applications of these philosophies in a factory situation. The Health & Safety Manager at a large plastics converter, which has a comparatively young engineering design team, says that the basic ability to design products for environmental sustainability or recyclability is lacking.

Designers, previously absorbed with product performance and aesthetics, must now also start taking into account the effect of design details on energy and material requirements for manufacturing, use and secondary use for the full life cycle of the product – including - repairability, remanufacturability and recyclability (Adapted from UNEP, 2003). Assessment of plastic industry unit standards and feedback on the environmental performance of the industry demonstrates that there is a gap between university and industry training. Several New Zealand engineering and industrial design lecturers were contacted on this matter and comments were made that (PNZ, 2002c):

1. Sustainable development does not form part of the current course curriculum.
2. Specific materials based design principles cannot be taught given the level of time and detail required.
3. It is inappropriate to teach specifics where debate still surrounds what sustainable development means.

This situation is gradually starting to shift with increasing emphasis now being placed on academic partnerships with industry, in addition to case studies and practical work in some courses.

A survey on the sources of environmental information conducted in America found that small businesses prefer to receive information about the environment and environmental regulations from vendors, associates, and industry associations (PPRC, 2003). The survey measured business type, areas of needed assistance, opinion of current information received, and actual versus preferred information sources. Overall, it found small businesses tend to avoid information sources that are associated with regulatory agencies or outside their sphere of close personal associates. Another survey of small businesses environmental behaviour in the UK found that they lag behind on environmental awareness and action in comparison to larger businesses (New Business, 2003). The study also noted that a compliance ceiling or plateau is likely to develop unless more strategic planning for sustainable development becomes a priority. Both of these findings are apparent within the plastics industry and will be discussed in more detail in Chapters 3 and 5.

The following chapter examines the sustainability of the New Zealand plastics industry in more detail to form an environmental profile.

CHAPTER THREE

3.1 The New Zealand Plastics Sector

There are over 400 plastic product manufacturers and raw material suppliers in New Zealand, these collectively employ some 8,000 employees (Cox, 2003). Fourteen plastics processing companies in New Zealand employ more than 100 people each with the majority of the industry being small to medium-sized enterprises. The plastics sector produces products for a wide range of applications, including packaging, construction, agriculture, and houseware.

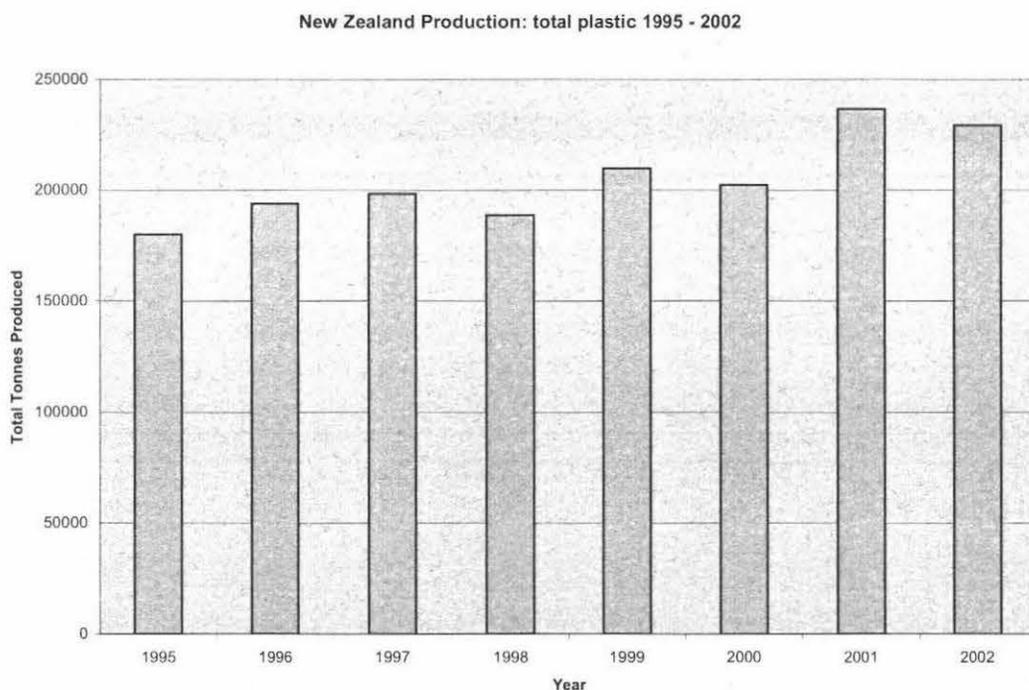


Figure 9. New Zealand Plastics Production 1992 – 2002 (PNZ, 2003a).

As outlined in Chapter 1 there are three critical issues that the industry must address in order to develop sustainably these are: the use of non-renewable petrochemical resources, the use of toxic or hazardous chemicals and additives and the creation of solid waste and litter.

The plastics sector is a petrochemical based industry and as such a user of non-renewable resources. In global terms plastics consume an estimated 2% of crude oil

(APME, 2001). The New Zealand plastic industry is almost entirely dependent on these non-renewable resources which are directly influenced by international supply, demand and pricing. Organic based polymer technology is rapidly developing with major international companies dedicating significant resources to research and development of polymers derived from renewable resources.

The New Zealand plastics industry faces mounting pressure as plastics are increasingly substituted as the material of choice, the volume of production increases and international pressure to reduce waste and increase recycling grows. Plastic is successfully displacing other materials in a wide range of products and packaging. It is therefore also replacing other materials in the waste stream.

The key benefits of plastics identified by the UNEP (2001) are:

- Less material is used in given applications
- Less energy is used in production
- Less fuel is used in transport and handling
- Less pollutants are produced through manufacture and use
- Less end of life waste is produced
- Low permeability
- Resistance to chemicals
- Resistance to impact
- Resistance to moisture
- Resistance to fire

Plastic is increasingly the most efficient and effective material choice for many products. Recent studies in Western Europe, for example, demonstrate that while plastic packaging accounts for only 17% of all materials used in packaging, it packs almost 50% of products (APME, 2002). Plastic continues to substitute for items previously made from paper, cardboard, tin, wood and steel. In New Zealand, the packaging sector of the plastics industry faces mounting pressure to make reductions in raw material usage, while at the same time their customers and consumers increasingly specify or choose plastic as the material for their products. There are many drivers for these choices but they relate principally to cost reduction.

Plastic products are used within all sectors of New Zealand. Decisions made by the New Zealand plastics industry therefore impact directly on the waste minimisation efforts of government, Councils, businesses and households. The focus of this research is therefore not just on the sustainability of manufacturing, but the overall sustainability of the products created by the sector during their entire life cycle.

Plastic is something that people have strong opinions about and often tend to examine in a very emotive non-factual manner. The connotations of cheap nasty plastic still prevail among the public. Consumers act differently in the supermarket, demanding the benefits of product protection, and shelf life, responding to branding and the clear messages and information that the packaging provides. Safety is weighted significantly above environmental benefits in purchasing decisions (Hume, 2003). A sense of helplessness and apathy is felt by consumers where environmental issues are portrayed by the media and environmentalists at a global level, and individuals feel they have limited options available to impact on these (Meltzer, 2003).

The responsibility for the creation of waste is commonly placed on the manufacturer, rather than the consumer. This is echoed by government policy under the New Zealand Waste Strategy where extended producer responsibility seeks to place the onus on the producer. Public policy makers need to respond to the calls for *less-plastic-in-landfills* and *more recycling* with a strong fact-based approach to ensure that the waste minimisation measures are sustainable.

Making products with less material is the most effective and responsible action a manufacturer can take to minimise impact on the environment where materials are derived from a non-renewable source. The wide success of plastics has masked significant reductions made in material use per unit of product. The alternative is to substitute organic-based polymers from renewable resources.

The Ministry for the Environment currently tracks plastic packaging consumption per capita against recycling volumes as the sole measure of the sectors environmental performance. Plastic manufacturers maintain that this a limited view. Some also consider that central and local government are focusing too strongly on waste minimisation

solutions that undermine benefits achievable by aggressive source reduction and sustainable product design.

Unfortunately the durability of plastic waste increases its visibility and often results in the scale of plastic waste being overestimated. Due to the negative image of plastic the plastics industry has often been forced into a defensive role, feeling the need to promote, protect and defend its current position and its future growth as a sector. The plastics sector has traditionally seen environmental initiatives and legislation as a threat to economic growth that continues to increase future compliance costs and affect profitability. This has meant that environmental initiatives by the plastics sector have typically been taken to minimise that risk.

As a result many industry participants remain sceptical of public policy initiatives and are unlikely to participate fully until a fresh approach to managing plastic waste is initiated. This will require recognition at the national policy level that there is no singular solution. Given current technology and economics 100% recycling of plastic products is not viable or achievable in New Zealand.

3.1.1 Industry Growth & Trends

Industry revenues now exceed \$1.8 billion per year and directly contribute over 1.7% to New Zealand's GDP (Cox, 2003). The New Zealand plastics industry has dramatically increased its direct exporting of plastic products in recent years, with revenue increasing from \$80m in 1990, to over \$347m (Cox, 2003). In addition it is estimated that up to one half as much again is exported indirectly as packaging or components for other export industries, in particular for meat, dairy and horticultural produce (Cox, 2003). Approximately 50% of New Zealand plastic production is packaging, the balance is made up of construction, agricultural and home-ware products.

3.1.2 Imported Plastic Products

There are few statistics available on the weight, volume or type of plastic products imported to New Zealand as finished goods or packaging. This is important to note as imported plastic products are a major contributor to the plastics waste stream. Statistics New Zealand figures show \$739 million worth of plastic goods, excluding packaging, are now imported per year (Cox, 2002). A study currently being conducted by Massey

University estimates that 50% of New Zealand's plastic packaging is imported (Webber, 2002). This study does not distinguish rigid and flexible plastics or polymer type. Another important information gap is the level of imported plastic products that are major components in finished goods such as electronics and white ware. Creating a detailed break-down of the weight, volume, or type of plastic imported to New Zealand would aid the analysis of resource recovery for the sector and is an area for further research.

3.2 The Life Cycle of Plastics in New Zealand

The following industry profile draws together a brief outline of New Zealand produced plastic products, with a life cycle perspective from production, to end use and disposal. This section outlines findings from the Mass Balance Survey, Local Authority Survey, workshops and company interviews outlined in Chapter 1.

3.2.1 Resource Use – Production

The New Zealand plastics industry does not manufacture plastic raw materials. Plastics are imported, in granular form, mainly from Northern America and Asia. Most plastics are derived from petrochemical by products and are therefore a non-renewable resource.

The processes of plastic product manufacture used in New Zealand, in very basic terms, involve melting and shaping the material. The manufacturing or conversion process, though technically demanding with exacting product specifications, is relatively clean and simple in comparison to other industrial processes. Basic resource use includes:

- Plastic (236,755 tonnes in 2002 (PNZ,2003a));
- Water;
- Energy for plant and transport;
- Chemical additives used to exact colour, mechanical, flexibility, impact, hardness, heat, environmental/chemical resistance and durability requirements;
- Oil, lubricants, inks and solvents for machinery, printing and cleaning;
- Packaging, and
- Office and café supplies.

Figure 10 below indicates the main resource flows during the plastic life cycle.

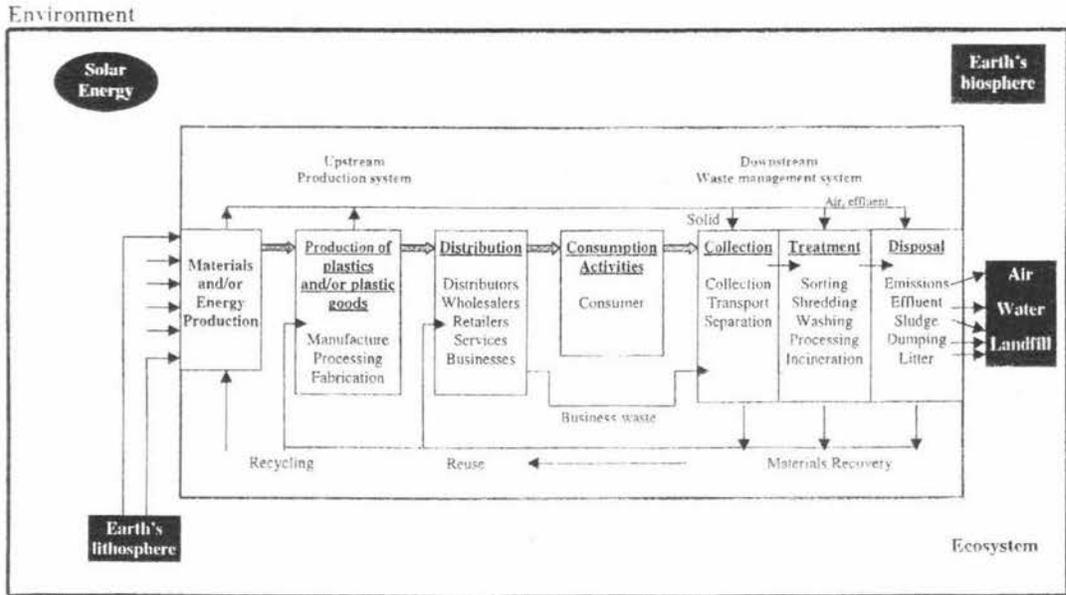


Figure 10. *The Life Cycle of Plastics (Liu, 2000).*

3.2.1.1 Raw material Imports & Annual Production

Plastics New Zealand Incorporated (PNZ) gathers annual statistics on New Zealand plastics production and recycling (1.5.2). Approximately 236,755 tonnes of plastic was used by the New Zealand plastics industry in 2002, 75% of this was consumed locally (PNZ, 2003a). Figure 9 shows the tonnage of plastic raw material imports from 1990 to 2002. Volumes of raw material imports are increasing, as consumers both here and overseas demand better product protection, longer shelf life, recyclable packaging, lower costs, lightweight materials and increased functionality and utility. By the year 2030 over 300,000 tonnes of raw plastic material will be imported by the New Zealand plastics manufacturing industry if current trends continue (Cox, 2003).

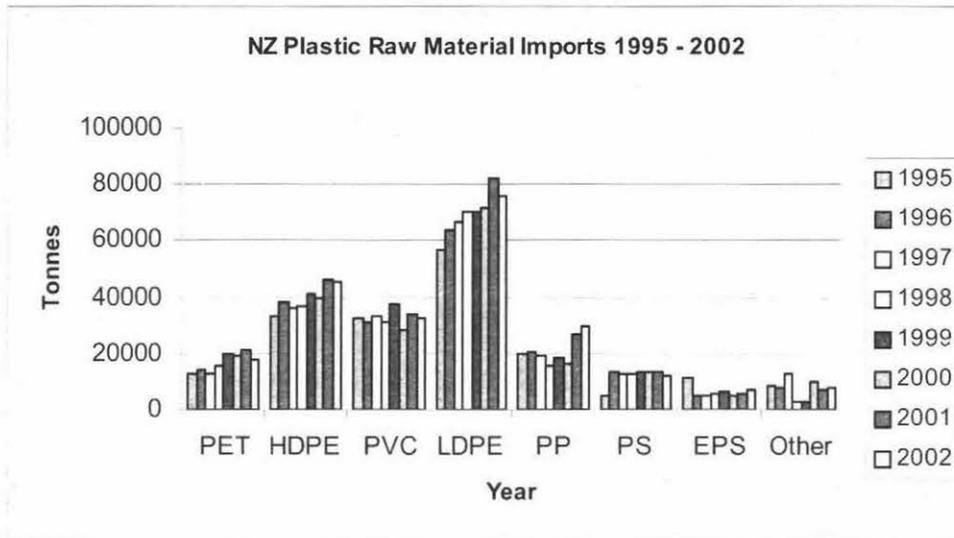


Figure 11. NZ Plastic Raw Material Imports by Polymer 1995 – 2002 (PNZ, 2003).

Figure 11 shows the volume of the six main types of plastic imported as raw material. Appendix 11 details the properties of these polymers and examples of the products that they are used and recycled in.

Low Density Polyethylene (LDPE) which is commonly used for pipe and film applications is the largest area of production in New Zealand with continuing rapid growth. Another major growth area in the last decade has been Polypropylene (PP). This is mainly used for rigid packaging and is anticipated to be the next viable material for kerbside collection, although trials conducted by Auckland City Council have to date proved uneconomic (ACC, 2003). This is largely due to the low volume of material in comparison to the cost of manually sorting the recovered material.

Resin	Rigid: Non Food	Rigid: Food	Flexible: Non Food	Flexible: Food	Other Packaging	Construction	Agriculture	House-ware	Other Prod.	Recycled	Waste	Total
PET	1%	87%		3%					7%	1%	1%	100
HDPE	14%	34%	7%	4%		6%	29%	1%	4%	1%		100
PVC					3%	82%	10%	1%	4%			100
LDPE	2%	2%	42%	37%		3%	10%			2%	2%	100
PP	9%	23%	4%	13%	1%	2%	14%	23%	9%		2%	100
PS	6%	79%						14%	1%			100
EPS	7%	19%				63%			8%		3%	100
Other		2%	9%	47%		2%	3%	21%	10%	1%	5%	100

Figure 12. NZ Produced Plastics: 2001 domestic consumption by sector (PNZ, 2002).

Resin	Rigid: Non Food	Rigid: Food	Flexible: Non Food	Flexible : Food	Packaging	Cons truction	Agri- culture	House- wares	Other Prod.	Recycled Waste	Total		
PET	201	15790	22	311					1	114	132	117	16690
HDPE	5784	14501	3030	413	114	2598	10300	223	1002	386	65		38506
PVC	167	112				26332	3331	180	915	85	100		31794
LDPE	1518	1594	903	23974	903	1837	7730	22	253	1938	1603		57722
PP	1493	4938	468	2681	241	357	1269	2469	1535	189	399		16094
PS	422	6185			3			722	990	1	3		8328
EPS	275	425			94	3416	51		396		144		4802
Other	38	96	389	762	2	121	54	653	191	71	369		2754
Total	10769	48057	19739	15498	1022	42290	22966	5042	5808	2233	2772		176780

*Figures are abridged for simplification therefore totals differ

Figure 13. NZ Produced Plastics: 2001 tonnage for domestic end use*(PNZ, 2002).

Figures 12 and 13 show the complex nature of the plastic sector with its differing material types and markets. The figures show a percentage of production and tonnage in each area. This information is extremely useful in determining and assessing the viability of recycling schemes when apportioned based on population distribution.

3.2.1.2 Water

There are no statistics currently available on water consumption by the New Zealand plastics industry. Water usage is predominantly associated with the heating and cooling of plastics during the conversion process. It is now common practice, especially within larger factories to recycle water used for these purposes. The use of chemical additives within water recycling systems also appears to be reducing with new products only requiring annual dosage. Several manufacturers have also reported making significant savings through repairing leaks found after actively monitoring water accounts.

Most manufacturers have significant building and hard surfaced areas for parking and manoeuvring on their sites, this has a direct impact on stormwater run off volumes. It is common for stormwater drains to be fitted with traps and, or filters to prevent the loss of materials into the stormwater system. Bunded areas and dangerous goods stores further protect these outlets. The use of stormwater as a water source is often prevented by a lack of space to install tanks of sufficient size. The adoption of charges for water and waste water by local authorities is acting as an incentive for manufacturers to monitor

and, where possible, reduce consumption. Companies will be required to monitor and report on water consumption under the Best Practice Programme (Chapter 7).

3.2.1.3 Energy

There are no statistics currently available on energy consumption by the New Zealand plastics industry. In 1996, Plastics New Zealand initiated an energy efficiency programme for the industry in partnership with the Energy Efficiency & Conservation Authority (EECA). This resulted in the participation of 16 plastics companies in EECA's Energy-Wise Companies Campaign. The programme provided an initial energy survey and audit followed by a report offering preliminary bench marking data and suggestions (PEAC, 1997). Regular forums were then held to identify and share technologies and to internally benchmark energy consumption. Several companies are still active in this programme. While most companies involved have gained real value from this programme they are now finding further improvements are prohibited by the capital intensive nature of further investment in less energy intensive plant and technology.

Changes in the structure of the New Zealand electricity market have caused frustration for manufacturers as they have been forced to absorb continued price increases. New Zealand plastic manufacturers were impacted by electricity price increases of up to 50% in 2002 as commercial contracts were renegotiated (PNZ, 2002a). Government's response to industry has been that these increases reflect a repositioning of the market, which has historically enjoyed the benefit of comparatively low energy costs and that further increases are likely in response to global trends (PNZ, 2002a).

New Zealand formally ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change on 19 December 2002 (Climate Change, 2003). Subsequently announced policies include an emissions charge for fossil fuel and industrial process emissions that will be imposed from 2007 capped at \$NZ25 a tonne (Climate Change, 2003). This means further compliance costs for the plastics industry. The New Zealand Government has recognised concerns that small to medium-sized businesses may not be able to take advantage of Negotiated Greenhouse Agreements or the Projects mechanisms designed to support industry under this regime and are investigating whether additional targeted policies are needed at this level (Climate Change, 2003).

Most plastic companies interviewed during this research are actively monitoring energy consumption, and some have set targets for reduction, but few appear to be actively analysing the data collected beyond an assessment of cost. An increasing number are now questioning the direct cost implications under the Kyoto Protocol. With higher energy costs likely and no other direct incentives for small to medium sized businesses the further capital investment required to reduce energy consumption may be jeopardised. Under the Best Practice Programme, companies will be required to monitor and report on energy consumption, Appendix 10. This data will be used to re-establish industry benchmarks, to evaluate the likely impact of government policy and to establish options for lowering future energy consumption.

3.2.1.4 Hazardous Substances

There is a drive towards phasing out dangerous chemicals and toxins from products and processes rather than tolerating acceptable levels as defined by legislation (Suzuki et al, 2002). This move reflects the systemic change from a short-term business focus to the longer-term focus of sustainability. This requires a change in approach to shift beyond adherence to legislative and regulatory demands.

The precautionary principle adopted under the Rio Declaration on the Environment and Development states that *where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation* (United Nations, 1992).

Under New Zealand's Hazardous Substances and New Organisms Act 1996 (HSNO) there are over 215,000 substances currently waiting to be transferred under transitional provisions. While substances may be approved or declined under this legislation there is no real incentive created to shift from a more hazardous substance to one that is less hazardous, beyond the avoidance of more onerous controls. This is further reinforced by the market where additives that are more hazardous are often cheaper or more effective in their application. The plastics industry now needs to examine opportunities to move beyond compliance towards best practice by re-evaluating the additives, solvents, inks and lacquers it uses.

All plastics companies interviewed during this research were aware of local discharge requirements to both air and water and had existing processes and procedures to manage hazardous substances on site. In some cases substances also required active monitoring to ensure that thresholds were not breached under occupational, health and safety requirements. Equipment such as safety glasses, masks, filters, dust extractors, scrubbers and computer-aided monitors with alarms are used to avoid potential risks. There have however been incidents of non-compliance noted.

Another significant issue for the industry is public perception – most people consider that plastic is bad for the environment³. Plastics New Zealand receives numerous enquiries into the level of hazard posed by certain additives or by-products that have been identified by NGO's, the media or scientific research as a potential risk from using plastic products. The rapid access consumers now have to global data on the Internet means that consumers can be much more discerning. It also means it is extraordinarily easy to mount a campaign against certain products and materials. These claims may, or may not, be founded on scientifically proven evidence. This means there is growing pressure on the industry and individual companies to avoid any potential risk that could damage their reputation, brands and products.

To address some of these issues a hazardous substances transfer project was initiated in 2003 under the Plastics Sustainability Initiative (Chapter 6). This project encompasses four stages:

1. Identification and recognition of all non-hazardous polymers under section 26 of the HSNO Act.
2. Assessment and classification of additives commonly used by the industry under the HSNO Act.
3. Approval of mixture rules for additives up to specified threshold levels as non-hazardous under section 26 of the HSNO Act.
4. Identification of targets to phase out the most hazardous additives identified.

³ Throughout this research during presentations to stakeholder groups the audience was asked to stand if they thought plastic was 'bad' for the environment – typically over one third of the audience stood. Perhaps more significantly when a plastics industry group was asked to stand if they believed their customers thought that plastics were good for the environment – all remained seated.

The first two phases of the project have now been completed. The fourth step of the project encouraging the phase out of the most hazardous substances used will be the primary focus for 2004. Overseas programmes such as Vinyl 2010 and the Australian Vinyl Product Stewardship Commitment already include targets for the phase out of lead and cadmium additives (Leadbitter, 2002, Vinyl Council Australia, 2003). While this is already occurring within the New Zealand plastics sector the public has not been made aware of these changes. There is a reluctance to share company specific details of improvements with stakeholders.

As discussed above there are strong market drivers to reduce the level of hazardous substances used by the industry. Discussions with plastic raw material suppliers indicate a growing trend towards eco or green polymers with non-toxic additives. Several manufacturers were also actively promoting less hazardous additives to their customers using examples of international companies that had already done so. Manufacturers raised the importance of raw material suppliers advising their smaller clients on these issues.

To date no data has been gathered on the volume of hazardous substances used by the industry. Most of the larger plastic companies are now actively monitoring and reporting their consumption, and recycling where applicable, of hazardous substances. Under the Best Practice Programme, Plastics New Zealand will introduce a survey of hazardous substance consumption to all members from 2004, Appendix 10.

The following section focuses on the issues surrounding plastics generation of solid waste at the end of a plastic products life.

3.2.2 Resource Use – End of Life

The best way to reduce any environmental impact is not to recycle more, but to produce and dispose of less.
(William Rathje)

The basic chemical structure of plastics is a long chain of carbon and hydrogen molecules. The huge variability possible in this molecular structure gives plastic its versatility in application, but also complexity in terms of waste minimisation. There are five options available at the end of a plastic products life: mechanical recycling, chemical recycling, energy recovery, composting (biodegradable plastics) and landfill.

Research shows that more sustainable plastics can be achieved by adopting natural cycles where possible and by improving technical cycles (Leadbitter 2002, Liu 2000). Plastics products can be produced with renewable organic materials that are subsequently degraded by the environment and from petrochemical based plastic waste through a technical cycle (Liu, 2000).

In New Zealand landfill is the prevalent destination for plastic products at the end of their useful lives, with 18% of plastic now being diverted through private and public recycling operations (PNZ, 2003a). Kerbside plastic recycling was initiated for the first time in the early 1990's. Survey figures show that plastic recycling has more than doubled in the last five years (PNZ, 2003a). The material collected by New Zealand territorial authorities and commercial recycling companies is used for mechanical recycling. Put simply the process involves:

- Material collection (kerbside, drop off, commercial bin collection)
- Transport
- Sorting
- Baling for export or
- Regrinding or
- Flaking then washing and drying
- Re-extruding to form pellets or granules for reuse

The Ministry for the Environment (MfE), councils and the New Zealand public frequently base their perceptions of plastics environmental performance on waste (Cox, 2003). The judgements made at these levels are based on what is visible in the waste stream and are often made in isolation from consideration of the full life cycle impacts of the product. The highly technical nature of such assessments and the complex nature of plastics with all its many variables and applications is a significant barrier to decision making (Cox, 2003).

It is difficult to apply the normal reduce, reuse, recycle hierarchy of recovery techniques universally when making waste management decisions about plastic. The plastics sector argues that the focus for waste management should be on diverting plastics from landfill via a range of recovery options, dependent on specific conditions.

Research conducted on the sustainable management of plastics waste in New Zealand concluded that recycling is the most effective way to move towards sustainability (Liu, 2000). *Recycling brings waste plastics back into the economic cycle. In doing so recycling prevents and reduces the overall pollution impacts on the environment associated with extraction of raw materials and disposal of wastes and also offers the potential for decreasing the consumption of non-renewable resources* (2000, Liu, p.249). With New Zealand's small population, geographical spread and small volumes of plastic waste many constraints need to be overcome. Liu's research is reflected in the strong emphasis placed by New Zealand's government and territorial authorities on recycling as the solution to waste plastics.

Plastic consumption is increasing and so is the level of waste generated. UNEP states it is *essential that these wastes are properly managed to protect people and the environment*. The disposal of plastic is seen by the UNEP as an intractable problem (2001). The following section briefly examines the main routes for plastic waste disposal and recovery.

3.2.2.1 Product Lifespan & Composition of Waste

American research has shown that approximately 80% of plastics waste comes from residential sources, and 20% from commercial and industrial sources (State, 2002). The same study showed durable products (eg. appliances, furniture) make up 28% of discarded plastics, 20% are non-durable products (eg. plates, cups, rubbish bags), and approximately 48% are containers and other packaging. The plastics that are most commonly recycled - PET bottles and containers, HDPE milk bottles and other HDPE containers - account for 3%, 3%, and 5%, respectively, of all plastics that are discarded (State, 2002).

The entrance of products into the waste stream is determined by the duration of their use. Figure 14 shows the main sectors of New Zealand plastic production, the volumes of plastic used, the approximate period in which these will enter the waste stream and an estimation of the total volume of plastics entering the waste stream annually from New Zealand production.

This information can be used to assist in predicting and determining the nature of future waste minimisation work required by the sector. For example, there are only 279 tonnes of rigid PVC packaging produced annually. In the territorial authority survey (1.5.3), some Councils noted their intention to collect rigid PVC containers in their kerb side collection. Due to the low volumes of PVC packaging available, this collection is unlikely to be economically viable. Many plastic products also have long life spans for example pipes and spouting, but can then still be recycled into another application if contamination is avoided. Significant volumes are used in construction and other long term product applications which are not yet recycled in New Zealand. For example, 82% of PVC produced in New Zealand is used in construction products that specified for a 15 - 50 year duration. PVC is an easily recyclable product. PVC construction product manufacturers are currently trialing the recovery of construction scrap. Better dissemination of sector statistics is an issue for the sector to address in ensuring that national recycling efforts are strategically focussed and coordinated.

Estimated lifespan of Plastic Products	2001		
	12 months (tonnes)	1- 5 years (tonnes)	6- 50 years (tonnes)
Rigid Packaging	53,539		
Flexible Packaging	32,953		
Other Packaging	1,357		
Construction			34,661
Agriculture		22,735	
Housewares		4,270	
Other Products	5,396		
Total for period	93,245	27,005	34,661
Approx waste per annum	93,245	5,401	693
Total plastics waste to landfill pa from NZ produced product	99339		
Manufacturers plastic waste from production	2772		
Total plastics waste pa generated by NZ plastics industry	102,111		

Figure 14. Estimated Lifespan of NZ Produced Plastics.

3.2.2.2 Energy Recovery

Overseas more emphasis has been placed on energy recovery, particularly within Europe and Asia where highly populated countries with small landmasses struggle to deal with

the increasing volumes of plastic waste. The European Directive for Waste (91/156/EEC, 18th March 1991) is an important guiding document for Europe (Cox, 2003). Article 3, section (b) “*encourages members states to...*

- (i) *recover waste by means of recycling, re-use or reclamation or any other process with a view to extracting secondary raw materials or*
- (ii) *use of waste as a source of energy”.*

Because plastic waste has a high intrinsic energy content the recognition that it can be an energy source is important – especially when recycling is not technically viable. Incineration is the main method utilised for energy recovery from plastic waste. Incineration has historically been highly polluting, however more recent technology has vastly reduced emissions.

In New Zealand with no such facilities, this is not currently an option. To date the technology has remained too expensive to establish a viable energy recovery plant within New Zealand, due to the low volume of suitable material available here and the comparatively low cost of landfill. There is a high level of resistance to incineration within environmental groups such Greenpeace NZ and the Zero Waste New Zealand Trust. This resistance would be a major barrier to such technology being established here.

3.2.2.3 Chemical Recycling

Chemical recycling includes techniques referred to as feedstock recycling like pyrolysis, hydrogenation, gasification and chemolysis. These processes can be used to enable energy recovery or creation of other materials. Chemical recycling of plastics can be used to “unzip” the constituent molecules back to their original components to plastic raw materials that can be reused. New technology is being created and developed internationally. No chemical recycling processes have been established here. This is again mainly due to the low volume of material available here. There is also a lack of technical expertise, research and development facilities due to our isolation from raw material manufacturers.

A proposal announced for a pyrolysis plant in February of 2002, which has not yet eventuated, was responded to positively by the audience which included local waste

buster groups looking for solutions to achieve their zero waste targets (Cox, 2003). The plastics sector continues to monitor developments in this arena, with several New Zealand businesses and local authorities considering the viability of such technology.

3.2.2.4 Mechanical Recycling

Recycling is an aspirin, alleviating a rather large collective hangover ...overconsumption (Rathje (1988) in McDonough & Braungart, 2002, p50).

In 2002 New Zealanders recycled 30,191 tonnes of plastic (PNZ, 2003a). Each New Zealander consumes 31kg of plastic packaging a year and recycles 5.58kg of this (Cox, 2003). Collection of post consumer PET and HDPE packaging is currently at around 28-31% recovery so there is room for improvement (PNZ, 2003a). At 18%, our plastic packaging recycling rate is comparable with most European countries which range from 7% to 22% – Germany being the one major exception where 31.1% recovery has been achieved under a mandated take back scheme (APME, 2002). Europe is seen as a leader in this area with prescriptive mandates and targets under European Union directives.

Survey figures show that New Zealand plastic recycling has more than doubled in the last five years. Figure 15 illustrates the volume of recycling in New Zealand from 1997 to 2002. A record of individual plastic types was not kept until 2000, however the figures show that the level of plastics recycling has risen dramatically.

There are three main streams of plastic recycling in New Zealand:

1. Kerbside PET (1) and HDPE (2) collections of post consumer waste;
2. Commercial collection of commercial films (shrink and shroud wrap), and
3. In-house plastics recycling by manufacturers (figures not included in Figure 15).

The material collected by territorial authorities and recycling companies is used for mechanical recycling as described in 3.2.2.

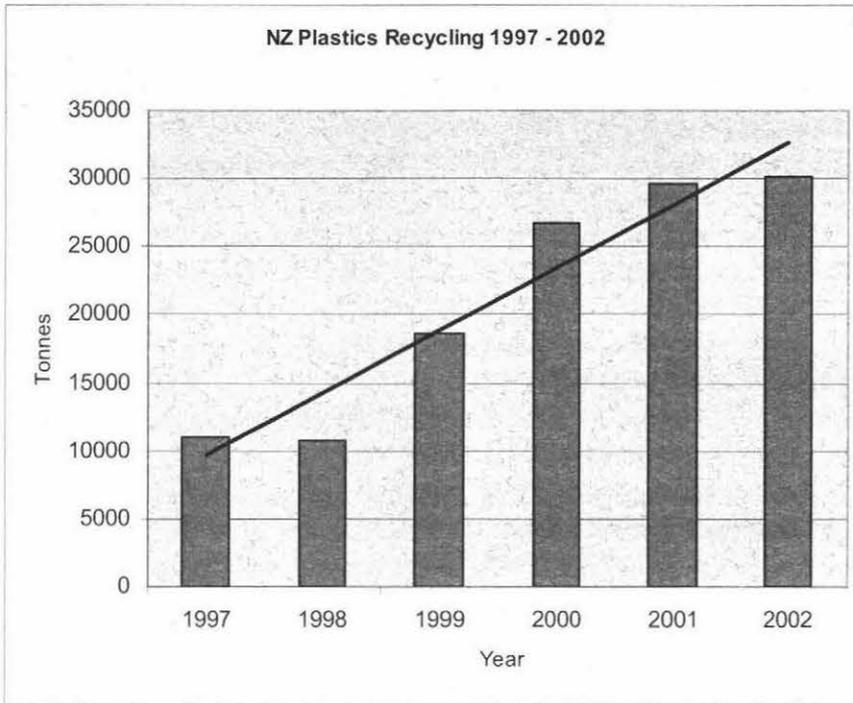


Figure 15. *New Zealand Plastics Recycling 1997 to 2002 (PNZ, 2003a).*

Post consumer recycling in New Zealand is administered and contracted out to private companies by territorial authorities. Kerb side collections started in the early 1990's in Auckland. These are still limited to the main urban centres with the bulk of collection coming from the Auckland region. With the use of sometimes-subsidised collections, there is a variety of systems of collection resulting from the different contracts and end markets of these materials. Most operate plastic recycling alongside glass, paper, steel and aluminium collections.

There are over twenty five New Zealand based commercial plastics recyclers, which may collect, sort, bale, trade or export post consumer materials, including those that focus on reprocessing these or commercial and post industrial materials. Several of these recyclers convert recovered plastics directly into their own product ranges. Some examples of this are flexible PVC scrap from cable cover which is used to manufacture floor coverings, High Impact Polystyrene (HIPS) cups that are used to manufacture coat hangers and LDPE film which is used to manufacture pellet slip sheets.

The key barriers to success for plastic recycling in New Zealand have become increasingly complex but are primarily technical or economic constraints that result from the following factors (Cox, 2003, Liu, 2000, NZIER et al., 1999):

1. **Complexity** - there are over 300 types of plastic and at least eight family groups within this, with material innovations and applications occurring constantly.
2. **Poor design practices** – products are being marketed that are not recyclable because of the labels, lids or the combinations of polymers used.
3. **Light weighting** – plastics companies are reducing the amount of plastic used per product, which means recyclers, need to collect higher volumes to gather the same weight of material.
4. **Lack of consumer awareness** – limited understanding of identifying and sorting plastic results in high levels of contamination.
5. **Contamination** – resulting from poor design, insufficient labelling and inadequate sorting.
6. **Low landfill charges** - lack of true costing for plastic disposal in comparison to charges for recycling.
7. **Transport logistics and high collection costs** - due to low population densities, geographical spread, and the high volume of plastic waste.
8. **Lack of domestic infrastructure capacity** - to reprocess materials for reuse eg: storage and sorting facilities, balers, grinders, manual sorting lines, and limited access to wash lines.
9. **Commodity markets** – Virgin plastics are comparatively inexpensive – this means lower quality recycled plastics must undercut these prices on a fluctuating market.
10. **Inconsistent supply** – insufficient inputs of recyclable content and seasonal product recovery variations compromise the ability of manufacturers to sell products with guaranteed levels of recycled content.
11. **Lack of economies of scale.**
12. **Lack of national consistency** – varying contracts have resulted in inconsistent criteria for kerbside collections nationwide.
13. **Inadequate or inconsistent information** – there is a lack of consistent information on plastics waste and no national strategy to address this.

These issues are exacerbated as the level of complexity grows with continued innovation and development in plastic materials. Recyclers criticise manufacturers for making recycling more complicated. The public is uncertain or confused about what can be recycled. Information that recyclers are dumping collected materials is showing that kerbside collection is not always guaranteeing recovery. At the same time manufacturers are frustrated that they cannot secure the quality and quantity of recovered materials required.

Given the major challenges imposed by these circumstances it is important to first establish the environmental basis for recycling plastic waste:

- Energy conservation
- Resource efficiency
- Lack of landfill space
- Possible leachate from plastic additives in landfill

Matthews (1994) found that the greater the dispersion and the higher the contamination the more energy and materials are used to recover and recycle. The energy consumption of the total system has a non-linear relationship and pursuing recovery beyond certain limits is therefore pointless. These environmental criteria should provide the underlying basis for considering the feasibility of a recycling scheme and in identifying the types of plastic recycled. Using a sustainable development approach means these criteria need to be balanced with social and economic considerations. Councils are continuing to make the decision to recycle plastics based on partial information. Alan Goddard, Chair of WasteMINZ, has commented that Councils are placing too much reliance on contractors advice and judgement on recovered material markets. Recyclers' criteria for an acceptable market is usually driven economically and may not accurately reflect what the community is setting out to achieve by recycling. Life cycle analysis provides one avenue for dealing with these complexities (2.3.6).

Pressure for plastics recycling comes from the public and increasingly through NGO's in New Zealand. Communication about plastics recycling to the public is typically limited to promotions or education programmes funded and administered by local authorities. Unfortunately local authorities are not always aware of the alternatives available to kerb side collections and opportunities to recycle other materials are being missed. This is evident in public enquiries received by PNZ from businesses that had already been told

by local authorities that their waste was unrecyclable, where there are other commercial recyclers who would accept the wastes concerned. This emphasises the importance of good communication with local authorities.

European research has concluded that too great an emphasis on recycling as a recovery option for plastics packaging waste could drive Europe to ever increasing waste management costs with limited environmental gain (APME, 2002). The study illustrates that increasing recycling above approximately 15 per cent, in combination with municipal solid waste incineration, has no major impact in terms of eco-efficiency for Europe. By exploring a number of different waste management scenarios, the study demonstrates that there is a cut-off point above which increasing plastics packaging recycling does not provide further environmental gain. While our demographics are different in New Zealand, this study emphasises the importance of examining the full life cycle. It also reveals the importance of plastic manufacturers placing increasing emphasis on sustainable design practices.

Plastics' recycling has had a chequered history in New Zealand. New Zealand plastics recyclers have often been referred to as "Cowboys". The plastic recycling industry has often been typified by people who are passionate about recycling but are not effective business managers. Tight recycling markets and fluctuating prices have seen many of these companies close. Overcoming these perceptions and increasing cooperation between manufacturers and recyclers is an issue to focus on for PNZ and RONZ.

PNZ is often approached in relation to recycling business proposals. These are frequently undercapitalised, or have poor levels of product research, development, and technical capacity. Better industry cooperation and coordination could greatly improve the potential for these businesses. With such a low level of material available in New Zealand there is a need to avoid development of recycling ventures competing for a narrow pool of materials. Unfortunately, enthusiasm for recycling is often undermined by harsh commercial reality.

The recyclers survey and company survey revealed many recyclers are exporting materials in contrast with comments from manufacturers who are not able to source enough recycled material. This reveals a real lack of coordination between the two

groups. From an environmental perspective reuse of these materials within local markets is a direct environmental gain, given the loss of energy involved in shipping materials overseas to China and Asia. It is also probable that New Zealand has a higher level of environmental performance than that being achieved overseas. With most collectors of post consumer plastics only baling recovered material it is unable to be directly used by manufacturers. The lack of access to New Zealand re-processors for recovered material is an issue that needs to be addressed as collection volumes continue to be increase.

Considerable energy and resources are consumed by the recycling of plastics. Take for example PET considered one of the success stories of the New Zealand plastics industry. This material is collected and transported from as far away as Dunedin to China and other Asian countries where it is reprocessed into polyester fibre. The international anti plastics lobby has attacked the plastics industry for “dumping” plastics in third world conditions where there is no guarantee over environmental performance or employment conditions. There is no record of an environmental life cycle analysis in the New Zealand context that would take these factors into account.

Often end markets are left to contractors and traders who focus on cost recovery. An anomaly in the market means it is cheaper to ship New Zealand’s plastics waste to China than to Australia where reprocessing facilities are available. HDPE the other major post consumer recycling stream is a comparative success story with much of this material being reused within New Zealand with minimal levels of reprocessing.

The plastics packaging recovery rate of 18% in 2002 indicates that there are large numbers of New Zealanders not actively participating in existing plastic recycling schemes. Estimates are that 60% and soon nearly 95% of the New Zealand population will have access to some form of plastic recycling (Cox, 2003). While 100% recovery is simply not possible due to the long-term application of many types of plastic there is the potential to significantly increase the volume of recovered material being taken at existing kerbside collections.

The New Zealand Plastics industry has set recycling targets for plastic packaging at the request of the Ministry for the Environment under the New Zealand Packaged Goods Accord (1.5.8). Packaging was not originally targeted as part of the Waste Strategy but

has since come under pressure from members of the public and pressure groups. As a result MfE have now grouped packaging, under the Special Waste target of the Strategy. This includes a target for eight sectors to introduce extended producer responsibility pilot programmes for the collection and reuse, recycling, or appropriate treatment and disposal of at least eight categories of special wastes (MfE, 2002).

Under the Plastics Sustainability Initiative, additional targets have been set by the plastics industry that will start to address the other barriers outlined above, Appendix 7. Further cooperative work is required by RONZ, Plastics New Zealand, Local Government New Zealand, the Packaging Council of New Zealand and WasteMINZ to provide better advice and information to local authorities to enable informed and sustainable decisions on plastic recycling. The Packaged Goods Accord provides an ideal avenue to address these issues for plastic packaging.

3.2.2.5 Degradable Plastics

Degradable plastics are likely to shape the future of the plastics industry internationally. The use of non-renewable resources and the generation of persistent waste are two critical issues that could be overcome by the successful introduction of organic based polymers.

Organic based plastics have made the production of plastics independent of non-renewable resources. These polymers can be assimilated by natural systems at the end of their useful lives providing the opportunity for a sustainable cyclical flow of resources (Liu, 2000). Liu maintains that the sustainable management of plastics needs to utilise the hierarchy of prevention and reduction, reuse, recycling, land storage and the contemporaneous development of degradable plastics (Liu, 2000).

Degradable polymers have been available for at least ten years now but are still a relatively immature technology in the market place. Figure 16 provides a summary of the current benefits and adverse effects of degradable plastics. With the technology still developing for mainstream applications, production levels are still relatively low and consequently polymer prices comparatively high. This will adjust over time as capacities increase. The range of degradable plastics now becoming available includes (Nolan ITU, 2002):

- Starch-based products including thermoplastic starch, starch and synthetic aliphatic polyester blends, and starch and PVOH blends.
- Naturally produced polyesters including PVB, PHB and PHBH.
- Renewable resource polyesters such as PLA.
- Synthetic aliphatic polyesters including PCL and PBS.
- Aliphatic-aromatic (AAC) copolyesters.
- Hydro-biodegradable polyester such as modified PET. Water soluble polymer such as polyvinyl alcohol and ethylene vinyl alcohol.
- Photo-biodegradable plastics.
- Controlled degradation additive master batches.

There are currently no Australian or New Zealand Standards for degradable plastics. Nolan ITU has just completed a national review on the issue of degradable plastics on behalf of the Plastics and Chemicals Industries Association Inc. Australia (PACIA). The report concluded that for the introduction of degradable plastics into Australia it is essential that for any new application the following be clearly identified (Nolan ITU, 2002):

- disposal route;
- appropriate recovery systems;
- processing infrastructure required; and
- the product has been tested against nationally agreed standards to ensure that the disposal route is appropriate and is environmentally sustainable.

The report also concluded that for this to be achieved it will be necessary to establish a national framework for standards and testing, based upon appropriate international standards. It also recommended that the Federal Government, through Environment Australia and in consultation with the plastics industry, take an initiating role in undertaking further research and development of these standards. This work has since been initiated. Further research focus areas identified included:

- Life-cycle assessment;
- Minimisation of the impacts on reprocessing;
- Determination of appropriate disposal methods; and
- Consumer education.

Benefits of Biodegradable Plastics:

- *Compost derived in part from biodegradable plastics increases the soil organic content as well as water and nutrient retention, while reducing chemical inputs and suppressing plant disease.*
- *Biodegradable shopping and waste bags disposed of to landfill may increase the rate of organic waste degradation in landfills while enhancing methane harvesting potential and decreasing landfill space usage. Biodegradable landfill covers may also considerably extend landfill life.*
- *The energy required to synthesise and manufacture biodegradable plastics is generally much lower for most biodegradable plastics than for non-biodegradable plastics. The exception is PHA biopolymers, which consume similar energy inputs to polyethylenes. New feedstock for PHA should lower the energy required for their production.*
- *Biodegradable plastics also offer important environmental benefits through, in many cases, the use of renewable energy resources and reduced greenhouse gas emissions.*

Adverse Effects of Biodegradable Plastics:

- *No Australian [or NZ] Standards.*
- *Pollution in waterways due to high BOD concentrations resulting from the breakdown of starch-based biodegradable plastic.*
- *Migration of plastic degradation by-products such as residual pigments, catalyst residues and isocyanate via run-off and leachate from landfills and composting facilities to ground water and surface water bodies.*
- *Trauma and death of marine species resulting from only partial or slow degradation of biodegradable plastic products in marine environments.*
- *Possible increase in the incidence of littering due to the belief that biodegradable plastic will disappear quickly.*
- *Soil and crop degradation resulting from the use of compost that may have unacceptably high organic and or metal contaminants derived from biodegradable plastic residuals, additives and modifiers such as coupling agents, plasticisers, fillers, catalysts, dyes and pigments.*

Figure 16. Benefits & Adverse Effects of Biodegradable Plastics (Nolan ITU, 2002, piii).

All these issues must also be addressed in New Zealand. The risk of contaminating conventional plastics recycling with degradable plastics, is a very significant one for New Zealand where there are even lower material volumes. Over 60% of plastic recycled here is commercial film. Contamination with biodegradable material would lead to product failure as degradation occurs. This would undermine one of the most successful areas of plastic recycling we have developed here. Degradable plastics have hugely positive environmental implications if they are properly selected, labelled, utilised and disposed of.

There are strong opinions held within the industry and by environmental waste groups both for and against degradable plastics. From a social responsibility perspective some groups are concerned that crops for polymers could replace essential food crops and potentially cause food shortages in poorer nations. There is also the issue of genetic

modification and the possible demand for certification of the material that forms the basis of an organic polymer.

The capacity of alternative disposal methods also needs to be addressed within New Zealand. Availability of compost facilities and the impact of organic based polymers is one arena that is likely to become more relevant in New Zealand as local authorities work towards the New Zealand Waste Strategy targets for organic wastes. The use of organic-based polymer bags for compost collections is already being investigated by Waitakere City Council (PNZ, 2002c).

Within the plastics sector some have expressed concern about the vulnerability of our unregulated market. Imported degradable polymers and products are not subject to any requirements for validation or independent testing other than as imposed by the market. Similar issues have recently created issues for pipe manufacturers who have discovered substandard imported pipes labelled as complying (PNZ, 2003b). Ensuring that the public and key sector groups are well informed is one of the first steps required for the New Zealand plastics sector.

Development of clear standards, guidelines and educational material for New Zealand markets is needed. This has been initiated by PNZ under the Plastics Sustainability Initiative, with the development of a Code of Practice for Degradable plastics likely to be launched by the end of 2004.

3.2.2.6 Landfill

Plastic makes up 7% of New Zealand's waste stream by weight (MfE, 2002a). Because plastics are lighter than many other materials, they contribute a larger proportion by volume of up to 20%. Approximately 190,000 tonnes of plastic waste is disposed of to New Zealand landfills each year (PEAG, 1996). The New Zealand Packaging Council has estimated that at least 50% of plastic packaging sent to New Zealand landfills is imported (Webber, 2002).

Measuring the quantity of waste disposed of to landfills has been identified as an environmental performance indicator for New Zealand (MfE, 2000a). In the 1999 national landfill census sixty-three percent of the landfills measured the quantity of waste

deposited (MfE, 2002a). Landfill operators conduct these measurements by survey, volume, weight or estimate.

No New Zealand research has been conducted to break down the specific composition of plastic wastes measured in these surveys. More recent landfill surveys are identifying plastics that are recycled separately. This is where PET (1) and HDPE (2) plastics are defined as a subset of plastics to determine the success of kerbside recycling, rather than as one broad plastics category as currently specified under the New Zealand Waste List. The annual Mass Balance Survey conducted by PNZ (1.5.2) in combination with the estimated life span of differing plastic products (Fig. 14) provides a mechanism for anticipating future plastic waste volumes.

Concern about plastics disposal to landfills is based on the fact that they degrade very slowly. A further concern relates to the release of hazardous substances from plastic products as they break down or are burnt. Landfill fires have been significantly reduced over recent years with most now being accidental (MfE, 2001a). The combustion process changes the chemical structure of plastics. PVC, for example, releases carbon dioxide, water, hydrogen chloride (an acidic gas) and metal chlorides when burnt (PINZ, 1999). PVC is also attributed, as a source of dioxin when incinerated, because of its chlorine content. Incineration in New Zealand is currently limited to hospital wastes (PINZ, 1999).

The New Zealand plastics sector is committed to the diversion of plastics waste from landfill, but manufacturers are keen to emphasise that all waste management solutions should provide the optimum balance of environmental impact and economic cost, from raw materials extraction, through to disposal of final residual waste.

3.2.2.7 International Comparison

Global plastics production reached 155 million tones per year in 2002 (APME, 2003). World consumption is now comparable to non-ferrous metals (UN, 2001). In Western Europe the growth of plastics consumption has outstripped the average annual growth in GDP (APME, 2001). At least three new plastic production plants are required to maintain adequate supply for the China market alone (PNZ, 2002c).

Plastics Waste in Western Europe 1999

Sector	tonnes	% by weight
Agriculture	274,000	1
Distribution & Industry	4,044,000	21
Building & Construction	526,000	3
Municipal Solid Waste	188,000	7
Automotive	692,000	4
Electrical & Electronic	764,000	4
Municipal Solid Waste	12,865,000	67

Figure 17. *Plastics Waste in Western Europe (APME, 2001).*

Country	Production	Recycling (%)	Energy recovery (%)
*New Zealand	239,000	12	0
Australia	1,258,000	13	0
United Kingdom	3,682,000	8	8
Denmark	351,000	10.3	68.9
Sweden	384,000	8.3	45.1
Austria	350,000	19.2	20.9
Germany	3,161,000	31.1	25.5

* Production figures include New Zealand production only.

Figure 18. *International Plastics Recovery (PNZ, 2003a, APME 2003, PACIA, 2003).*

Figures from Western Europe demonstrate that plastic equates to less than 1% of total waste in comparison to New Zealand's 7% (APME, 2001). The discrepancy between the New Zealand and European figure probably results from the exclusion of clean fill and sludge waste from New Zealand waste surveys.

3.2.2.8 Comparison by Packaging Medium

Material	Consumption per person	% collected for recycling
Plastic	31kg	18%
Glass	32kg	42%
Paper	81kg	66%
Steel	7kg	38%
Aluminium	2kg	50%

*The above figures include imported and New Zealand manufactured plastic but relate to packaging only.

Figure 19. *New Zealand Packaging Consumption 2000 (MfE in Cox, 2003)*

Figure 19 shows a comparison of packaging consumption and recovery in New Zealand for the different mediums as reported on by the Ministry for the Environment. Unfortunately as discussed above this method of analysis portrays the industry in a narrow way and it is easy to draw a negative conclusion about the plastics sector from the comparison of these figures. This is due to a huge number of factors including the

number of differing plastics, its low raw material use per product, source reduction capability, the value of raw materials and the number of plastic collectors, recyclers and manufacturers.

3.3 Current Sustainable Development Performance

This section outlines findings from the local authority survey, company interviews and the workshops held, as outlined in Chapter 1, and explores the current level of sustainable practice within the plastics sector in more detail.

3.3.1 Results of Council and Recyclers Surveys

There is an increasing level of frustration apparent within local authorities as they attempt to reach Zero Waste targets and try to establish or expand community recycling for plastic products. Councils consistently report difficulty in identifying markets for plastic material and in determining the appropriate sort of plastic to collect.

Several Councils contacted were unsure of the type of plastics collected. The complexity of the material types and grades was seen as a major issue for ratepayers. There was also concern that the plastics identification code implied that all plastics were being recycled. There was also uncertainty about new kinds of packaging. Some Councils had received complaints about products in polymers not accepted by their contractors. In some cases these complaints had been followed up with a letter to the company concerned. Some Councils had even developed guides for green purchasing which discourage the purchase of specific plastic products based on recyclability. For most surveyed keeping the costs of recycling collections down was a central issue. There was frequently confusion about what could be recycled in New Zealand and why. Often Councils had been told a material was not recyclable by their contractor, on the basis of costs not technical feasibility but this was not always clearly expressed to the Councils or ratepayers.

There was also concern expressed about contamination resulting from products designed with components that created contamination and those that had differing polymer types but the same appearance. There were also several reports of plastics companies who had not known about the plastic identification code when contacted. It was asked that

manufacturers notify and consult with recyclers where they are developing new packaging that may have implications for recyclers.

Most Councils surveyed gained information on plastics from other Councils or their contracted waste provider and there was concern expressed about the impartiality of this information given the tender process followed by Councils. Figure 20 provides a summary of these issues.

Recyclers directly involved in plastic recycling often have little immediate contact or media influence with consumers. The need for consistency and standardisation in all communication to the public about plastics recycling was raised as a significant issue. Recyclers reiterated the importance of giving the right message the first time and ensuring that the same advice is given from all parties. There is growing inconsistency between Councils in the type of materials collected and recycled and in terms of the level of advice given. National consistency for those Councils with kerbside collections would help to alleviate this but would have ramifications for individual contracts.

These survey findings reinforce the barriers to plastics recycling identified in 3.2.2.4. They also reveal a poor standard of communication between New Zealand manufacturers, recyclers and Councils. At the time of the 2002 survey there were no joint initiatives or programmes involving both groups.

Devito et al define the knowledge gap as the difference in knowledge between one group and another (2000). The differing focus of manufacturers, Councils and recyclers and the resulting dissemination of information and education provided between them is a major weakness in facilitating resource recovery for the sector. There is a need to set mutually beneficial guidelines, targets and goals as part of a cooperative strategy between manufacturers, customers, Councils and recyclers. This is a major opportunity for the future of the sector.

Barriers to a Sustainable Plastics Sector

The following are examples of issues facing the New Zealand plastics sector that require improved education and communication to resolve:

- Competition for materials between traders and recyclers.
- Lack of environmental knowledge among plastic manufacturers.
- Inadequate environmental industry training.
- Lack of cooperation and joint initiatives between TA's, sector groups and government.
- Lack of cooperation and joint initiatives between recyclers and manufacturers.
- Few established communication links between manufacturers and recyclers.
- Lack of public knowledge.
- Inconsistency of advice.
- Lack of national and regional consistency.
- Uncertainty of market and supply of materials.
- Lack of access to simple life cycle analysis.
- Lack of control over imported products.
- Lack of international consistency in the labelling and identification of plastic materials.
- Increasingly complicated nature of plastic materials.
- Mistrust between businesses within the industry.
- Lack of information sharing between industry and local government.
- Reliance of local authorities on contractors and environmental organisations for technical plastics information.
- No sector waste strategy.
- Industry focus on light weighting and energy conservation not recycling.
- Lack of technical plastics knowledge within territorial authorities and schools.

Figure 20. Barriers to a Sustainable Plastics Sector

These findings have been used to demonstrate the necessity of better communication and cooperation with other sectors. They were also used to demonstrate the need to better educate the plastics industry on sustainable design and recycling. The results were also used to justify the development of the Plastics Sustainability Initiative to PNZ, Appendix 7.

3.3.2 Results of Company Surveys

The following section outlines the results of the company surveys, and discussions held with industry members as the PNZ Environmental Affairs Manager and summarises the actions currently being taken by the industry to operate in a more sustainable manner.

3.3.2.1 Material & Technology Development

The New Zealand plastics industry has to date been strongly focused on promoting the environmental efficiency and effectiveness of plastic. Figure 21 provides a list of examples of current technical innovations.

Current Technical Innovations in the Plastics Sector

- New polyethylene types which allow further down gauging to produce thinner films with similar properties.
- Improved polymerisation catalysts for polypropylene, enabling films and mouldings to be more rigid, allowing lighter packages and improved balance of properties.
- New polymers and polymer combinations that allow better barrier properties and enhanced protection of food products using minimal material.
- Improved process controls, enabling better consistency, and reduced film gauge and container weights.
- Increased electronic control and precision in equipment increasing consistency and reducing rejection rates.
- The change to flexible packs and pouches from rigid containers, significantly reducing weight and resource use.
- The removal of the need for secondary packaging e.g: stand-up pouches instead of bags in boxes.

Figure 21. *Current Technical Innovation in the Plastics Sector (APME, 2002).*

3.3.2.2 Efficiency – Resource Monitoring and Costing

The ever-present drive to improve efficiency has dramatically improved levels of industry resource stewardship. Total Quality Management and similar systems institutionalised within New Zealand industry over the 1980's and 1990's have resulted in the establishment of systems and measures that have improved resource efficiency dramatically. These management systems instigated some time ago within most company structures are still in place, with staff working to reduce error rates and faults. Effective operational managers are constantly measuring and reviewing these issues. There is a noticeable trend emerging within the sector to quantitatively measure and cost production waste as a performance indicator. Marley New Zealand, Fisher & Paykel Healthcare, Huhtamaki Ltd and Chequer Packaging Ltd are among some of the larger plastic companies instigating this practice.

Financial incentives to reduce material use are strong. Improving technologies and tight markets continue to push manufacturers to lightweight, reducing the amount of raw material required per product. This has also resulted in continued efforts to recycle as much plastic waste as possible. In-house recycling of plastic by manufacturers is now standard practice where production off cuts are reground and reused in the same or similar products. This ensured 9,439 tonnes of plastics were reused in 2001 (PNZ, 2002c). Because of this plastic waste from plastic manufacture in New Zealand is estimated at only 1% of material used (PNZ, 2002c).

The production of a milk bottle for example produces flaps of surplus plastic at the base and top that account for nearly 40% of the overall material use in production. Recycling of this material back into the product results in huge energy and resource savings. Many machines are now equipped to gather and return production off-cuts straight to a grinder to be chipped for immediate reuse. This area of recycling is not shown in plastic recycling statistics but demonstrates a significant contribution by the industry towards waste minimisation. Improvements to technology and design will further eliminate the need for regrinding by better design of dies and moulds to reduce production scrap.

Mixed or contaminated plastic waste proves more difficult to deal with and represents most of the residual 1% of plastic production waste achieved by the sector. An effort has been made by PNZ to promote the recycling of the purge material used to clean machine barrels between differing batches. An industry challenge was also issued by PNZ for companies to reduce their waste by 50% by May 2003 at the 2002 PNZ conference. Two companies exceeded this target and there has been a strong commitment within the industry to reduce waste even further. The impending rise in landfill charges under the New Zealand Waste Strategy has been used to further reinforce this commitment. Given the continued efforts of plastic manufacturers in this area towards best practice the main waste minimisation challenge now facing the plastics industry in New Zealand is the reduction of waste at the end of their products' useful lives.

Measuring and reporting on environmental or social performance is still in the main limited to basic health and safety within the plastics industry. There is however a growing move to assign staff responsibilities to environmental areas and to monitor and report on resource use and waste created within larger companies. This is often as an extension to existing reporting and is frequently occurring as a result of top down directives within multi national companies. As evident in this research creating quantitative data to measure environmental performance can be time consuming and complex for companies. Factors like waste minimisation and energy consumption are comparatively easy to measure. Addressing the full life cycle impacts of products and processes is highly complex and is fraught with difficulties when trying to aid comparison between products.

From a social perspective employers, particularly in Auckland, are dealing with issues relating to language barriers, and poor literacy and numeracy among employees. Considerable resources have been invested by the companies concerned to provide company based numeracy and literacy training through the Plastics and Materials Processing Industry Training Organisation (PaMPITO). Businesses have reported increasing levels of productivity as a result – even where study has been provided during working hours. For the employee this also represents a major personal achievement that will dramatically impact on their lives outside work.

Environmental and social performance measurement and reporting by business has come under increasing focus throughout the 1990s. Customers and government are increasingly requesting evidence of such measurement. Companies are therefore having to respond with better environmental performance data for effective internal management. Environmental monitoring and reporting at a sector level has to date been limited to plastic production and recycling. PNZ currently reports to the Ministry for the Environment on plastics production and recycling as part of packaging mass balance requirements under the Packaged Goods Accord. There have been no other sector-based measures of environmental performance monitoring or reporting in place.

3.3.2.3 Sustainable Design

Figure 22 illustrates raw material source reduction in the New Zealand plastics sector. The relationship between New Zealand plastic 'outputs' (as measured by industry turnover) can be benchmarked against raw material imports, and gives an overall index of the productivity of the New Zealand plastics industry. For each dollar of output, New Zealand manufacturers are using less and less material as measured by tonnes of resin imported. By this measure, more than 50,000 tonnes of material has been saved in the eight years from 1994 to 2002. This is a crude measure, as it takes no account of changing product design requirements for added features, nor the utility benefits from materials selection. It does however start to show the value of continuing source reduction.

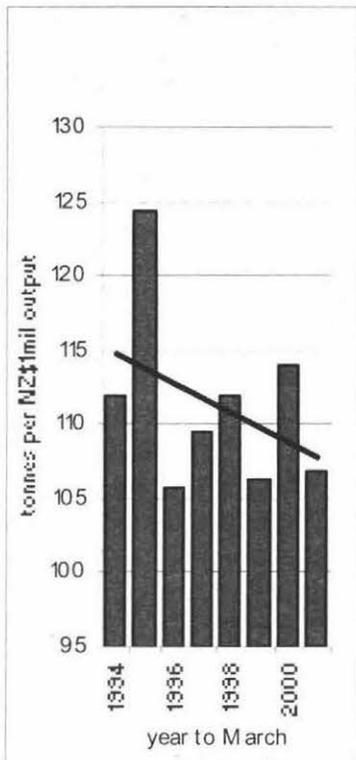


Figure 22. NZ Plastics Source Reduction Index 1994 – 2000 (Cox, 2003).

Plastic manufacturing companies working to reduce their own waste are gaining an increased level of awareness of the importance of sustainable design practices. There are an increasing number of examples of new and existing products being redesigned in response to the difficulty manufacturers are experiencing recycling their own production waste. Once a product has been established successfully on the retail market, it is extraordinarily difficult to change or remove it given the overriding focus of business to succeed financially. Without strong customer support for the changes required these are unlikely to progress. To avoid these situations smart decision making is required at the product design stage.

A lack of knowledge of what constitutes the most sustainable solution also provides a significant barrier. Councils and environmental groups have both noted the lack of industry responsiveness and understanding to questions and concerns about plastic identification codes and recycling. This lack of knowledge reflects poorly on the industry and further emphasises the lack of consideration of environmental issues in the design process where the parties are not sufficiently informed to make these decisions. While environmental factors in terms of issues such as functionality, durability, performance and appearance are considered, those of sustainability are still considered only indirectly in most instances. A key criticism of the environmental debate has been its focus on downstream effects when little emphasis is given to the systemic causes of problems (TNS, 2003).

Hawkins et al comment that environmental design is not so much reliant upon new technology but on more intelligent application of existing technology (1999). The development of best practise design guidelines has unfortunately lagged behind technology. The rapid rate at which technology is developed does not keep pace with the

creation of standards or regulations for application. PVC beverage sleeve labels and degradable supermarket bags are two good examples of this. While it is not possible to create these standards ahead of the substance, product or process it is possible to integrate checks and balances from a holistic perspective into business procedures particularly as they relate to process and product development.

Following the supply chain approach would suggest that suppliers of new materials must work with other authorities to ensure that full life cycle assessment has been conducted before products are launched and available on the market. This includes the use of additives, inks, solvents, and the application of degradable plastics.

Some multinational companies are now requiring environmental impact assessments as part of their product development cycle (UNEP, 2003). None of the plastic companies interviewed had formally incorporated sustainable product design criteria into their company procedures. Several indicated that they were raising these issues with customers and making suggestions based on their technical knowledge. At a sector level PNZ has distributed ACOR guidelines and hosted a series of seminars during 2002-2003 to raise awareness of the issues that need to be considered in designing for waste minimisation and recyclability. Figure 23 below shows the 12 key considerations for the sustainable plastics design that PNZ is recommending. Ensuring that the industry has the knowledge, skills and ability to advise customers on sustainable plastics design is a key focus under the Plastics Sustainability Initiative. This area is examined in more detail in the following chapters.

12 Design Guidelines for Sustainable Plastics

1. Avoid using more than 1 type of Plastics
2. Check compatibility – plastics, labels, foils, caps, adhesives
3. Use colourants sparingly
4. Always use Plastics Identification Codes
5. Disassembly – ease of emptying, use snap fittings or break points to replace component or separate for recycling.
6. Avoid secondary finishes and coatings
7. Avoid composite materials
8. Avoid metal foils, components and fasteners
9. Avoid toxic additives
10. Don't over specify or over order
11. Establish possible reuses
12. Provide clear information on recyclability to end user.

Figure 23. 12 Design Guidelines for Sustainable Plastics, (PNZ, 2003b).

3.3.2.4 Supply Chain

Most large plastic companies surveyed had a formal environmental policy. Unfortunately the same companies were not always fully informing or advising clients on the correct labelling or recyclability of materials sold. Following the EPR approach plastics companies have an implied social and environmental responsibility to provide technical advice and support to their clients and thus the communities in which these products are eventually sold, used and disposed of. While the companies surveyed were frequently starting to monitor their own environmental performance, this was in isolation from the full life cycle effects of the products and services they provided. A good example of this is the frequent queries PNZ receives from plastics manufacturers about what can they do with empty plastic raw material bags which are not recyclable. Several major New Zealand polymer suppliers have changed to a fully recyclable LDPE (4) bag because of these customer requests.

As a manufacturing sector part of any sustainable development strategy must examine supply level relationships and the possibility of formulating service level agreements. There is a strong opportunity to develop strategic projects both at a sector level and with key stakeholder groups. Consultation and coordination is needed to ensure:

- Economies of scale.
- Buying power.
- Certainty and reduced commercial risk.
- Greater transparency

3.3.2.5 Responsibility for Decision Making

Interviews with plastic manufacturers indicate that awareness of the need to minimise waste is starting to affect product design decisions, but that the final responsibility for design decisions is often being deferred to customers. The concern here is that these customers are often uninformed about the possible resource impacts of the decisions they make. PVC sleeve contamination is a good example of this occurring where a market innovation has progressed in direct conflict with accepted design criteria for plastics recycling (7.1.2). Deferring decisions to other sectors that are less informed is a real concern and raises the importance of cooperating in the provision of material specific sustainable design education, information and resources to both the tertiary sector and the

other sectors using plastic products. The broad scope of related industries and the ability to disseminate the correct information within these is another challenge to improving the design of plastic products.

3.3.2.6 Risk Management

The manufacturing sector continues to see environmental initiatives and legislation as a threat to economic growth that will continue to increase future compliance costs and reduce profitability. Environmental initiatives have therefore frequently been made by the plastics companies to minimise risk, as opposed to maximising market opportunity. As outlined in section 3.2.1.4 increasing demands on business for greater transparency and responsibility in the use of hazardous substances are also driving positive changes.

3.3.2.7 Environmental Management Systems

The number of plastics companies implementing environmental management systems such as ISO 14001 is increasing. The key benefits identified by those with or currently undertaking accreditation were:

- Evidence of environmental policies for customers
- Company commitment
- Identification of issues
- Identification of project priorities
- Integration with existing company procedures and strategies
- Independent validation through the audit process

The survey of plastics companies revealed that some companies with no formal environmental policies or procedures could be far more proactive than those who had. This scenario was however reliant on commitment from senior management and a particular market niche which supported this behaviour.

3.3.2.8 Economic barriers

Investment in capital, product research and development is essential to ongoing reductions in material usage and energy consumption. A lack of market incentives to carry out these developments is a barrier. Adjustments to depreciation and taxation may provide opportunities to improve the rate of plant replacement that would have a positive impact on energy consumption by the sector. The small to medium-sized businesses

which dominate the plastics sector are is typical of most in New Zealand where engineers and technicians are skilled at keeping the older, simpler, but less efficient, machinery operating at a lower cost than purchasing replacements.

One barrier referred to in reference to further reducing bottle weights and therefore raw material consumption was the ability for fillers to cope with these innovations. Some beverage companies continue to operate with equipment designed to fill heavy glass bottles that will not cope with the lightest weight plastic bottles now technically possible. Efficiency in terms of energy consumption is a critical issue. A number of the largest plastics companies did extensive work on energy efficiency in the late 1990's; as a result the easy energy savings have already been made. Further efficiency gains require capital investment. Economic incentives to speed this shift need to be examined by government.

CHAPTER FOUR

4.1 Government Policy for Sustainable Development

Sustainable development has increasingly been adopted in government policies over the last decade. Figure 24 below provides an overview of New Zealand sustainable development policy relevant to the New Zealand plastics sector. This clearly shows the silo approach being taken by government and the extent of policy issues that New Zealand's small to medium-sized businesses need to be aware of. This separation of critical issues affords government the opportunity to focus and concentrate resources on specific issues. From a business owners perspective however it is harder to stay aware of the issues relevant to their operation. This is especially so given the tendency to focus on sustainability issues at a global level. This lack of integration and direct relevance is a major issue for businesses, which deal immediately with decisions affecting all of these areas. The increased cooperation of trade organisations and government departments is one avenue to alleviate some of these problems that is explored further within this chapter. The following sections outline related areas of government policy in more detail.



Figure 24. NZ Sustainable Development Policy Relevant to the Plastics Sector

4.2 Regulation and Leadership for Sustainable Business

The Sustainable Development programme of action released by the New Zealand Government in January 2003 states that achieving sustainable development involves a different way of thinking and working. It requires (DPMC, 2003, p.6):

- Looking after people.

- Taking a long-term view.
- Taking account of the social, economic, environmental and cultural effects of our decisions.
- Encouraging participation through partnerships.

Existing environmental legislation in New Zealand is framed to minimise the impact of industry. For example the purpose of the Resource Management Act 1991 under section 5 requires the *avoiding, remedying, or mitigating any adverse effects of activities on the environment*. The purpose of the Hazardous Substances and New Organisms Act 1996 under section 4 is *...preventing or managing the adverse effects of hazardous substances and new organisms*. McDonough and Braungart refer to this terminology: reduce, avoid, minimise, sustain, limit, and halt as being central to environmental agendas taken up by industry today (2002). The focus is therefore not on decisions made in design and product development; it is on managing the effects of these decisions. McDonough and Braungart describe this situation as one size fits all end of pipe legislation rather than as a deeper design response, as it does not encourage creative problem solving.

The New Zealand government has received criticism for being unduly focused on delivering outputs ahead of building capacity and accountability for environmental outcomes (PCE, 1998). The current economic paradigm has led to the development of governmental policy focused on (PCE, 1998):

- Globalisation.
- Free markets.
- Least cost.
- Processes orientated to outputs.
- Devolution to local government.

At the same time the New Zealand business community has become increasingly focused on compliance costs particularly those created under the Resource Management Act – where time delays and appeals from trade competitors have called into question the effectiveness of the legislation. This climate has led to a strongly entrenched belief within the New Zealand business community that environmental legislation creates higher costs and is therefore something to be avoided. This environment means it is difficult to engage the business community constructively in the development or

assessment of legislation or regulation. A good example of this was the decision by the current Labour government to ratify the Kyoto protocol. The business community through organisations such as Business New Zealand and the Employers and Manufacturers Association have rallied against this proposal and the perceived compliance costs under this.

Moving away from this resistance will be a challenge for the New Zealand government. Calls for certainty and reduced compliance costs needed to be balanced carefully when considering the need to take leadership and drive pragmatic changes in the business community. Engaging and creating business leadership will be critical for this. The Ministry for the Environment consulted with stakeholders in 2003, to gain feedback on its role – one of the key messages received from a wide cross section of groups was the need for leadership (MfE, 2003). The NZBCSD has also taken on this challenge with the following objective: *To provide business leadership as a catalyst for change toward sustainable development, and to promote eco-efficiency, innovation and responsible entrepreneurship and to be the leading business advocate on issues connected with sustainable development* (NZBCSD, 2003). The media attention gained by this group has raised the profile of sustainable business in New Zealand (PCE, 2002). Given the limited membership of this organisation it is likely that the impact on the plastics industry will be limited to supply chain impacts and use of the resources developed by the Council.

It is evident in this research that business leaders and innovators in the plastics sector are increasingly accepting the challenge of sustainable development. It is the remainder that may require stronger attention from government and, if necessary, additional regulation. The following section summarises related governance issues for the New Zealand plastics sector.

4.3 Governance of the New Zealand Plastics Sector

The New Zealand plastics industry has the relative luxury of having no industry specific sustainable development legislation. It is however subject to the normal raft of standards, regulations and Acts which affect business compliance costs. Manufacturers and recyclers operate under national and international standards, resource management, health and safety, and hazardous substances legislation and regulations. As discussed above

environmental legislation in New Zealand is framed to minimise the impact of industry. Further legislation of sustainable development is seen as an additional compliance cost that the plastics sector wishes to avoid. The threat of legislation is therefore a driver for action.

The New Zealand economy has been deregulated and there are few controls on imported plastic products or packaging. The Hazardous Substances and New Organisms Act 1996 for example does not apply to manufactured items. There is also no requirement for a statement of origin on products. An essential concern of the plastics industry is that of product substitution. Government initiatives such as Climate Change Policy, a free market economy, and the removal of trade barriers have left the plastics industry exposed and vulnerable to cheaper imported products.

Any initiative to introduce regulation controlling or directing plastics products for example through a waste levy becomes extremely complex due to the range of products and materials involved. Unfortunately, the voluntary approach has invariably meant local manufacturers are held responsible for the whole problem, when they are often unable to succeed in influencing the decision-making of importers in any effective manner. Central government needs to start reconciling this issue with the sector through the renegotiation of the Packaged Goods Accord and the sectors Sustainability Initiative.

The following section outlines the current governance of the sector and some future implications of this.

4.4 Government Policy & Partnerships

To facilitate the development of a culture geared to continuous improvement businesses have stressed that clear direction on government policy is required (Ministry of Commerce, 1999). *This provides both confidence and a platform to drive best practice, the scope for manufacturers to develop more effective employee practices, and the concerns raised about skills also invite consideration of the interaction between industry and the education and training system* (Ministry of Commerce, 1999, p.140).

As observed above sustainable development policy is highly fragmented in New Zealand. To overcome this better leadership and direction is needed, alongside the development of the core competencies for working with the business community. Specific mechanisms available to improve the cooperation of government and the plastics industry in working to achieve sustainable development are now examined.

4.4.1 The New Zealand Packaged Goods Accord

The 1996 Packaging Accord sought to minimise the environmental effects of packaging waste. Rates of packaging recycling have improved from 29% in 1994 to 43% in 2002 (Webber, 2003). Innovations such as light weighting have slowed the rate of increase in packaging waste, but without reversal of this trend the total quantity of packaging waste continues to increase. The Packaging Council of New Zealand represents the broader packaging sector groups of glass, paper, steel, aluminium and plastic.

As part of the first Accord the Packaging Council of New Zealand produced a self-regulating Code of Practice for the packaging of consumer goods (Packaging Council, 2002). The key objectives of the code are:

1. To ensure that new packaging materials or new forms of packaging are evaluated for their environmental impact prior to their introduction and, if possible, modified to ensure minimal environmental impact;
2. To allow companies to evaluate the environmental impact of existing packaging and, if necessary, make alterations to any package to make it more environmentally appropriate, and
3. To reflect the following waste management options: reduction, reuse, recycling, recovery and disposal (Packaging Council, 2002).

The Code provides a complaint procedure under which formal complaints can be made if the code is breached. The Code is self-regulating and does not have an enforceable mandate under which the Packaging Council who administers it can act. The Code was revised in 2002 in consultation with the Ministry for the Environment. Better dissemination and industry training on the code is required to gain more support and involvement from environmental groups, customers and the public. The adoption of the code by customers and retailers as part of their purchasing requirements will provide a more powerful mechanism to enforce the use of the code.

The Accord is currently being renegotiated. The current political message from the Ministry for the Environment is to act on a voluntary basis or they will step in with legislation (Webber, 2003). As part of a renewed agreement action plans are required from all packaging sectors, including retailers, brand owners, recyclers, central and local government. Increased emphasis has been placed on retailers and brand owners, for their influence on the supply chain and potential to influence changes through combined purchasing power. Also included for the first time are requirements for the sectors to monitor and report on environmental performance at a level broader than recycling. These requirements reflect an increasing awareness within the Ministry for the Environment of the need for a more holistic approach to assessing the environmental impact of industry. The Accord provides the plastics sector with an ideal opportunity to work with key stakeholder groups towards Plastics Sustainability Initiative targets, such as the development of sustainable recovered material markets.

4.4.2 The New Zealand Waste Strategy

Research in 2000 found that New Zealand had no waste management legislation and that existing waste management policy was having very little effect (Liu, 2000). At this time no national management plans or strategies with clear targets had been enacted for the minimisation of waste, and no significant reduction of waste had been achieved. Ministry for the Environment staff have since stated that New Zealand is one of the only developed countries in the world not to have waste legislation (PNZ, 2002c).

In the period from 1999 to 2001 the Zero Waste New Zealand Trust challenged all local authorities to commit to a target of zero waste to landfill by 2015. By September 2001 31 out of 74 authorities representing 36% of the population had signed up to the concept of Zero Waste (Doorey, 2001). The New Zealand Waste Strategy: Towards zero waste and a sustainable New Zealand was released in February 2002.

The strategy was formed as a result of a partnership between central government and Local Government New Zealand and sets out a four-programme framework for (MfE, 2002b):

1. Institution and legislation.
2. Waste reduction and materials efficiency.

3. Information and communication.
4. Standards and guidelines.

The Strategy sets a target for 95% of New Zealanders to have access to community recycling collections but does not specify what should be collected, nor how this material should be recycled. Criteria for determining action through the strategy focus on volume, harm, achievability, public concern, and cost effectiveness. Plastics and packaging waste as a result were not specified under Strategy targets. This has since been re-evaluated with the inclusion of packaging as a special waste.

The Strategy identifies the following blocks on the path to zero waste (MfE, 2002):

1. Lack of information.
2. Variable community commitment.
3. New Zealand's geographic spread.
4. High level of imports – make take back of end of life schemes inequitable.
5. Inaccurate pricing and charging.
6. Unreliable markets.
7. Choices in prioritising resources for waste minimisation vs. waste management.
8. Funding for waste minimisation.
9. Lack of incentive in existing contracts.

End of pipe solutions dealing with disposal instead of prevention have historically been the focus of New Zealand policy. The Waste Strategy acknowledges the need for a more comprehensive approach by (MfE, 2002):

- Recognising that we cannot minimise waste without a system that deals with it from generation through to final disposal.
- Recognising the need to promote materials and resource efficiency at every stage of production and consumption.
- Recognising that those best environmental, social and economic solutions will vary for different wastes and different areas.

Also significant for the plastics industry is the adoption of the principle of Extended Producer Responsibility (2.3.7) and the life-cycle principle (2.3.6) under the Strategy.

4.4.3 Local Government Policy

Local government is one of the major drivers towards sustainable business practices in New Zealand (Gehrke, 2000). Some Councils are proactively raising awareness and fostering business involvement through local award schemes, coordination services, and field officers working directly with businesses to assist them in developing sustainable business practises (Gehrke, 2000). Target Zero in Christchurch City for example has had a huge impact on the operations of major companies like General Cable, New Zealand's largest producer of plastic covered cable. The New Zealand Business Care Trust has also been working to develop a network of cleaner production advisers through local government by providing training as part of a capacity building model. Coverage of these services is still limited as the activities often fall outside what Councils consider their core business.

The requirement to provide Long Term Council Community Plans under the 2002 amendment to the Local Government Act is also likely to have some impact as a more holistic long term approach will need to be demonstrated (Zero Waste, 2003a). The current three year political term has often been a barrier to this form of planning. The roles and responsibilities of local government will also be broadened under the New Zealand Waste Strategy to include (MfE, 2002b):

- Funding for recycling.
- Tendering and maintaining recycling contracts.
- Promotion and education of recycling schemes.
- Monitoring of contract performance

As discussed in Chapter 3 lack of national consistency is one of the major barriers to approaching plastic recovery strategically within New Zealand. Another area of concern is the basis for decision making and the accuracy of weighting given to this. The hierarchy of action for waste minimisation focuses first on source reduction. The focus of local government in the current political climate, is not on decisions made in design and product development, but on managing the effects of these decisions. With no environmental focus on product design and development, Councils are left to solve the waste issues of our communities in isolation. Consequently, problems are discovered when products have already been established on the market. A good example of this is

PVC sleeving case study outlined in Chapter 7. PVC sleeves, a relatively new innovation, rapidly gathered market growth and acceptance both here and overseas in spite of being a well-known contaminant of the PET and HDPE recycling streams.

4.4.4 Government Co-ordination with NGO's

The lack of coordination and resources among business related environmental groups within New Zealand is a further barrier to sustainable business practices. There are a large number of such groups in New Zealand given our population base. While these groups are strongly driven and are succeeding in the promotion of change, they seldom have a strong governmental mandate and are typically under resourced. Groups such as: the Zero Waste Trust, EECA, SBN, NZBCSD, WasteMINZ, RONZ, New Zealand Packaging Council, BusinessCare, Land Care Research, the Ministry for the Environment and cleaner production staff within Councils, need to consider more effective coordination of projects and pooling of resources.

As a national organisation Plastics New Zealand sometimes struggles to find the local contacts, resources and support people required to work with individual companies on sustainable development projects. There is a wide breadth of resources available through the various groups referred to above, but not always the depth of support required. For example the plastics sector has its biggest pool of industry within Manukau City. Manukau City does not have any cleaner production staff and therefore no cleaner production coordinator under BusinessCare. Better coordination of these groups at a national level, with regional contacts, would help businesses with sustainable development inquiries. Business owners and managers look at environmental work as something to do where time and money permits. Having easy access to the right resources and technical support people in their local communities is therefore critical to ensuring ongoing commitment to sustainable development.

Also critical is a better alignment of Trade and Enterprise New Zealand and the Ministry of Economic Development with the Ministry for the Environment. Technology and engineering innovations will be critical to the sustainable development and redesign of plastic products. Further industry training, research and development support and coordination is needed at this level.

4.4.5 Government Industry Partnerships

The Ministry for the Environment has recently been restructured and a Sustainable Industry group created to work with business to lead change towards more sustainable business practices (MfE, 2003). The group has three teams (MfE, 2003):

1. **Industry Effectiveness and Innovation** – works with industry to implement sustainable business practices and supports innovation in environmental practice.
2. **Industry and Society** – focuses on the relationship between industry and society and on raising awareness on sustainability issues for industry.
3. **Primary Sectors** – works with primary sectors to initiate sector wide improvements in environmental performance.

Most issues faced by the plastics sector affect all three of these areas. Experience with industry government partnerships by UNEP in cleaner production and eco-efficiency projects has exemplified the value of partnerships (UNEP, 2003). These partnerships have involved universities, local environmental agencies, NGO's, local politicians, research institutes, industry representatives and the media.

UNEP's recommendations to governments for encouraging the adoption of cleaner production and eco-efficient practices focus on negotiated compliance, correct pricing of resources, promotion of resources and information, management and technology assistance for small-to- medium-sized enterprises, financial support and incentives for programmes, and research and development involving processes, products and services that build the capability of business (UNEP, 2003).

Overseas models provide examples of sector based agreements between government and business. For example the EPA Industry Sector Program in the United States has created a multi-media sector program to work with industries through trade organisations on a focused set of actions to prompt industry-wide environmental gains (EPA, 2003b). Partnering with EPA programs in regions, and states, trade associations are working on solutions to sector specific problems. The program consists of the following elements (EPA, 2003b):

- **A Sector point-of-contact.**

- **Promoting environmental management systems** - sector teams work with trade associations to develop strategic plans for delivering outreach, training resources, and support to build a 'business case' for EMS.
- **Overcoming regulatory or other barriers to performance improvement** - sector teams work with trade associations, states, and interested public groups to address the most significant impediments to better industry-wide performance. Regulatory changes may be accompanied by compliance and technical assistance.
- **Performance measurement** - sector teams explore ways to measure and report industry-wide environmental and economic progress using performance indicators, success stories and other tools
- **Provision of an online toolbox.**

This model has obvious implications for the resourcing of both trade organisations and Government. It does however provide an integrated support system that has not yet developed in New Zealand. A one-stop shop for businesses with support from sector specific organisations and local contacts at local government or NGO level would cement the benefits of existing efforts in this area. Any such change would need to be done with the support of the NGO's already operating in this arena in an effort to overcome some of the duplication of effort and competitiveness for funding that is currently occurring.

Change of this nature is necessary if a voluntary approach to sustainable business is to continue to gain momentum in New Zealand. Businesses are breaking new ground and making changes the hard way where they do not have access to the necessary expertise and resources. As evident in Chapter 2 there are a number of very similar yet competing approaches that businesses can take towards sustainable development. Simplifying and tailoring this for specific business sectors will improve the level of uptake. Capacity and capability building for sustainable development within industry is something that needs to gain the full support of both Government and educators. Integrating the efforts of the Ministry for the Environment with the work of Trade and Enterprise with industry development is also necessary to ensure that the sectors targeted for growth are developing strategies that integrate sustainable development.

CHAPTER FIVE

5.1 Becoming a Sustainable Sector: Drivers & Barriers

The Parliamentary Commissioner for the Environment identified the following barriers to sustainable development (PCE, 2002):

- confusion over interpretations of sustainable development
- silo thinking in public sector agencies
- inertia and complacency as a result of “Clean Green Image”
- emphasis on economic growth
- lack of leadership
- scale of issues is too difficult to deal with
- lack of debate
- low awareness of linkages between social, environmental and economic and a lack of responsibility for consequences of actions.

Some of the key barriers and drivers towards sustainable development specific to the plastics industry have been outlined in Chapters 3 and 4. The following section explores these further.

5.2 Drivers for Sustainable Development

5.2.1 Zero Waste

The goal is zero: zero accidents, zero waste, zero emissions.

(Edgar S. Woolard Jr., Former Chairman, DuPont)

The success of the Zero Waste Trust is reflected in the title of the current New Zealand Waste Strategy: Towards Zero Waste and in the commitment of over 50% of New Zealand territorial authorities to the philosophy (Zero Waste, 2002). This has created a situation where considerable pressure is placed on recovering and recycling plastics from the waste stream.

A key benefit of this movement has been in the increased level of community recycling and moves to examine future plastic recycling streams. Unfortunately these decisions are

typically made in isolation from the producers of these products, feedback to manufacturers has been sporadic and largely based on public debate. PNZ and Zero Waste have been working to find better ways to cooperate, even where it is not possible to reach agreement on specific issues.

As Councils attempt to find solutions for plastics waste, pressure will continue to develop for manufacturers and importers to reconsider their material and design choices. Moves by the Zero Waste Trust to provide educational infrastructure for the New Zealand waste industry may also provide further opportunity to promote best practice in plastics waste management.

With the technical and economic limitations currently facing plastics recycling New Zealand plastic manufacturers see Zero Waste as an unobtainable ideal⁴. The NZBCSD state that the main value of Zero Waste to business is in its provision of a stretch target and a guiding vision for the process of continuous improvement within the eco-efficiency model (NZBCSD, 2003). Perhaps more significant for the plastics industry is the drive for change being created by this organisation at a community level and through local government channels.

5.2.2 Local Government

Approximately 30% of New Zealand's plastic recovery and recycling is as a direct result of community and local government kerbside collections and drop off points (PNZ, 2003c). In New Zealand, local government has the primary responsibility for managing domestic and, in some cases, commercial waste. The traditional approach to landfill management has been significantly changed with the advent of the Resource Management Act (RMA) in 1991. Many substandard landfills have now been closed with an estimated 110 landfills now in operation (PNZ, 2002c). The requirement for environmental assessment and full cost benefit analysis under the RMA has meant low cost unsealed landfills are no longer acceptable. The public submission process under the RMA has also lead to an increased level of public scrutiny and resistance to new landfill facilities. This in combination with growing awareness of, and commitment to, zero

⁴ A long-term target for 100% recycling of plastics waste was included in the original draft of the Plastics Sustainability Initiative but was later removed as a result of further industry consultation.

waste policies has increased the focus on diverting waste from landfill for reuse and recycling.

The role and responsibilities of local government have been broadened under the New Zealand Waste Strategy and include funding for recycling with tendering and maintenance of recycling contracts, promotion and education of recycling schemes and monitoring of contract performance. The Waste Strategy also looks to establish true cost pricing for landfill operations through legislative review (MfE, 2002b). This will improve the viability of plastics recycling operations.

As outlined in Chapter 3 there is a high level of frustration within local government with the growing complexity of plastic waste. Recent moves by the Auckland City Council to decrease the range of PET and HDPE products accepted in their kerbside collection as a direct result of financial disincentives - or lack of sustainable markets as reported by the Council - is evidence that this problem is becoming more significant (ACC, 2003).

Decisions on which plastics can be accepted for recycling are typically made on a financial basis through the annual plan and tender processes employed by Councils. As mentioned above concern has been expressed that Councils are accepting recommendations on plastics recycling from contractors without independent verification or assessment. Contractors typically base tenders on plastic collections from a purely financial perspective that may not fully reflect the broader environmental and social intentions of local government. The occurrence of disparate advice being received by Councils and the public about the existence, or not, of markets for types of plastic from contractors with vested interests, needs to be alleviated by the provision of consistent impartial information. Plastics New Zealand, the Recycling Operators of New Zealand, Waste MINZ and Local Government New Zealand have an excellent opportunity to address this need through the New Zealand Packaged Goods Accord.

McDonough & Braungart state that: *blindly adopting superficial environmental approaches without fully understanding their effects can be no better – and perhaps even worse – than doing nothing* (2002, p.58). Considerable energy and resources are consumed by recycling of plastics. Take for example PET, this material is collected and

transported from as far away as Dunedin to China and other Asian countries where it is reprocessed to create polyester fibre. The international anti-plastics lobby has attacked the plastics sector for dumping plastics in third world conditions where there is no guarantee of environmental performance or employment conditions (PNZ, 2002c). There is no record of a life cycle analysis in the New Zealand context that would take into account all these factors. Councils therefore continue to make the decision to recycle plastics based on partial information.

The determination of end markets for plastic waste is usually determined solely on cost recovery. An anomaly in the market means it is cheaper to ship New Zealand's plastics waste to China than to Australia where reprocessing facilities are available. HDPE the other major post consumer recycling stream is a comparative success story with the majority of these materials being reused within New Zealand with minimal levels of reprocessing.

The lack of information and the complex technical nature of assessing the true costs and benefits of plastics recycling is a barrier to making best practice waste management decisions in New Zealand. This is an area for further research. Plastics New Zealand has undertaken to meet regularly with recyclers, Councils and waste companies, to keep the sector informed of new developments and to assist in the development of common strategic goals for plastics recycling in New Zealand. This research demonstrates the importance of the plastics sector working more cooperatively with local government and recyclers to provide transparent information, and direct assistance to finding viable sustainable markets for greater levels of plastic waste.

5.2.3 Public

There is considerable public pressure to offer plastic recycling services through kerb side collections. Recycling is seen as the environmental solution to what the public perceive as a mountain of plastic waste. Queries from the public often reveal that they perceive the volume of plastic waste to be much higher than the reality of 7% of waste in landfill - most asked assume it makes up more than 30%. The general public does not often consider nor are they aware of the environmental life cycle of the packaging or products, they purchase, use and dispose of. Paper or cardboard is seen as

environmentally preferable due to the ease of recyclability and the perceived “naturalness” of the material (Meltzer, 2003).

Internationally the plastics industry has invested significantly in research and promotions, which demonstrate the lifecycle benefits of plastic materials and products. Provision of information and educational resources demonstrating this value has been seen by the New Zealand plastics industry as a way of better informing the public and ensuring that the debate on the environmental impacts of plastic is an informed one. Feedback from the public, and Councils suggest that this judgement may be flawed as this information is viewed in a highly critical manner. The most commonly held public perception is that plastics have a negative environmental impact (PNZ, 2002c). This indicates that past efforts by the sector to change this perception have not succeeded.

The risk that these perceptions may influence consumer purchasing decisions is a significant driver for improving the sustainability of the industry. Reversing these perceptions is perhaps the biggest challenge facing the industry. This will be highly dependent upon the sector providing increased stakeholder involvement, transparency in its operations and reporting and most importantly through tangible improvements in product design and waste recovery.

5.2.4 Threat of Regulation

A key concern of the plastics industry is that of product substitution. Government initiatives such as the removal of trade barriers, climate change policy and further measures designed to internalise environmental costs have left the plastics industry exposed and vulnerable to imports from countries that can employ cheap labour with poor environmental performance. Any New Zealand initiative to design plastic products sustainably must therefore be on a cost competitive basis with imports. This presents the sector with a double challenge – first selling these initiatives to customers and secondly ensuring that they are not displaced by cheaper imports. The sector considers that further sustainable development regulation would add to this burden and endeavours to avoid this scenario.

5.2.5 International trends

Almost all the countries that import or compete with New Zealand products have higher population densities than New Zealand. These countries will increasingly have to develop or import products that enable them to save on landfill space, reduce pollution, reduce waste at its source and conserve energy. This trend is well established in Europe and North America and is emerging in the more developed Asian countries. New Zealand cannot afford to get left behind by creating products that are limited in their markets as a consequence of being designed for a high waste society. The imperative to gear New Zealand products to meet international best practice in waste minimisation will become stronger and stronger as these pressures increase (NZBCSD, 2003).

The sector is currently in the early stages of developing an industry growth strategy, a key focus of the strategy will be the development of niche export markets for high value, low volume product lines (PNZ, 2003c). As New Zealand's ability to compete in the international commodity market is increasingly compromised, a greater focus will be placed on these areas. The export of plastic products has grown rapidly with over twenty five percent of New Zealand plastic production now exported at an estimated value of over \$350 million (PNZ, 2002c).

Overseas trends towards extended producer responsibility (EPR) have a direct impact on products as manufacturers here increasingly design to international specifications. This is especially the case within European markets where EPR continues to be regulated with stringent waste recovery targets. These trends are being closely monitored and reported on by environmental groups and Government in its assessment and determination of policy.

The sector has established the need to further investigate opportunities for EPR at both an international and domestic level. Discussions with the industry show that there are many opportunities for EPR schemes at a micro business to business level. This will be an important consideration in the assessment and creation of further targets under the sectors Sustainability Initiative.

5.2.6 Media

David Grayson refers to the risk of negative media exposure and the need to take positive action before being confronted with this negative trigger (2001). The Enron case exemplified the significance of this. Given the increasing recognition of sustainable development issues by the media, business leaders will increasingly be exposed for negative social and environmental impacts. This raises the need for strategic foresight. Many companies with high potential risks, like chemical companies overtly practice strategic risk management. Business leaders in the plastics sector are increasingly taking up this approach in a broader sustainable development sense.

Using the media as a mechanism for informing and educating the public on plastic sustainability issues is challenging given the tendency to sensational journalism. The media has significantly influenced public perception of the plastics sector. News items which focus on product health scares, and wildlife deaths gain significant media attention. A good example of the potential impact of the media were the reports about plasticisers used in PVC children's toys affecting fertility which resulted in product bans in several European countries (Greenpeace, 2003). The media can drive businesses to manage risks associated with their operations or products.

While the media has published a variety of reports on plastics recycling members of the public frequently ask "*Doesn't it [kerbside plastic] all just get dumped anyway?*" This perception seems to have originated from news media items that showed collected materials going into landfills. This had led to a belief that plastic recycling is not authentic because "*it all gets dumped anyway*". Increasing levels of industry transparency with accurate information on plastics and recycling for those educating and informing the public is vital to any future increase in recycling levels. Building better relationships with the news media to promote and encourage the positive actions the industry is taking towards sustainability is an important step for the sector.

5.2.7 Risk Management

As discussed above from the perspective of the media risk management is an area which requires increasing attention in the development of corporate and sector level strategies. Environmental issues like global warming have also drawn the attention of insurers and financial institutions to the potential business risk. There is growing

reference to bankers and insurers attempting to integrate environmental issues into their decision making. The assumption is that corporations with bad environmental performance pose a high financial risk and therefore have a poor shareholder value (UNEP, 2003). For example European industrial insurer, Gerling, closely examines the environmental performance of its customers before agreeing to carry their environmental risks for third party liability insurance or fire insurance (UNEP, 2003).

New Zealand expanded polystyrene (EPS) manufacturers are facing many of these issues. Auckland landfill charges have increased up to \$1,000 a tonne for waste containing more than 5% EPS. In addition, insurance premiums for foam panel systems have increased due to the perceived fire risk of the product. As a result the Plastics New Zealand sector group have invested significant money in fire testing, product design, training and specifications. They have also committed to an international agreement taking responsibility for the recycling of EPS waste and are about to invest in machinery to establish EPS recycling facilities in Auckland. This example illustrates how changes are driven by market risks. Actively managing these risks gives the industry an opportunity to adapt strategically with a view to long term commercial success.

5.2.8 New Zealand Waste Strategy

As discussed in Chapter 4 the New Zealand Waste Strategy released in March 2002 sets voluntary targets for access to recycling but does not specify the type of material that should be collected. There are no specific plastic waste targets. The Strategy does however pave the way for imposing true cost pricing on landfills. The low cost of landfill in New Zealand has long been a financial disincentive for recycling – particularly plastic recycling which has low financial returns.

Relevant waste minimisation and special waste targets for the sector to work towards are (MfE, 2002b):

- By December 2005, at least 10 major businesses will be participating alongside central and local government in developing and promoting waste minimisation programmes within their sector;
- Regional councils will ensure that industrial resource consent holders will have in place a recognised waste minimisation and management programme”;

- By 2005 businesses in at least 8 different sectors will have introduced EPR pilot programmes for the collection and reuse, recycling, or appropriate treatment and disposal of at least 8 categories of “special” wastes. eg. *[packaging]* waste oil, tyres, end-of-life vehicles, packaging, computers, batteries.

5.2.9 Plastics New Zealand

Plastics New Zealand Incorporated is an industry group which coordinates responses and initiatives to facilitate the continuing development of its membership, and the industry. Plastics New Zealand has been operating for 59 years and has employed an environmental adviser for over 10 years. PNZ has over 165 member companies; including plastics product manufacturers, recyclers and suppliers of raw materials to the industry covering over 75% of the New Zealand industry. Plastics New Zealand is based on a representative committee structure and employs three full time staff. The purpose of PNZ is to maximise the growth and success of plastics-based technology in New Zealand in an economically, socially and environmentally responsible manner.

PNZ has employed a full time environmental affairs manager since 1993. The principal purpose of this role is to assist and encourage members to operate their businesses in an environmentally responsible manner by promoting relevant standards, by-laws, legislation and best practice relating to environmental issues. Plastics New Zealand liaises with New Zealand’s government on a wide range of issues, sponsors the Plastics and Materials Processing Industry Training Organisation, coordinates industrial relations matters, and undertakes environmental research, education and communication.

The industry has dedicated substantial resources to environmental programmes over this period particularly in relation to product design, recycling, waste minimisation, hazardous substances, and energy efficiency. PNZ responds to continued public and governmental pressure to improve the environmental performance of the sector.

As a result of this research PNZ has re-examined its approach to these issues. On 27 February 2003 PNZ launched the New Zealand Plastics Sustainability Initiative. This Initiative was developed by the industry, as outlined in Chapter 1, in order to respond more proactively to external drivers for change and to better coordinate and communicate these measures with stakeholders. To date over 65 companies have formally committed to the Initiative’s five-year action plan. Appendix 7: New Zealand Plastics Sustainability

Initiative. Appendix 8: List of Signatories to the New Zealand Plastics Sustainability Initiative.

5.2.10 Recognition

Both Plastics New Zealand and the Packaging Council of New Zealand hold biennial awards that have strong environmental criteria and continue to raise the profile of sustainable product design.

5.3 Barriers to Sustainable Development

5.3.1 Resource & Cost Issues

As discussed earlier environmental issues tend to be perceived as compliance costs by New Zealand businesses. Time and money are the main reasons given by plastics companies for not working on related issues (PNZ, 2003c). The local authority survey results show evidence that New Zealand plastics manufacturers are not always well informed about the key sustainability issues the sector faces. PNZ as the industry organisation faces the task of facilitating, motivating, educating, and advising members and external stakeholders on relevant sustainable development issues. Working with individual companies is not possible with existing resources due to the high level of external stakeholder concerns that need to be responded to. The cost of consultants has proven prohibitive, especially for the small to medium sized businesses that dominate the sector. The Best Practice Programme outlined in the following chapter was specifically designed to overcome these barriers.

5.3.2 Market

Research both here and internationally shows that there is an undisputable link between economic growth and the volume of waste we produce (MfE, 2002b). OECD ministers agreed in May 2001 that; *Decoupling environmental pressures from economic growth, while continuing to satisfy human needs, requires an integrated effort addressing consumption and production patterns, including encouraging more efficient resource use* (OECD Environmental Strategy as quoted in MfE, 2002b, p.16). This is described as closing the loop on resource use and waste generation, by enclosing the cycle of recovery, production and use.

Securing market support for sustainable development is the ideal business scenario, where environmental best practice is actively reinforced and supported by the market. *Market forces are driven by the pursuit of profit and growth. When an idea is commercially successful, market forces divert ever-greater resources to replicate it and trigger a self-reinforcing cycle. Creating value – and reporting it the financial bottom line using accepted accounting and reporting approaches – drives change in business further and faster than anything else* (Gilding, 2002, p.5). Unfortunately, the reverse scenario is also true.

A New Zealand study has shown that while there is a sizeable group of consumers who say environmental issues are important, only a very small proportion buy brands with a strong environmental image (Gehrke, 2000). This is also reflected in research carried out into the purchasing decisions of European and United States retailers and consumers, that confirmed health issues, not environmental, were influencing purchasing decisions (Hume, 2003). The same study also showed that customers were not prepared to pay more for a more sustainable product.

It is hard to gauge the overall effect of consumers perceptions of plastic in social, economic and environmental terms in relation to their purchasing decisions. A European study found that paper packaging was preferred above plastics by consumers, due to its natural characteristics (Meltzer, 2003). The rapid growth of the plastics packaging industry at a global level does not reflect this finding. Consumers are strongly driven by cost savings, brands, looks and convenience. Short product life cycles and fast changing consumer choices typify our consumer society. Demographics also show that the number of people per household is diminishing. It is predicted that convenience based packaging will continue to increase on this basis (Webber, 2003).

As outlined in Chapter 3, maintaining brand value through active risk avoidance is a significant driver to reducing the level of hazardous substances used by the plastics sector. Unfortunately market experience has also shown the failure of environmentally sound plastic products. For example, the heaviest plastic component and most expensive part of roll on deodorant bottles is the roller ball. The balls are typically made of a different material, are not removable and are therefore unable to be recycled. The Mum

deodorant refill produced by Premier Plastics that alleviated this problem, reduced costs, material usage and enabled recycling proved unsuccessful on supermarket shelves (Cox, 2003).

Lack of market support for resource efficient products provides a disincentive to taking innovative action. The sad reality is that some of these failures have made manufacturers wary of trying new environmental product initiatives. Most plastic manufacturers do not sell direct to the public so ensuring that government, brand owners and retailers start redefining their purchasing policies will ensure these considerations gain more weight in the decision-making process.

The need for customer support is an issue that is common to all sectors. A 1999 survey of corporate environmental responsiveness was made of the top companies in New Zealand by turnover (College of Business, 1999). The survey found that heavier impact industries like manufacturing scored more highly than service and lighter impact sectors. A recent survey of the retail sector revealed the following comments and opinions (AEBN, 2002):

- Retailers are highly customer driven and would quickly respond to what ever their customers demanded.
- They stressed the importance of looking back up the supply chain to work with suppliers to address sustainability issues at source.
- As major companies with large buying power, they felt that NZ suppliers would listen to them and take action in response to retailer concerns.
- One retailer stated that responding to issues as a sector meant they would have bigger impacts on the major suppliers.

As evident in the studies cited above there is not yet sufficient consumer demand to drive the sustainable design of products. There is however the ability to create this change through the supply chain by engaging major brand owners, retailers and government in the development of sustainable purchasing policies. To do this there must be a defined business case or some form of competitive advantage. This is why innovation supporting sustainable design and new technologies within the plastics sector needs to be fostered.

There are already excellent examples of industry innovation being used to get around market barriers. Several products have been developed where a layer of virgin plastic has been layered over recycled material to meet customer specifications.

For example underground pipes made from HDPE (2) are usually colour coded to identify different services. Marley New Zealand Ltd recently developed a pipe with a co-extruded coloured outer layer and an inner layer of black recycled material. This enabled the use of recycled material not previously possible because of its colour limitations. Sealed Air Ltd Auckland also cites a case of a plastic coated paper product being changed to one plastic material (LDPE) so that it could be recycled at the request of the customer (Cox, 2003). This product change, which was driven by the customer, not only enabled recycling but reduced raw material costs, and therefore provided both environmental and economic benefits. Better promotion and awareness of specific sustainable development issues within the industry and with customers will increase the incidence of this sort of scenario.

Customer feedback to the plastics manufacturing sector is vital to the redesign of plastic products. Manufacturers base most of their decisions on the demands of the customer. If demands to ensure recyclability and reuse of recovered material are not supported by customers these will not succeed. A prime example of this is the purchasing practise of Councils. Manufacturers cite several Councils demanding coloured rubbish bags that prevent the use of recycled material. A black rubbish bag can be made from 100% recycled content and yet some Councils will not purchase these. Price is usually the key determining factor in material selection for manufacturers. Currently there is no financial disincentive for either consumer or supplier to change the basis for these decisions.

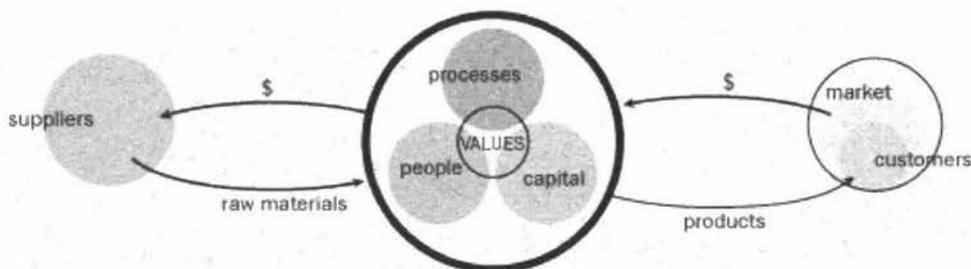


Figure 25. Interface Supply Chain Model (Anderson, 1998, p.107).

Figure 25 above shows supply chain relationships are a necessary focus point for any business considering environmental issues.

5.3.3 Conflicting Support Structures

There are currently no sustainable development programmes run for businesses at a national level, that provide the full spectrum of practical assistance required. Referring business owners and managers to Councils, BusinessCare, NZBCSD, The Natural Step, EECA and the Sustainable Business Network has been confusing for businesses. Each of these organisations has it's own specific agenda and programme and is often unable to offer the depth of support or specific resources that individual companies require.

Activities in support of sustainable business in NZ 2001	Number
Information dissemination and exchange	55
Promotion of EMS and quality labels	23
Delivery of environmental services	20
Production and manufacturing	5
Environmental business awards	5
Subsidies, loans and financial incentives	3
Other	3

Figure 26. *Activities Supporting Sustainable Business in NZ (Goldberg, 2001).*

Activities by organisation	Number
District or city council	29
Regional council	12
Central government	4
Industry organisation	22
Community association	27
Partnership organisation	14
Individual business	3
Research organisation	4

Figure 27. *Organisations Supporting Sustainable Business in NZ (Goldberg, 2001).*

A working paper on the implementation of sustainable business practices in New Zealand published in 2000 reported a lack of coordinated and subsidised advice to businesses, particularly small businesses, on the range of sustainable business practices available (Gehrke, 2000). The paper also concluded that there is a need for education reinforcing the financial gain achievable from low levels of investment in sustainable business practices. As time and cost are the principal barriers identified by businesses to becoming more proactive on sustainability issues reliance on information from multiple external sources is undesirable.

5.4 Impact of Drivers & Barriers

A combination of these factors has resulted in a strong element of scepticism or resignation towards some of the environmental issues facing the plastics sector. This is preventing individual businesses from striving towards best practice. As with all business sectors there are various pressures pushing and pulling the decisions and actions of plastic business owners and managers.

In any discussion on the sustainability plastics invariably comes up as a major concern. As mentioned above concern about plastic does not often translate into behaviour changes like purchasing decisions. For this reason, the industry faces both strong and weak drivers for change.

At a time when recyclers are competing for more material and green groups are demanding better access to recycling plastic manufacturers are compromising this by placing more unrecyclable products on the market. European trends toward the legislation of extended producer responsibility impacting on material use, identification and responsibility to take back products at the end of their lives are impacting on the industries export markets and political perceptions. With the release of the New Zealand Waste Strategy the current government has taken a much looser voluntary approach.

The focus of the industry is economic growth. The association of growth with negative consequences has become a major theme for environmentalists in the modern age (McDough & Braungart, 2002). The main drivers and barriers to sustainability within the plastics sector have been outlined above. It is obvious from the assessment that the New Zealand plastics industry, like all others, places predominant emphasis on financial gains and shareholder value. In order to progress towards sustainability there must be either a perceived competitive advantage or a minimisation of perceived risk. Given that the consumers are not yet purchasing based on their beliefs about sustainability the industry is currently more reliant on the drive to minimise risk. The voluntary approach to sustainability in the current political climate means that regulation or legislation does not actively reinforce this.

CHAPTER SIX

6.1 Creating a Sustainable New Zealand Plastics Sector

The following section outlines the development of the Plastics Sustainability Initiative (Appendix 7), to the early stages of its implementation. The Sustainable Business model developed for the sector as a result of this research is summarised in Chapter 8.

6.1.1 The Plastics Sustainability Initiative

Leadership in all sectors is critical for any significant progress to be made on sustainable development (PCE, 2002).

Liu's research into the sustainability of plastics waste found that: *nobody is taking responsibility for the generation of waste, no policies exist to encourage people involved in the life cycle of plastics to act responsibly, and no coordinator is acting to bring all participants together to work for minimisation of plastic waste* (2000, p.251).

The emphasis of the New Zealand government on a voluntary approach to sustainable development for business means that business sectors are left to define their own direction, or to risk this being determined for them by other parties. This means that this role should ideally fall on Plastics New Zealand (PNZ) as the plastics sector representative.

Historically the focus of PNZ has been the protection and promotion of the industry. The feedback gained from local authorities and recyclers, as outlined in Chapters 3 and 5, showed that this was not helping stakeholders resolve the issues they faced. Most were frustrated with the lack of support and guidance available. Many of the local authorities contacted during the survey did not even know that PNZ existed as a sector representative.

This research clearly demonstrates that recyclers, Councils, NGO's, retailers, the public and the plastics sector are not working together. Uncertainty, lack of information and strategic direction amongst these groups has resulted in uninformed decisions being made. PVC label contamination, stockpiled plastics wastes, recyclers exporting and manufacturers importing recovered material are all symptoms of this problem.

There was also the impression given by the plastic companies surveyed that they felt they were already doing as much as they could in this arena. As is evident in Chapter 3 most plastic companies are successfully dealing with the first four destinations on the sustainability journey at an informal level, with compliance established, baseline actions planned and efficiency gains and improvements realised, and significant focus continuing to be placed by the industry on the continuous improvement of operational efficiencies (Fig. 1). The next step for many of these companies requires the examination of strategic innovation and markets. The biggest barrier to initiating change at this level is the lack of support from consumers. Without the pull of potential markets, there is little incentive for plastics companies to initiate changes. Retailers have also stated they will respond to customer demand, and as research shows as this is not yet present changes are unlikely to result (AEBN, 2002, Gehrke, 2000, Hume, 2003). Recyclers similarly report an unwillingness to collect materials without a sustainable market. The result is inertia.

The general lack of enthusiasm apparent within the companies interviewed for exploring higher levels of sustainability reflected that the sector may be at risk of reaching a compliance plateau. This is a scenario predicted for businesses unless they engage in more strategic planning for sustainable development (New Business, 2003). There was also a distinct lack of strong leadership in this arena coming from within the sector. PNZ has had an Environmental Affairs Manager for over ten years and there was a growing tendency to deal with sustainability issues at this level, rather than by individual companies becoming involved.

The temptation in this situation is to continue being reactive, to continue to respond to issues as they occur, operating in a manner that maintains the status quo. As De Bono states *the usual approach to problem solving is to identify and remove the cause of the problem* (1999, p.140). In this case, the cause of the problem – unsustainable business practices by the plastics sector – is complex. Rather than becoming paralysed by analysing all the issues in these circumstances De Bono recommends that a way forward be designed (1999).

The obvious way to do this was to engage the plastics sector in the creation of a sustainable development strategy. The concept for the strategy gained support from the

PNZ National Executive Committee after the researcher presented a summary of the results from the initial phase of this research.

As a result on 10 September 2002 Plastics New Zealand facilitated a full day workshop with twenty one plastics sector representatives to formulate a sector strategy. These attendees were strategically selected, as the level of buy in, support and involvement from the sector at this stage was critical. As outlined in Chapter 1, the session was hosted by an independent facilitator, and commenced with a presentation from the Ministry for the Environment. This provided context for the day with an overview of the key environmental issues, government policies, and international performance relating to the sector. The group then identified the environmental trends and pressures they felt would increasingly impact on the sector. The final portion of the session was used to develop short, medium and long-term strategic responses.

After the workshop a draft strategy was formulated and circulated to all Plastics New Zealand members for comment. Several plastics sector meetings were also held as part of the consultative process. While the initial group who developed the strategy had been representative of the industry, there was a strong reaction to the strategy with a lot of debate and concern expressed about some aspects of the direction proposed in it. Some members of the industry felt that the sector should not risk working so closely with environmental groups and that the draft strategy was unrealistic given the inclusion of a long term goal for 100% recycling of plastic. Several key parties also objected to the inclusion of specific targets as it was felt that the government would hold the sector to these, with repercussions if they were not achieved. In retrospect, the debate provoked by the draft strategy was positive as it brought forward significant issues the research had not yet revealed.

In response to these concerns the strategy was amended, while leaving the wording as close as possible to that originally created by the industry during the workshop. The Plastics Sustainability Initiative was subsequently approved by the Plastics New Zealand National Executive Committee as a five year agenda for action. Given the reaction to the initial draft an essential concern for progressing the Initiative was the level of buy in from the sector. Rather than forcing the Initiative as an agreed industry position PNZ members were then invited to become signatories committing to the agenda for action. This

request to make a public declaration of commitment again provoked considerable discussion and debate.

Some companies felt unable to sign the commitment though they agreed with its intent. These companies mainly consisted of injection moulders who in some instances had more than 150 different clients using several different moulds and dies. For them the main barrier was the requirement to put plastics identification codes on all their products. In some instances clients would not permit these and the cost of doing retooling work was considered prohibitive by some of the smaller companies involved. The responses received at this time demonstrated high levels of integrity from the companies concerned, as they seriously considered the implications of committing to this Initiative for their businesses. As the first completed commitment forms were received by PNZ, so too were the first telephone calls from companies asking what they now had to do to meet this obligation.

On the 27th of February 2003, Helen Clark, Prime Minister of New Zealand, launched the Plastics Sustainability Initiative, and presented certificates to the first signatories. The presence of the Prime Minister at this event added to the credibility of the Initiative for the sector. As has the subsequent recognition given to the sector by the Minister for the Environment and her staff. Over 65 companies, including ten of New Zealand's largest plastic converters, have now made formal commitments to the Initiative.

The New Zealand Plastics Sustainability Initiative focuses on design; labelling; communication; education and partnerships as the mechanisms to improve environmental performance; minimise waste and increase recycling, Appendix 7. Expansion of the Initiative to involve other sectors with the support of those directly involved in purchasing decisions; educating the public and recycling, will be vital to its success.

Discussions with other industry sectors show there are a growing number of opportunities to create and expand business with products that are designed to be environmentally sustainable. Ironically this is more often being driven by the businesses themselves rather than customers. If these changes continue to gain momentum there is a major risk of losing business if plastics companies are not informed and proactive in this area. The farming, tourism, forestry and fisheries sectors are already starting to invest

significantly in sustainable development. The retail sector is also starting to respond. A simple example of how this may effect the plastics sector is in the re-evaluation of packaging. Most major multi-national companies have developed environmental policies and are now actively implementing these. A number of them are already increasing demands for recyclability in their purchasing. Major customers will increasingly demand higher levels of environmental performance from their suppliers. Adopting and implementing the Sustainability Initiative will put the plastics sector in a very strong position to take advantage of this global trend as it develops. PNZ is now developing a range of actions to implement the Initiative, which capture the need to create competitive advantage within the sector.

6.2 Implementation: The NZ Plastics Sustainability Initiative

An ultimate objective of the plastics industry is to reverse unsustainable practices to demonstrate to stakeholders that plastics play an important part in a future sustainable society (Leadbitter, 2002).



Figure 28. NZ Plastics Sustainability Initiative Projects 2003-2004.

Figure 28 above outlines key projects commenced by the New Zealand plastics industry under the Plastics Sustainability Initiative. Research conducted on the sustainability of plastic waste in New Zealand in 2000 recommended an extensive array of solutions, to mitigate the barriers to sustainable plastic waste disposal (Liu, 2000). These recommendations have been updated in Figure 29 to illustrate their current status (Adapted from Liu, 2000).

Action Recommended (2000)	Status (2003)
National organisation, with regional contacts to co-ordinate plastic waste recycling efforts at a national level and to achieve national collection and recycling targets	<ul style="list-style-type: none"> ▪ Opportunity to improve cooperation between RONZ, PacNZ, WasteMINZ, PNZ under the Packaging Accord.
National Green Programme	<ul style="list-style-type: none"> ▪ Reduce Your Rubbish www.reducerubbish.org.nz
Promote Green consumerism – endorsements, labelling,	<ul style="list-style-type: none"> ▪ Reduce Your Rubbish ▪ Environmental Choice Labelling ▪ Plastics Identification Code
Adoption of environmental best practice and sustainable design by the plastics industry	<ul style="list-style-type: none"> ▪ Best Practice Programme ▪ www.plastics.org.nz on line design guidelines ▪ PacNZ & PNZ Design Awards ▪ Packaging Code of Practice ▪ Plastics Identification Code
Eco-labelling schemes, recycling content agreements in specific plastic products, and charges/taxes on plastic products or products with plastic packaging that are non-recyclable in this country, or that use different types of materials unnecessarily,	<ul style="list-style-type: none"> ▪ Packaging Code of Practice ▪ Plastics Identification Code ▪ Environmental Choice labelling ▪ Govt3 project on government purchasing policies ▪ Packaging Accord renegotiation ▪ MfE investigating legislation for true cost landfill pricing
Mandatory collection systems and deposits on PET and HDPE containers or disposal taxes/charges on plastic waste.	<ul style="list-style-type: none"> ▪ Government / Industry investigation required ▪ Packaging Accord renegotiation ▪ 40% PET, HDPE & 25% LDPE packaging recovery targets for 2008 set by PNZ
Bans on plastics products or packaging without identification codes	<ul style="list-style-type: none"> ▪ Government / Industry investigation required
Grants/awards schemes and tax deductions or credits for research and development for design-based waste minimisation	<ul style="list-style-type: none"> ▪ Packaging Council Awards ▪ PNZ Design Awards ▪ Young Designer Awards – Plastics category ▪ Govt3 government purchasing programme
Introducing policies or provisions to encourage the establishment of materials storage facilities (MSF)	<ul style="list-style-type: none"> ▪ 90% New Zealanders now have access to recycling facilities (MfE, 2003)
Information databases or systems on plastics	<ul style="list-style-type: none"> ▪ annual production and recycling statistics now available at www.plastics.org.nz ▪ PNZ annual environmental report from 2004
Development of degradable plastic applications	<ul style="list-style-type: none"> ▪ PNZ developing industry code of practice for degradables by December 2004

Figure 29. Sustainable Management of Plastics Waste in NZ (Adapted from Liu, 2000).

6.2.1 Education

Sustainable development needs to be implemented across a complex network of places and time scales. Different types of actions work best at different levels or organisation and over varying timeframes (PCE, 2002, p.8).

Environmental education undertaken by Plastics New Zealand has to date been largely based on the intellectual strand with the provision of information, facts and figures which

describe and discuss. PNZ has produced a series of informational brochures, has a website www.plastics.org.nz and has produced an education kit for secondary school students studying under the Technology curriculum.

As discussed above the next challenge facing the plastics industry is the formalisation of environmental initiatives at an operational level and the strategic evaluation of products and markets from a sustainability perspective. Few plastics companies have formally built environmental or recyclability considerations into their company procedures for product development or design. These aspects need to influence the selection of plastic materials, how they are put together and how they are labelled. Management and design staff need to be aware, informed and able to undertake research where information is not immediately available. On a positive note this is happening informally, however it is in a very fragmented way both across the industry and within companies. At a time when recyclers are competing for more material and community groups are demanding better access to recycling some plastic manufacturers and fillers are compromising this by placing unrecyclable products on the market. This is a contradiction that needs to be alleviated through better education and communication between environmental, educational, government and industry sectors.

As outlined in section 2.4.3 (Fig.8) there are several core areas that need to be addressed to grow the capability of the industry to operate sustainably. To address these issues the following solutions are proposed:

1. **Corporate level** – through the Best Practice Programme and associated seminar series.
2. **Business Unit** - materials specific sustainable design - the creation of a course available across related industry sectors eg: plastics, electronics, homeware, is currently being investigated by PNZ to raise awareness of the applications and properties of plastics which covers sustainable design, processing, use, recycling and disposal.
3. **Operations level** – PaMPITO the plastics sector training organisation has committed to incorporating practical environmental content into existing unit standards covering relevant aspects of cleaner production and eco-efficiency practices.
4. **Stakeholder level** – regular forums with key stakeholder groups to formulate joint strategies and projects.

Plastics Industry	Training Required	Provider/Industry Organisation
Managers	<ul style="list-style-type: none"> ▪ Environmental management systems ▪ Extended producer responsibility 	<ul style="list-style-type: none"> ▪ Tertiary ▪ NZIM ▪ PNZ
Engineers	<ul style="list-style-type: none"> ▪ Sustainable design principles ▪ Material/industry specific sustainable design 	<ul style="list-style-type: none"> ▪ Tertiary ▪ Sector specific training ▪ IPENZ ▪ PNZ ▪
Designers	<ul style="list-style-type: none"> ▪ Sustainable design principles ▪ Material/industry specific sustainable design 	<ul style="list-style-type: none"> ▪ Tertiary ▪ IPENZ ▪ PNZ
Technicians	<ul style="list-style-type: none"> ▪ Eco-efficiency/cleaner production – energy & materials 	<ul style="list-style-type: none"> ▪ PaMPITO
Operators	<ul style="list-style-type: none"> ▪ Unit standards – update existing to include eco-efficiency /cleaner production 	<ul style="list-style-type: none"> ▪ PaMPITO

Figure 30. Sustainable Development Education Model for the Plastics Sector

6.2.2 Best Practice Programme

Each company needs to consider its own strengths and weaknesses and build practices that best suit their own needs. The success of best practice depends on many controllable and uncontrollable factors, many of which are unique to individual firms. It also needs to work hand-in-hand with, not substitute for, leading and innovative products and services that deliver value to customers. But best practice is likely to succeed in firms that plan, value their stakeholders, especially employees, and accept change as par for the course (Ministry of Commerce, 1999,p.140).

A study of best manufacturing practice in New Zealand conducted in 1999 by the Ministry of Commerce concluded that the development of best practice needs to be unique to the specific requirements of each firm. The Plastics Environmental Best Practice Programme was developed in recognition of this need as a major component of the industry action proposed under the Plastics Sustainability Initiative.

The programme is seen as a major opportunity to facilitate a paradigm shift in thinking and pragmatic change by creating industry specific expertise. The programme was designed to improve the uptake of sustainable development best practice in the plastics sector by developing a self-sustaining framework for change based on the findings of this research. That support is provided through PNZ as the sector organisation. Through the programme key environmental performance indicators for the sector have been identified and the focus is now on working to demonstrate and sell the business case for change, and to engage key stakeholder groups in driving environmental best practice across the industry supply chain. Appendix 10: Key Environmental Performance Indicator Survey.

The key objective of the programme is to provide a practical and effective model to create ongoing environmental improvements and foster industry leadership. The central issues the sector hopes to overcome through this project are:

- Lack of industry leadership.
- Low priority of environmental issues - other than operational efficiencies.
- Engaging those in the industry who have not previously been involved.

Participating companies have been selected to represent subsectors of the sector eg. blow moulders, film extruders, foam, thermoforming, and it is hoped these companies will in turn act as connectors within the wider industry. Use of industry leaders in the initial phase of the project will ensure the benefits of the project are promoted within through formal and informal channels. Participating businesses will continue to provide industry leadership through regular presentations on their projects at PNZ and affiliated events eg. AGMs, branch meetings, sector group meetings, affiliate member training evenings, National Executive meetings, industry design awards, and their annual PNZ conference

PNZ experience shows businesses even within the sector are very individual with their own specific needs and desires. Many are not interested in receiving guidelines or a programme in print form as it is not clear how to relate these to their particular business needs. Learning styles within the industry are typically kinetic, learning by doing, and competency based, so a project with a strong practical approach that will build the level of capacity and knowledge within the sector more effectively.

An integrated and cooperative approach is proposed where existing sustainable development models are strategically utilised and implemented through regional working groups made up of plastics sector business leaders. The focus of this programme is on:

- **Industry leadership** - the project will foster industry leaders. This will enable better industry support, buy in, and will ensure that the programme becomes self-sustaining.
- **Self-sustaining framework** - a self-sustaining framework to improve the uptake of environmental best practice in the plastics industry has been created and continues to work effectively with minimal resource requirements. There are over 400 plastic businesses in New Zealand.
- **Acceleration of change** - speeding the progress of the industry towards sustainable development through best practice will ensure it is prepared to meet market demands for resource stewardship.
- **Capacity development** - the project will provide increased capacity, as employees/business develop the knowledge and skills to respond to environmental issues and opportunities. Demographics for the Plastics Sector show employees tend to stay with firms for long periods, and if they do move, they move to other plastics companies, up the supply chain or to open their own plastics business. This dynamic will ensure an additional transfer of skills developed through the programme.

6.2.3 Monitoring, Statistics & Reporting

Sustainable development or triple bottom line reporting calls for businesses to be more transparent in nature. Customers are increasingly requiring this level of information. The full commitment of business owners and managers is essential to the ongoing adoption of sustainable development. Environmental management systems provide a useful tool for ensuring this is formalised and externally validated. It also ensures that environmental projects filter down into operational procedures and business unit responsibilities. The primary ways to drive the adoption of environmental management systems are through the supply chain, and as a strategic management or risk management tool. Independent validation of environmental measures is considered important to ensure the credibility of information provided by the industry. Many companies perceive ISO 14001 as a significant hurdle. Establishing this as an end goal through the Enviro-Mark NZ™ process has been identified as an opportunity to ensure that the small-to-medium-sized businesses that dominate the New Zealand plastics sector are confident of the steps to take.

More importantly environmental management systems require the approval of company management and ensure that environmental initiatives gain formal commitment and are approached strategically on an ongoing basis. The provision of formal systems within a company ensures that environmental projects persist after the initial enthusiasm dies.

From 2004 PNZ will publish an annual plastics sector environmental report. This will document Sustainability Initiative projects and build on existing statistical reporting at a national level. It is hoped that the sharing of results will leverage ongoing industry and stakeholder involvement and participation under the Sustainability Initiative, the Best Practice Programme and most importantly assist in gaining recognition for the efforts of businesses involved. This information will also be used to provide accurate information to local authorities and recyclers to facilitate improved decision making.

The Best Practice Programme has been utilised to trial environmental monitoring and reporting on projects at an industry-wide level. Currently, while PNZ has access to accurate statistics on production, recycling and financial business performance, it is very difficult to gauge the environmental performance of the sector from a full life cycle perspective. Other impacts such as energy use, product and site-specific environmental effects are less well documented, and this project will help to clarify and address these. These will be fed into the annual sector environmental report as industry benchmarks are established.

CHAPTER SEVEN

7.1 Case studies

To examine the sustainability of the New Zealand plastics industry from a stakeholder perspective four case studies have been examined utilising active research methodology. Active research, as outlined in Chapter 1, involves the key ingredients of research, action and participation.

The researcher has taken part in each of these groups both as an active participant and as an observer. The case studies outline work being done on sustainable development issues relating to plastics at a company, organisational and governmental level. In summary:

- Three of the case studies developed at the initiative of sector group organisations outside the plastics industry.
- Three of the case studies resulted from concern expressed about a particular kind of plastic product.

It is important to note that the areas examined have developed and continue to unfold at the initiative of independent parties.

7.1.1 Business School Partnership

In August 2001 a team of 10 employees from Cryovac Sealed Air Corporation's Hamilton site set a goal of reducing their waste to landfill by 80% within a year. Cryovac have been working closely with the Waikato Environmental Business Network, Environment Waikato, and Hamilton's Fraser High School as part of the Gateways Programme. The students from Fraser High School did a research project in 2001 to find out the actual value of waste produced on the Hamilton Sealed Air site, including the café and administration area. To do this they measured waste production, waste reprocessing and waste to landfill. The students then made recommendations about how to reduce this waste.

Sealed Air Corporation is a global manufacturer of flexible plastic products and systems for protective, presentation, and fresh food packaging in the industrial, food, and

consumer markets, with four New Zealand branches in Auckland, Hamilton, Rotorua and Wellington. Sealed Air has an Environment, Health and Safety policy that commits to continual improvement. Each employee is expected to promote these goals in their tasks, and to work towards safety and environmental excellence as an integral part of their program. This corporate philosophy has strong management support that has translated into the dedication of staff time and resources to waste minimisation.

As a result of this project Hamilton Sealed Air staff and Fraser High School students have focussed on reducing, reusing and recycling: plastics production waste; blue strapping; shrink wrap; photocopy and printer cartridges; cafe waste; paper and cardboard; adhesives; solvents and stormwater system identification and separation. Refuse costs over the first six months of 2002 dropped dramatically from \$60,000 to \$20,000. The team feels so strongly about the project that they are storing some types of waste plastic until they find a solution to enable recycling. The next step for Sealed Air is to work on these problem plastic wastes. Through the Gateway programme Hamilton's Fraser High School is continuing to work with Sealed Air staff to find alternative uses for the remaining problem wastes.

The waste minimisation project has successfully reduced waste, and saved money, more significantly it has also raised awareness over the inability to recycle or reuse several of Sealed Air's major product lines. This inability to deal with aspects of their own waste, while not able to be solved quickly, has created a desire for more sustainable design practices. This philosophy is being increasingly echoed within other Sealed Air branches and cooperation on product development at an international level provides future opportunities for the company. The major successes of this project have been:

- involving and educating the local community;
- developing staff passion and management commitment to waste reduction;
- growing technical awareness of the life cycle implications of material choices and product design, and
- re-evaluation of current products due to their lack of ability to be recycled.

7.1.2 PVC Plastic Sleeves

In 2001 the Recycling Operators of New Zealand (RONZ) raised concerns about the impacts and issues associated with a noticeable increase in the use of PVC plastic sleeve

labels. The sleeves are shrink wrapped onto bottles to provide label over the entire product surface and are predominantly made from PVC. PVC is a well-known contaminant in the PET and HDPE recycling streams. In New Zealand sleeved products are mainly used for flavoured dairy milk drink bottles normally in the 300 to 500ml serving sizes, but these are increasingly entering the energy drink and juice markets. Research into the issue was commissioned by RONZ. A formal complaint was subsequently laid with the New Zealand Packaging Council.

The RONZ report found that packaging design is driven by the perceived need for market differentiation and innovation and is used as a fundamental means to maintain or increase market share for a product.

In a competitive marketplace, design changes are considered necessary to keep products image up to date, especially in response to changes in a competitor's product. The report also stated that changes in product design invariably affect the operational parameters of recyclers.... The design, production, consumption, disposal, recycling and remanufacture of packaging needs to be viewed as an integrated whole. Decision-making at all levels should take cognisance of the requirements of others in the system (Waste Not, 2001, p.11).

Most bottle labelling is imported to New Zealand. PVC labels form the bulk of the sleeve market and are the cheapest available. Alternatives are not considered as technically effective with differing temperatures, shrink performance and colouration impacts. Stopping the use of PVC labels would have ramifications in terms of costs, time and equipment. The sleeves are also creating an adverse affect the Australian PET recycling market and have been raised as an issue there with the Australian Council of Recyclers (ACOR).

ACOR in its deliberation of this issue, emphasised the importance of getting everyone onside before going ahead with research to come up with an economic alternative, this being necessary to get buy in from label makers, and market share for any initiative (PNZ, 2003c). With major bottle manufacturers all involved there would be sufficient market push to get solutions actioned. ACOR stated it would be at least 12-18 months before an acceptable alternative was defined.

Coca Cola Amatil is the largest manufacturer of PET beverage bottles in New Zealand. They were the winner of the 2001 Packaging Council Supreme Award for 2001 and the Recovered Packaging Materials Award as the first manufacturer to incorporate recycled material within a food grade product (PNZ, 2001). Now at least 25% of each PET bottle they produce is made of recycled material. As such they are a significant buyer of recycled PET material from kerbside collections in Australia and are experiencing first hand the same PVC sleeve contamination issue raised by RONZ for New Zealand's HDPE bottles. Coca Cola emphasised the importance of getting everyone onside before going ahead with research to come up with an economic alternative (PNZ, 2003c). This being necessary to get buy in from label makers, and the market share necessary for any initiative. With major bottle manufacturers involved there would be sufficient market push to get any solutions actioned.

The delay in finding a solution means the problem continues for recyclers. Given the information being provided by Territorial Authorities in New Zealand where kerbside collections are available, a member of the public would assume that, as these sleeved bottles are either PET (1) or HDPE (2) the bottles are able to be recycled. The general public are not yet aware that there is a problem with this type of bottle. This means the process is not fully transparent and manufacturers and fillers are not being held fully accountable for their decisions. The process does however give manufacturers the opportunity to resolve the issue without jeopardising or confusing the public on the message of recycling 1 and 2 plastics. Moves by North Shore City Council to list these products as non-recyclable in their green purchasing guidelines mean this is starting to change.

The comments raised in this case study highlight the highly complex nature of plastic. The principle of Extended Producer Responsibility creates major challenges where there are a large number of participants and companies involved in the production of one product. The need to share information and cooperate between organisations and businesses both nationally and internationally has been emphasised. Lack of formal consultation and communication networks between non-governmental agencies means communication has been fragmented and haphazard at times.

Dissemination of information back to the relevant industries about the issue has been seen as critical to both Australian and New Zealand interests and the media was identified as the best way of doing this through newsletters, articles and trade publications. The Australian Packaging Covenant also funded the development and distribution of recycling design guides for beverage and food manufacturers marketing in both PET and HDPE containers. PNZ has distributed a copy of both these guides to all New Zealand PET and HDPE manufacturers.

There is now a growing level of pressure on label manufacturers to provide an alternative. PET labels are unfortunately more expensive, and require hotter temperatures to apply. There is also a problem with colour bleeding from these labels that would lead to contamination of the PET recycling stream. New Zealand's recovered PET is typically exported to China and Asia for reuse in the fibre industry. RONZ have commissioned a study to gain more technical information on the PET markets they sell into as any variations from the ACOR design recommendations which relate to Australian reprocessors are currently difficult to ascertain.

The New Zealand Code of Practice for Packaging of Goods has provided a formal avenue through which a complaint could be laid for design which breached the Code. As an international issue involving multi national companies a resolution is being sought at this level. The New Zealand Code of Practice complaint process lacks enforceability and a timeframe for resolution. A resolution is therefore highly dependent on the commitment of the parties involved. In this case a major New Zealand brand owners are impacted by this issue and have a strong interest in driving a solution as public awareness continues to grow.

7.1.3 Farm Plastic Waste

The Ministry for the Environment released a consultation document entitled the Dioxin Action Plan in 2001 (MfE, 2001a). This document proposed several policy measures aimed at reducing the emission of dioxins to air. Among the proposed measures was the introduction of a National Environmental Standard (NES) that would result in a ban on uncontrolled outdoor burning of plastic materials. The document pinpoints farm plastic waste as a source of dioxin emissions. Particular sources identified are agricultural containers and silage wrap. However as both of these are typically polyethylene, this

would be highly dependent on chlorine being present in the contents of the containers or the surrounding atmosphere.

In reaction to this document the rural sector asked the Ministry for the Environment what alternatives were going to be provided to if they were now unable to burn their waste. As a result a workshop on farm plastic waste was held on 12 February 2002. See Appendix 12: List of Farm Plastics Workshop Attendees. The workshop identified that even in areas where burning had already been banned by Regional Councils the practice was still commonplace. Most Regional Councils current rules permit on-farm land filling, including triple rinsed agrichemical containers where waste has been produced on the property.

The three key issues identified as a result of the farm plastics workshop were:

1. The disposal of unwanted agrichemicals,
2. The disposal of on-farm plastics and
3. The disposal of associated on-farm waste

The landfill census conducted by MfE does not look at rural sector waste but estimates it to stand at 10% of waste (MfE, 2000b). In rural New Zealand there are 77,000 land-based businesses, and 45,000 rural residential properties (PNZ, 2002c). Some of these have access to municipal waste streams. Feedback from rural sector groups at the initial workshop demonstrated a level of frustration with the lack of options for plastic wastes other than burning or burying.

The need to take an integrated approach to the issues of agrichemicals, farm plastics and other associated on-farm plastics was central to the formulation of a Sustainable Management Fund (SMF) grant application. Another major objective of the working party developed to progress this was that the results of the project could be integrated into other existing rural programmes. The key outcomes of this workshop were the creation of a working group to work further on the issue and the amalgamation of two existing applications for funding for the Sustainable Management Fund (SMF). The project has subsequently been granted \$340,000 SMF funding and is currently under progress (NZAET, 2002).

A willingness from growers to pay levies on their agrichemical containers to fund a collection and recycling scheme was also raised. Both Canada and Australia have systems in place. Pressure is being placed on New Zealand growers to document and audit best practice of waste management measures. There was also discussion over the logistics of looking specifically at silage or agrichemical plastic but it was concluded that as they have the same basic logistics of collection, to look at both.

Education and provision of alternative methods of disposal were identified as the obvious solutions to these problems. Bruce Emerson of Allbrite Recyclers representing RONZ discussed the key issues for plastic recyclers in looking at options for farm plastic waste (PNZ, 2003c):

- Small volume/low weight.
- Cost of collection.
- Collection system.
- Return to buyer.
- No Regional Council funding.
- Overseas programmes are adaptable.
- Reuse - refilling of containers.
- Triple rinsing to ensure agrichemical containers clean.
- Size of containers to enable reuse.

Several studies have now been completed and the first collections trials were held in November 2003. The need to take an integrated approach to the issues of agrichemicals, farm plastics and other associated on-farm plastics was central to the formulation of the SMF grant application. While the final outcome of the trials is uncertain, the project has been positive as it has: raised awareness and provided an opportunity for sharing perspectives from a broad array of sector groups from manufacturers, suppliers, the farming and horticultural communities and Councils. Information on the current status of the project can be obtained from the Ministry for the Environment.

7.1.4 Supermarket Bags

Shopping bags are a symptom of consumerism. The way in which society now operates demands low cost convenient packaging. Every person in New Zealand comes into some form of contact with plastic bags as a consumer. The lightness and durable nature of

plastic bags mean they often become a persistent and highly visible form of litter. A New Zealand campaign against plastic bags, particularly supermarket bags, gained significant political momentum during 2003. This reflected an increasing international trend responding to growing litter problems in many countries and what is conceived by many environmentalists as a blatant consumption of resources for short-term convenience.

Supermarket bags make up an estimated 0.25% of the 3.2 million tonnes of rubbish going into New Zealand landfills each year. An estimated 8,000 tonnes of supermarket bags are used in New Zealand each year, most of which are imported (PNZ, 2003c). The t-shirt bags commonly used in NZ supermarkets are around 18µm thick.

It is estimated that 80% of NZ grocery bags are being reused at least once by householders (PNZ, 2003c). The bags are commonly made from HDPE (2), which is an easily recycled material in demand in New Zealand. The main barrier to recycling supermarket bags is rubbish contamination. Recyclers cite previous experience with bag collection where shoppers were leaving paper receipts and rubbish in bags. There is as a result few plastics recyclers in New Zealand who are collecting these. These bags can be made locally using recycled plastic. To be made from 100% recycled plastic film bags need to be at least 30µm thick to maintain equivalent levels of performance.

Over a year ago Annelies Pekelharing and Cath Knight mounted a campaign against shopping bags in New Zealand. The focus of this campaign has been minimising the distribution of plastic supermarket bags, with a long-term goal of completely eliminating the distribution of plastic bags at the checkout counter. To do this they proposed that supermarkets introduce a charge (somewhere between 10 and 20 cents) per bag at the checkout counter and that they stock and actively promote reusable cloth bags made from biodegradable materials. The previous debate of paper versus plastic has not been raised. Life cycle assessments now available indicate that converting back to paper bags would increase resource use up to 15 times (PNZ, 2002c). No technical life cycle assessment information has been provided that compares the resource efficiency of plastic bags with cloth bags.

The campaign gained significant media attention, especially in Canterbury. The Zero Waste New Zealand Trust has also been a vocal campaigner. A press release issued by Zero Waste on 24 February 2003 quoted Trust chairperson Mike Morris saying "*We are trashing our planet with one trip plastics all in the name of convenience. It's waste on a colossal scale. The plastic bag problem can no longer be ignored*" (Zero Waste, 2003b). This group has stated that the New Zealand government is not regulating waste enough. Zero Waste has driven the shopping bag campaign as an opportunity to gain public support for waste levies.

On World Environment Day, June 6 2003 Green Member for Parliament Mike Ward announced a private members bill that would place a levy of up to 25c a bag (Beston, 2003). This Bill is as yet undrafted and would only proceed for consideration if successful in Parliaments ballot process.

Plastics New Zealand and Packaging Council staff had several meetings with the Retail Merchants Association in response to growing public concern about supermarket bags. These meetings revealed that the major New Zealand grocery chains and retailers saw differing solutions to the problem and would proceed with these initiatives quite rapidly. This has seen a shift to degradable bags by Foodstuffs, the introduction of a Pack Seven campaign by Progressive Enterprises, and the provision of reusable bags in several other major retail outlets.

Pac'N Save supermarkets have had bag charges in place in most stores for some time now. Anecdotal reports indicate these charges have reduced bag consumption by 80% where charges are in place (PNZ, 2002c). The levy instituted in Ireland has reported a similar reduction of 90%. The plastics sector is cynical of these reports as there has been a corresponding increase in the sale of bin liners, which supermarket bags are commonly reused for, and much heavier weight PP (5) bags.

New Zealand plastic film recyclers are concerned at the move by Foodstuffs and other retailers to a degradable plastic bag. These are a major contamination risk for the plastic film recycling industry which currently processes over 60% of plastic recycled in New Zealand (PNZ, 2002c). PNZ is currently initiating a code of practice for degradable plastic to ensure that New Zealand businesses make informed decisions (3.2.2.5). This is

needed to ensure that materials selected are appropriate for their proposed use, meet stated performance standards and suitable disposal options are in place.

Australia has experienced the same debate but with stronger political demand for action. The Australian Government has also formed an agreement with industry recently accepting the Australian Retailers Association Code of Practice for the Management of Plastic Bags (ARA, 2003). The key requirements of the Code are (ARA, 2003):

- Clear auditing and reporting on progress.
- A five-year phase out of light weight single use plastic bags containing HDPE.
- A 25% reduction in plastic bags issued by the end of 2004.
- A targeted reduction of 50% in plastic bags issued by the end of 2005,
- An increase in the recycling rate of plastic bags to 15% (in store) and to a target of 30% (combined store and kerb side) increase by the end of 2005.

Through the renegotiation of the New Zealand Packaging Accord the Ministry for the Environment has requested that a target for the reduction of shopping bags be set and met by New Zealand retailers. The reliance upon voluntary action by industry is considered preferable to regulation by the current government. Calling for action on plastic bags under the Packaged Goods Accord has been as a direct result of growing public pressure, and political interest.

7.2 Findings

A desired outcome for each of these projects was to improve the environmental impact of plastics within New Zealand. Indirect outcomes even from the early stages of each of the case studies were better levels of understanding and improved communication. Dialogue between stakeholders raised common concerns, cleared misconceptions, and new communication channels opened as information was shared and common objectives were formulated. Scrutiny of the plastics industry by external stakeholders is a strong driver for change that has created opportunities for direct changes in behaviour. The case studies clearly show that stakeholders have a major role to play in influencing the industry to act in a more sustainable manner.

CHAPTER EIGHT

8.1 Conclusion

All life is interrelated. We are all caught in an inescapable network of mutuality, tied to a single garment of destiny. Whatever affects one directly affects all indirectly.

Martin Luther King (BT, 2003, p.6).

It is argued that a quantum shift in thinking, behaviour and practices is required for industry to become sustainable. Society makes changes in a complex and integrated way. In reflection of this the case for sustainable development should be both a moral and a business one. The critical issues the plastics sector must address to become sustainable are the use of non-renewable petrochemical resources, the use of toxic or hazardous chemicals and additives, and the creation of solid waste and litter. Perhaps more damaging to the sector are people's perceptions of the industry given the scope and complexity of these issues.

Data gathered during this research clearly demonstrates that New Zealand plastics companies need to start using environmental assessment in a more systematic manner to define goals, collect data, assess impacts, control effects and communicate to their stakeholders. Environmental management systems and sustainable development reporting provide two mechanisms that will help the industry formalise existing activities.

The New Zealand plastics sector has also attained a relative compliance plateau, with the primary focus of businesses being on the continuous improvement of operational efficiencies. The surveys conducted with recyclers and local authorities showed increasing frustration with the lack of support given by the sector to considerations reflecting the full life cycle of plastic products. This requires that the sector progress to the fourth level of sustainability where strategic innovation and market advantages are leveraged and the business unit and corporate strategy levels of the business become more engaged (Fig. 1). This requires the adoption of sustainable design practices and better communication with customers, consumers and local recyclers by the sector. The primary barrier to this is in the lack of market support.

This research illustrates how existing sustainable business models can be adopted to address the levels of business strategy as demonstrated in Figure 31. There is a tendency

in existing sustainable development approaches to focus on specific areas of business practice rather than an integrated whole. Tailoring these approaches for individual companies needs specialist support until the capabilities of industry are developed to this level. The Sustainability Initiative and Best Practice Programme illustrate how sustainable development strategies can be adopted and developed to overcome the plateau that many businesses are now reaching. The Best Practice Programme is designed to operate in a manner which upskills the industry to resolve these issues. The principal role of the industry organisation is acting as an interface between the relevant government, NGO and sector groups, and as a conduit to creating opportunities to establish projects which allow innovation and market development from a sustainability perspective.

Business Strategy	Environmental Model/Tool	Education	Potential Joint Projects
1. Corporate Strategy	<ul style="list-style-type: none"> ▪ Environmental Management Systems ▪ Strategic Business Innovation ▪ SDR 	BPP	<ul style="list-style-type: none"> ▪ MED, NZTE ▪ Customers ▪ PacNZ ▪ Tertiary ▪ MfE ▪ RONZ
2. Business Unit Strategy	<ul style="list-style-type: none"> ▪ Sustainable product design (EPR, LCA) 	Materials specific course & projects	<ul style="list-style-type: none"> ▪ ERMA – HSNO ▪ Research Institutes ▪ MfE ▪ Tertiary ▪ PacNZ ▪ RONZ ▪ Local Govt NZ ▪ Customers ▪ WasteMINZ
3. Operational Strategy	<ul style="list-style-type: none"> ▪ Continuous improvement of eco-efficiency 	Unit Standards	<ul style="list-style-type: none"> ▪ MfE ▪ Other sectors

Figure 31. *Linkage of Sustainability Models to Business Strategy.*

It is not enough to establish a ‘tipping point’ within the industry – a sustainable sector is determined by more than operational efficiencies. In order for the New Zealand plastics sector to become sustainable key stakeholder groups must also support this. If an industry is not supported by clients, consumers and government it will ultimately revert to previous practices where sustainable best practices are not supported by the informal and

formal components of the market through supplier relationships and government policies. Creating a more sustainable industry is reliant on change at numerous different levels of business and community to sustain a drive towards sustainability. The case studies relating to PVC sleeves, farm plastics and supermarket bags clearly demonstrate that decision making does not occur in a linear fashion. It also demonstrates that even where clear guidelines on best environmental outcomes are generated by an industry sector these are not necessarily followed. In all three instances many of the parties were not aware of the full environmental implications of the decisions they were making.

The need to share information and cooperation between sectors, organisations, businesses and consumers both nationally and internationally is critical to the success of the plastics sectors Sustainability Initiative. Lack of formal consultation and communication networks between non-governmental and governmental agencies means communication is fragmented and often haphazard. Sectors within the business community are at differing levels of understanding and capability in terms of sustainable development.

The New Zealand plastic recycling industry when viewed at an inter-organisational level is highly fragmented. Trial and error is apparent within the decisions made by local government establishing recycling collections. There is currently no authoritative source of information or best practice guidelines on plastic recycling available for local authorities. The focus of central and local government, environmental groups and the public is on waste solutions in their policies, programmes and actions, and is of real concern to the industry. There needs to be more focus made at all these levels to support and enable positive product and service designs by raising the awareness of the impact of purchasing decisions and more formally through supply programmes and purchasing policies with other sectors. The formulation of a national strategy for plastics recycling would help overcome the current levels of inconsistency which are creating so much confusion. The New Zealand Packaged Goods Accord provides the ideal forum for this work with all the relevant sectors involved.

A major focus of PNZ in developing the New Zealand Plastics Sustainability Initiative and the Best Practice Programme has been to identify ways in which to work more co-operatively and effectively with stakeholders for the whole life cycle of plastic products. By working together with government, research-based organisations, and other sector

groups the programme will bring together a coherent and integrated approach to the problems faced. This will do much to reduce the confusion and fragmentation that currently exists.

The current political environment in New Zealand calls for voluntary action from the business community – this assumes that business has the skills, resources or abilities to define this direction. In order to assure good leadership in this area better involvement and direction is needed. As this is a cutting edge area leadership and expertise is needed which can take sustainable development theory and put it into practice in an holistic and integrated manner. This research clearly demonstrates that forging ahead towards sustainability in isolation as a business sector does not work. The New Zealand plastics sector is already encountering barriers in its relationship with major customers, local authorities and recyclers with the varying depths of information and skills within these groups. Development of the pragmatic skills necessary to make decisions informed by sustainable development are required at a macro level. Governmental support is necessary to facilitate the changes required for the business community to be actively supported by the marketplace when changes are created that adhere to sustainable best practice.

As a result of this research the New Zealand Plastics industry has established a strategy and a framework for overcoming these barriers. Under the principle of Extended Producer Responsibility major challenges face the plastics sector with the large number of materials, products, sectors, participants and companies involved. The plastics sector does have the opportunity to lead by example and to raise awareness within these sector groups. Trail-blazing is however often frustrating, expensive and time consuming, as evidenced by the earlier failure of some products. Plastics companies are in business to make money – sustainable development solutions must ultimately meet these ends. Demonstrating a clear business case, in addition to moral arguments, is a necessity. Identifying competitive advantage from sustainably designed products needs to become a focus for research and development.

There is also reluctance within the industry to lead because of the existing negative perceptions about plastic, and the perceived risk that companies will be cut down if they hold their heads up. This re-emphasises the need for stronger government leadership on

sustainable development, from an industry perspective, which focuses on product design rather than the end of pipe solutions. There has been much reference to decoupling economic growth from growing waste volumes however there has been little government input into sustainable design solutions. Waste focused solutions like recycling are good for hooking into peoples' emotions, and raising community enthusiasm, and involvement, but these may not necessarily achieve the best environmental outcomes.

Government also needs to establish political tools and waste minimisation instruments to follow up and support central waste policies, to ensure that all participants execute their roles and implement responsibilities, and to ensure good participation and collaboration among all groups (Liu, 2000). Perhaps the most vital of these for the plastics sector is the implementation of true cost pricing for landfills as set down under the New Zealand Waste Strategy.

The current government has focused on promoting the knowledge economy through technology and innovation. Support for the manufacturing industry to educate for sustainable or eco-efficient product design is lacking. Earlier reports by the Ministry for the Environment referred to the need to bed down environmental education within industry unit standards. Unit standards focus on the operational levels of a business. As shown in this research, businesses in the manufacturing are already implementing continuous improvement at operational levels. Technology and engineering design courses are currently lacking the specific material required to ensure that specific environmental issues are weighted into the decision-making process. In order to improve the sustainability of industry, training which focuses on the practical ramifications of designing sustainable products and services must now be fostered. A mandate for inclusion of such education material within both business sectors and the tertiary sector is required to address this gap. The philosophy espoused under the Waste Strategy refers to responsibility for all for the creation of waste but without the correct tools or education to make informed decisions, continuation of the status quo is likely. This will require a shift in tertiary education from the current theoretical focus to providing industrial designers and engineers with more pragmatic sustainable design skills. This weakness needs to be addressed by government for industry as a whole.

PNZ in its role as the industry representative will continue to assist and encourage members to operate their businesses in an environmentally responsible manner by promoting relevant standards, by-laws, legislation and best practice relating to environmental issues under the framework of the Plastics Sustainability Initiative and the Best Practice Programme. The Sustainability Initiative developed by the sector provides the industry with the strategic direction that was previously lacking and has identified a path which industry believes is necessary to overcome some of the barriers faced engaging all levels of the New Zealand community in taking responsibility for plastic waste.

8.2 Recommendations

Based on the above conclusions the following recommendations are made to create a sustainable plastics sector in New Zealand.

8.2.1 Government Support

- More clarity and definition of the policy and departmental linkages between economic development and sustainability which enable an integrated approach.
- Continued fostering and development of government industry partnerships, through the provision of (adapted from EPA, 2003):
 - Sector point-of-contacts.
 - Promotion of Environmental Management Systems.
 - Political and regulatory support to address sector specific impediments.
 - Co-ordination of sector level statistics and information. required for decision making by other parties.
 - Clearer linkages with existing NGO's.
 - An online toolbox or freephone facility which enables access to sustainable business resources and a framework of regional contacts.
- Adoption of sustainable purchasing policies by government.
- Programmes which facilitate sustainable purchasing policies in the private sector.
- Mandate for sustainable design education at industry and tertiary levels.
- Provision of funding and incentives for research and development of sustainable products and services.
- Development and adoption of a national strategy for post consumer plastics recycling.

8.2.2 Plastics Sector Model for Sustainable Development

- Model for Sustainable Development of the New Zealand Plastics Sector**
1. Development of sector strategy facilitated by PNZ – Plastics Sustainability Initiative.
 2. Public commitment to strategy by individual business as signatories to Initiative.
 3. Framework for capability building to assist industry in meeting Initiative targets developed - Best Practice Programme (BPP);
 - a. Participating companies chosen to represent industry subsectors.
 - b. Regional groups facilitated by PNZ.
 - c. EMS promoted to ensure long term commitment and strategic approach.
 - d. Participating companies required to submit environmental key performance indicator data and commit to completing a specific project.
 - e. Provision of supporting resources to participating companies and wider sector and stakeholders through seminars, workshops, website resources, and publications by PNZ.
 4. Fostering Sustainable Development Education:
 - a. Corporate Strategy – BPP.
 - b. Business Unit – industry specific design course.
 - c. Operations – adaptation of existing unit standards to include eco-efficiency.
 - d. Connectors, sales people, mavens – identify influential people within industry, offer specialised training eg: trainee assessors, raw materials sales staff.
 5. Partnerships:
 - a. BPP – MfE Sustainable Management Funding \$94,000 year 1.
 - b. HSNO transfer project – ERMA New Zealand and FRST.
 - c. Degradables (3.2.2.5) – Industry New Zealand and Forest Research.
 - d. Material Specific Recycling Issues – brand owners, PacNZ, RONZ, Local Government New Zealand through the Packaged Goods Accord.
 - e. Continuing to foster and develop new linkages at a business and sector level.
 6. Communication:
 - a. Environmental key performance monitoring at sector level - benchmarks.
 - b. Annual sector level environmental report.
 - c. www.plastics.org.nz.
 - d. Workshops, seminars, publications, press releases and events.

Figure 32. *Model for Sustainable Development of the New Zealand Plastics Sector*

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List of appendices:

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APPENDIX 1

PLASTICS MASS BALANCE SURVEY - 2001 PRODUCTION

Company Data

Company Name:
 Subsidiaries included in this return:
 Address:
 Responsible Officer: Contact Number:

(Please photocopy and provide one data sheet for each resin type used. A separate data sheet is also required for each product, which uses more than one resin type. **Input** data to be shown in **tones** please. **Output** data to be shown as **percentages**, of your **TOTAL INPUT**.)

Resin type (circle one) PET M/HDPE PVC-R PVCC-O PVCC-L L/LDPE PP PS EPS OTHER
 _____ (See Note 6) (O'seas source) (O'seas source) (Local Source)

Data for twelve month period ending 31 December 2001.

INPUT TONNAGE

-Virgin Resin/compound purchased and used in production. (PVC users - see note 5.) tonnes p.a.
 -If a converter of reel stock/sheet:
 Input of NZ-sourced reel stock/sheet tonnes p.a.
 Input of Overseas-sourced reel stock/sheet tonnes p.a.
 -Regrind bought in and used in production: tonnes p.a.
 -Total Input tonnes p.a.

OUTPUTS: The sum of C+D+E in any row must equal the figure in B of the same row. Eg : If B = 40%, and half of the output was directly exported and the other half consumed domestically, enter 20% in column E and 20% in column C.

OUTPUT (Please show all figs in B,C,D&E as a percentage of total production by weight)	Total
(A)	(B)
	=C+D+E
Packaging	%
Rigid : food/beverage contact	%
Rigid : non-food/beverage contact	%
Flexible films: food/beverage contact	%
Flexible films: non-food/beverage contact	%
Other packaging	%
Construction (Excl. packaging, but incl. cable)	%
Agriculture (Excluding packaging)	%
Reel Stock/Sheet	%
Housewares (Including appliances)	%
Other Products	%
Sold to Recycler	%
Sold as Recyclate	%
To Waste (Dumped)	%
Not Accounted For	%
TOTAL	100 %

Domestic NZ Use (See Note 17)	Indirect Export	Direct Export
(C)	(D)	(E)
%	%	%
%	%	%
%	%	%
%	%	%
%	%	%
%	%	%
%	%	%
%	%	%
%	%	%

IN-HOUSE RECYCLING (Including material recycled as tolling operation for company. See note 9.)

Amount tonnes p.a.

ADDITIONAL NOTES:

16. For products of **mixed resins**, circle each type used, and show percentages under relevant resins. See also Note 6.
17. Exclude product sold in New Zealand for indirect export. (This latter tonnage is to be shown in next column).

APPENDIX 2

Recyclers Survey

Method:

Telephone call to each New Zealand plastic recycler, with follow up calls if required. Introduction and explanation of reason for call followed by these questions:

Questions:

1. What type(s) of plastic are you collecting?
2. Can you please provide the tonnage for the 2002 calendar year for each type of plastic collected?
3. Is the [insert type(s) of plastic eg: PET] post consumer or post industrial material? If both can you provide a breakdown? If not, can you estimate the proportion of each?
repeat for each material type collected
4. *[If the material is post consumer] Which kerbside collections, resource recovery centres and/or areas do you collect materials from? *repeat for each material type collected*
5. *[If the material is post industrial] Which areas do you collect from? *repeat for each material type collected*
6. *Do you on sell the [insert type of plastic eg: PET]? For export/reprocessing – request tonnage for each. Who do you on sell to? *repeat for each material type collected*
7. *Do you reprocess the material? – request tonnage for each *repeat for each material type collected*
8. Are your contact details and materials accepted correct on our records? – *read listing and amend records*
9. What have been your major concerns over the last year?
10. Have market conditions impacted on your business?
11. Do you have any specific concerns that you would like PNZ to follow up on?

* These questions help avoid double counting material which has been handled by two or more plastics recycling companies through collection, sorting, baling and/or reprocessing.

APPENDIX 3

Local Authority Survey Questions

Local Authority Telephone Survey (Conducted 22-31 July 2002)

Method:

One telephone call to each local authority in New Zealand.
Introduction and explanation of reason for call followed by these questions:

Questions:

12. Who can answer questions about plastic rubbish?
13. What is plastic is collected or recycled in this District/City?
14. Or in Regions: What involvement do you have in giving advice or developing policy on plastic waste?
15. What is your main source of information on plastics?
16. What are the main issues or concerns you face now on plastics?
17. What additional information on plastic do you need?

Follow Up:

- Contact e-mail addresses from all survey participants were recorded. Any immediate queries were responded to and a copy of the Plastics Identification Code information sheet was distributed.
- Participants were added to the mailing list for the two monthly Plastics New Zealand newsletter on request.

APPENDIX 4

Survey of New Zealand Plastics Companies

1. Does your company have an Environmental Management System?
2. Do you have a written environmental policy?
3. Do you have any environmental audit process or independent accreditation?
4. Do you have any written environmental company objectives?
5. Do board or staff members have specific environmental responsibilities?
6. Has your company set any measurable environmental targets?
7. Do you consider environmental issues when dealing with your suppliers?
8. Have employees been given any environmental responsibilities or training?
9. Does your company consider the environmental impact of its products, processes and services?
10. Do you talk with any other parties about environmental issues? Who?
11. Do you have any good examples of an environmental improvement your company has made?
12. What resources or assistance can PNZ provide you with?
13. Do you have any general comments or recommendations for the plastics industry?

APPENDIX 5

List of Participants in Manufacturers & Recyclers Workshop

Morris Watson	Premier Plastics	Manufacturer injection moulder
Tony Forrest	Coca Cola Amatil	Manufacturer/recycler
Melissa Arseneault	RONZ	Sector organisation
John Webber	Packaging Council	Sector organisation
Bruce Emerson	AllBrite	Collector/trader
Steve Donnelly	FullCircle	Collector/trader
Craig Turner	Replas	Recycler
John Forbes	JJ International	Trader
Richard Muirhead	Signum Acepak	Manufacturer thermoformer
Graeme Newman	Streetsmart	Collector/trader
Mark Wheeler	Aalto Plastics	Manufacturer blowmoulder
Andrew Bush	Aalto Plastics	Manufacturer blowmoulder
Mark Lovie	Tubepack	Manufacturer extrusion
Neil van Duyan	Advanced Plastics	Recycler
Carolyn Cox	Plastics New Zealand	Industry organisation
Alistair Rowe	Plastics New Zealand	Industry organisation

APPENDIX 6

Environmental Strategy Workshop Participants

Alistair Rowe	Plastics New Zealand
Barry Bignall	Fisher & Paykel Healthcare
Carolyn Cox	Plastics New Zealand
Clive Johnston	PaMPITO
Dana Peterson	Ministry for the Environment
Don McLean	Bribros Cressey Ltd
Geoff Bickerton	Marley New Zealand Ltd
John Forbes	JJ International Ltd
John McKee	Vertex Pacific Ltd
John Price	Fisher & Paykel
John Webber	Packaging Council of New Zealand
John Kens	Astron Plastics Ltd
Mark Stuart	Viscount Plastics NZ Ltd
Mark Wheeler	Alto Plastics Ltd
Murray Sargisson	Sealed Air NZ Ltd
Owen Embling	Convex Plastics
Peter Thorne	Paper Reclaim
Rod Galantai	Galantai Plastics Group Ltd
Rod Sullivan	Chequer Packaging Ltd
Roy Graves	Clariant NZ Ltd
Terry Mischefski	Expol Ltd

APPENDIX 7

The NZ Plastics Sustainability Initiative: Agenda for action by 2008

The New Zealand Plastics Industry promoting economically, socially & environmentally responsible Plastics

<p>Industry Action</p> <ol style="list-style-type: none"> 1. Develop and implement industry training to ensure that all plastic companies are provided with the capacity to adopt waste minimisation practises including; cleaner production, design, labelling, and recyclability. 2. Sharing waste minimisation ideas and innovations between members and making it easy for good ideas to be adopted. 	<ol style="list-style-type: none"> A, We have simple and effective programmes in place for improving environmental performance. B, Where possible all our products are designed to minimise environmental impact.
<p>Company Commitment</p> <ol style="list-style-type: none"> 3. To design new products for recyclability and/or waste minimisation. 4. To label all rigid plastic products. 5. To label all printed plastic 1-6 films. 6. To educate and advise customers on product design and selection based on best sustainable development practice. 	<ol style="list-style-type: none"> C, Sustainable design forms an important part of the decision making process for manufacturers, raw material suppliers and recyclers. D, Clear identification of plastics type on New Zealand produced products. E, Our customers are making environmentally informed decisions when purchasing plastic products.
<p>Joint Projects</p> <ol style="list-style-type: none"> 7. We have a regular forum with our major customers and brand owners to develop and progress an environmental strategy for plastic product design, production and purchasing. 8. We have an annual forum with government, councils, recyclers and manufacturers to develop and progress a common strategy for plastic waste. 	<ol style="list-style-type: none"> F, We have assessed New Zealand's plastic waste stream and established which plastics should be collected for recycling. G, We have set and met waste minimisation targets and a process for measuring improvement. H, Our recovered plastics all have defined sustainable markets. I, Importers, retailers and brand owners are requesting plastics identification on all products. J, Our stakeholders; including territorial authorities, government, customers, and the public have a better understanding and contribute to industry sustainability initiatives

APPENDIX 8

List of Signatories to the New Zealand Plastics Sustainability Initiative:

ACI Plastics Packaging NZ	Acma Industries
All Brite Industries	Alto Plastics Limited
Amcor Flexibles Australasia	Amcor PET & Closures
Aotea Machinery Ltd	Aotea Plastics Industries Ltd
APS Chemicals - Gulf Culamix	Atofina (Australia) Pty Ltd
Bayer New Zealand Ltd	Blow Moulders Ltd
Bonson Industrial Ltd	Bribros Cressey Ltd
Calvert Plastics Ltd	Chemiplas NZ Ltd
Chemvin Plastics Ltd	Chequer Packaging Ltd
Ciba Specialty Chemicals Ltd	Clariant (New Zealand) Ltd
Cryovac Sealed Air (New Zealand) Ltd	Dawson Reed 1990 Ltd
Dynex Extrusions Ltd	Culamix NZ
Elastomer Products Ltd	Expol Ltd
Field International Ltd	Flight Group Ltd
Galantai Plastics Group Ltd	Gallagher Group Ltd Plastics Division
General Cable NZ	HBM (NZ) Ltd
Huhtamaki Henderson Ltd	Huhtamaki New Zealand Ltd
Huntsman Chemical Company NZ Ltd	Industrial Mouldings Ltd
Industry Training & Technology Ltd	Iplex Pipelines NZ Limited
Koolfoam Industries Ltd	Labserv Division of Biolab Scientific Ltd
Linkplas Ltd	Marley New Zealand Ltd
Master Manufacturing Ltd	Monaghan Plastics & Eng. Co Ltd
Oilless Bushes Ltd	Pacific Plastics Ltd
Picot Technologies Ltd	Plastech Industries Ltd
Polychem Marketing Ltd	Poynter Agencies Ltd
Premier Plastics Ltd	Replas New Zealand Limited
RX Plastics Ltd	Sealed Air (New Zealand)
SIGNUM AcePAK	Simaplas Ltd
Superior Plastics Ltd	Talbot Plastics Ltd
Tekplas Ltd	The Insulation Panel & Door Co Ltd
TSL Plastics Ltd	TW Petersen & Co. Ltd
Vertex Pacific Ltd	Viscount Plastics (NZ) Ltd
Visypak - PET	Whurl Plastics Ltd

APPENDIX 9

Parties Consulted in Development of the Best Practice Programme

- Ministry for the Environment
- National Association of Retail Grocers Of New Zealand
- Energy Efficiency Conservation Authority
- Land Care Research
- Business Care
- Packaging Council of New Zealand
- Ministry of Economic Development
- Sustainable Business Network
- Centre for Advanced Engineering
- Recycling Operators of New Zealand
- Department of Prime Minister and Cabinet
- Parliamentary Commissioner for the Environment

APPENDIX 10

Plastics Environmental Performance Indicator Survey

Instructions:					
1. Complete all green squares					
2. All blue squares contain formula do not alter					
3. Complete survey for calender year 2002					
4. Scores are to be allocated as follows	Yes = 3				
	Developing = 2				
	Sometimes = 1				
	No = 0				
5. Complete list of targets and actions for 2004					
1 Company details					
a. Company name					
b. Number of employees					
c. Location					
d. Process type					
e. Primary product type					
f. *Units of product					
g. *Net sales					
*This is optional but will enable greater analysis					
2 Resource Consumption					
2.1 Resin / Compound Consumption					
a. Total virgin resin / compound processed			Tonnes		
b. Total resin / compound in house regrind			Tonnes		
c. Total regrind purchased			Tonnes		
d. Total resin / compound sent to recycler			Tonnes		
e. Total resin / compound sent to landfill			Tonnes		
f. *Total resin/compound not able to be recycled in NZ			Tonnes		
g. *Specify main reason ie: technology, economics, degraded					
Total product		0	Tonnes		
2.2 Utility Management					

a. Water		m3			
Energy Consumption			GJ	Factor	Tonnes of CO2
b. Electricity		kWh	0	0.00015	0
c. Gas		GJ	0	0.0524	0
d. LPG		Kilograms	0	0.0604	0
e. Coal		Tonnes	0	0.0912	0
f. Petrol		Litres	0	0.00228	0
g. Diesel		Litres	0	0.0026	0
h. Oil (light fuel oil)		Litres	0	0.00257	0
Other					
Total energy consumption		0	GJ		
*Total CO2 emissions		0			
<i>* Based on emissions factors used by NZBCSD & Huhtamaki NZ</i>					
Hazardous Substances					
i. Total chemical usage		Tonnes			
j. Total solvent usage		Tonnes			
k. Total solvent recovered (for authorised disposal or recycling)		Tonnes			
l. Total chemical recovered (for authorised disposal or recycling)					
afterburner facilities					
VOC (solvent only)		0			
Total Waste					
l. Total solid waste to landfill (includes polymer & excludes recycled waste)		Tonnes			
m. Total recovered/recycled solid waste		Tonnes			
n. Total chemical/solvent recovered (for authorised disposal or recycling)		0			
Total waste		0			
3 Product Design & Supply Chain		Score			
a. Do you have an environmental purchasing policy?					
b. Do you have an environmental policy on product design?					
c. Do you consider the environmental impact of products?					
d. Do you advise clients on environmental impact of products?					
Total Supply Chain Performance		0			

	<i>*with material type and/or disposal instructions</i>				
4	Environmental Management Systems			Score	
a.	Do you have any form of environmental management system eg: ISO 14001, EnviroMark?				
	If yes, is it independently audited & certified?				
	If yes, please specify type				
b.	Has an environmental policy been written?				
c.	Have environmental targets & objectives been set?				
d.	Have roles & responsibilities for environmental management been set?				
e.	Do you monitor, measure and evaluate environmental performance regularly?				
f.	Environmental investments (\$) eg: <i>not new printing machine but include solvent recovery unit</i>				
	Total performance EMS				
5	Waste Minimisation Initiatives			Score	
a.	Do you monitor waste outgoings?				
b.	Have you assessed:				
	Energy				
	Materials				
	Water				
c.	Do you track reject rates?				
d.	Are targets for improvement of reject rates set and monitored?				
e.	Do you segregate waste streams?				
f.	Do you regrind waste and/or send to recycler?				
g.	Do you monitor the contents of waste skips?				
h.	Do you monitor consumption of utilities?				
i.	Do you relate consumption of utilities to production or turnover?				
j.	Do you recycle the following?				
	Cardboard				
	Paper				
	Polymers				
	Solvents				
	Water				
	Oil				
	Other				
k.	Revenue from recycled material sold				
	Total score waste Minimisation			0	

6	Environmental Performance Evaluation	Total	Bench mark	2004 Target		
	Overall score	-				
	Carbon consumption	0				
	VOC	0				
	% of Products Labelled	0%	100%			
	Waste per tonne of product					
	Energy per tonne product (GJ)					
	Total Environmental Investment	\$				
		-				
	5 key environmental areas identified for completion or action in 2004:					
1						
2						
3						
4						
5						

The Plastic Identification Code

Symbol	Type of Plastic	Properties	Common Uses	Recycled In
 PET	PET Polyethylene Terephthalate	Clear, tough, solvent resistant, barrier to gas and moisture, softens at 80°C	Soft drink and water bottles, salad domes, biscuit trays, salad dressing and peanut butter containers	Pillow and sleeping bag filling, clothing, soft drink bottles, carpet
 PE-HD	PE-HD High Density Polyethylene	Hard to semi-flexible, resistant to chemicals and moisture, waxy surface, opaque, softens at 75°C, easily coloured, processed and formed	Crinkly shopping bags, freezer bags, milk bottles, ice cream containers, juice bottles, shampoo, chemical and detergent bottles, buckets, rigid agricultural pipe, milk crates	Recycling bins, compost bins, buckets, detergent containers, posts, fencing, pipes
 PVC	PVC Unplasticised Polyvinyl Chloride PVC-U Plasticised Polyvinyl Chloride PVC-P	Strong, tough, can be clear, can be solvent welded, softens at 80°C Flexible, clear, elastic, can be solvent welded	Cosmetic containers, electrical conduit, plumbing pipes and fittings, blister packs, wall cladding, roof sheeting, bottles Garden hose, shoe soles, cable sheathing, blood bags and tubing, watch straps	Flooring, film and sheets, cables, speed bumps, packaging, binders, mud flaps and mats
 PE-LD	PE-LD Low density Polyethylene	Soft, flexible, waxy surface, translucent, softens at 70°C, scratches easily	Glad wrap, garbage bags, squeeze bottles, black irrigation tube, black mulch film, garbage bins	Rubbish bin liners, pallet sheets
 PP	PP Polypropylene	Hard but still flexible, waxy surface, softens at 140°C, translucent, withstands solvents, versatile	Dip pottles and ice cream tubs, potato chip bags, straws, microwave dishes, kettles, garden furniture, lunch boxes, blue packing tape	Pegs, bins, pipes, pallet sheets, oil funnels, car battery cases, trays
 PS	PS Polystyrene	Clear, glassy, rigid, brittle, opaque, semi-tough, softens at 95°C. Affected by fats and solvents	CD cases, plastic cutlery, imitation 'crystal glassware', low cost brittle toys, video cases	Coat hangers, coasters, white ware components, stationery trays and accessories
 PS-E	PS-E Expanded Polystyrene	Foamed, light weight, energy absorbing, heat insulating	Foamed polystyrene hot drink cups, hamburger take-away clamshells, foamed meat trays, pro-TECTIVE packaging for fragile items	
 OTHER	OTHER Letters below indicate ISO code for plastic type e.g. SAN, ABS, PC, Nylon	Includes all other resins and multi materials (e.g. laminates) Properties dependent on plastic or combination of plastics	Car parts, appliance parts, computers, electronics, water cooler bottles, packaging	Car parts, concrete aggregate, plastic timber

The Plastic Identification Code

Bottoms up! Recycling plastic is easy at work and at home



- Ring your local Council or Plastics New Zealand to find out what plastic is recycled in your area
- Most City Councils recycle PET & HDPE plastic
- We make recycling easy by coding your plastic
- Check the bottom of bottles and containers for the plastic identification code!
- Rinse
- Squash
- Remove the cap
- Put it in your recycling bin or drop off at your local resource exchange centre.

Did you know: Recyclers need more milk and soft drink bottles. Are you recycling these at home, at school, and at work?

An investment in your future

Plastics New Zealand Incorporated works to maximise the growth and success of Plastics-based technology in New Zealand in an economically, socially and environmentally responsible manner.

Our members voluntarily label their plastic products so they are easily identified for reuse and recycling.

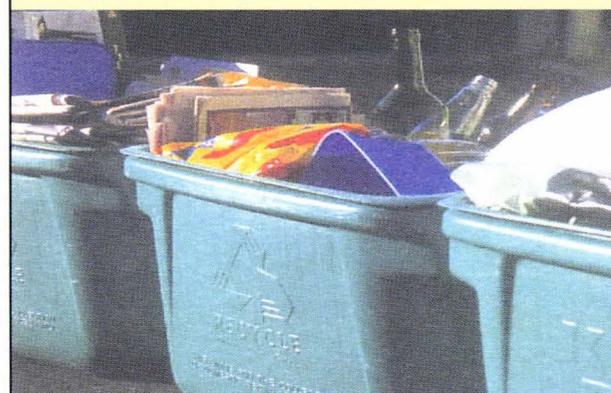
Plastics New Zealand introduced its plastic identification coding system in the early 1990s. A growing number of New Zealand towns and cities are implementing recycling schemes in an effort to reduce waste to landfills. Because these target packaging the coding system focuses on the six most common plastics. Currently, over 60% of recovered plastic comes from commercial sources.

All plastics can technically be recycled but what is being recycled varies from area to area. This is usually because of economic or volume constraints. Check with your local Council.



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NEW ZEALAND PLASTIC RECYCLING 2000

Plastic	Tonnes
1 PET	4772t
2 HDPE	5736t
3 PVC	2180t
4 LDPE	5229t
5 PP	574t
6 PS	978t
7 Industrial Film	340t
8 Other	5893t
TOTAL	26,702t

APPENDIX 12

List of Participants: Farm Plastics Waste Workshop 12 February 2002

Jack	Richardson	Agcarm
Sandy	Scarrow	Agriculture NZ
Bruce	Emerson	All Brite Industries Ltd
David	Chaston	Astron Plastics Limited
Patricia	Blutner	Auckland Regional Council
Charlotte	Rutherford	Dexcel Ltd
Phil	Smith	Donaghys Industries Ltd
Peter	Kendall	Dow Agro Sciences (NZ) Ltd
Peter	Dryden	Dow AgroSciences (NZ) Ltd
Fergie	Sumich	DuPont New Zealand
David	Hewson	Environment Canterbury
Darren	Patterson	Environment Canterbury
Gretchen	Johnston	Environment Southland
Robert	Brodnax	Environment Waikato
Ian	Futter	Farmlands
Randy	Muderewich	Federated Farmers
Kees	Hyink	Franklin District Council
Dan	Bloomer	Hawke's Bay Regional Council
John	Edwards	Integrated Packaging
Mike	Wetzler	Integrated Packaging
Neil	Miller	JAGAN Developments
John	Maber	Lincoln Ventures
Stuart	Smith	Marlborough Grape Growers Association
Simon	Buckland	Ministry for the Environment
Catherine	Moss	Ministry for the Environment
Simon	Park	Ministry for the Environment
Dana	Peterson	Ministry for the Environment
Gary	Grive	Monsanto NZ Ltd
Linda	Robertson	Monsanto NZ Ltd
Peter	Ensor	NZ Agrichemical Education Trust
Bill	Birch	NZ Chemical Industry Council
Peter	Silcock	NZ Fruitgrowers & Vegetable Growers Federation
Richard	Kemphthorne	NZ Fruitgrowers Federation
Don	Ross	NZ Landcare Trust
Mike	Butcher	NZ Pipfruit Limited
Jim	Barnett	NZDRI
John	Russell	NZDRI
John	Webber	Packaging Council NZ
Alan	Fielding	Palmerston North City Council
Carolyn	Cox	Plastics New Zealand
Sarah	Gordon	Recovered Materials Foundation
Graeme	King	Recovered Materials Foundation
Karuna	Douglas	Recycling Operators of New Zealand (RONZ)
Harry	Burkhardt	Replas New Zealand Limited
Craig	Turner	Replas New Zealand Limited
Mary-Anne	Baker	Tasman District Council
Boyne	Drummond	Tredi NZ Ltd
Ken	Robertson	Vegfed
Steve	Mead	Vertex Pacific
Mike	Safey	Waikato District Council
Graham	McBride	WAIPAC
Duncan	Wilson	Waste Not Limited
Barry	Strong	Wellington Regional Council
Bob	Martin	Zespri

Farm Plastics Waste Working Party:

Peter Ensor	Secretary NZAET	Project administration
Sandy Scarrow	Agriculture New Zealand	Project management
John Maber	Technical Consultant NZAET	Technical consultation
Robert Brodnax	Environment Waikato	Working Group
Darren Patterson	Environment Canterbury	Working Group
Ket Bradshaw	Ministry for the Environment	Working Group
Jack Richardson	AGCARM	Working Group
Peter Kendall	Dow AgroSciences	Working Group
Mike Butcher	Pipfruit NZ	Working Group
Randy Muderewich	Federated Farmers	Working Group
Bruce Emerson	AllBrite Industries	Working Group
Carolyn Cox	Plastics NZ	Working Group
Steve Mead	Vertex Pacific	Working Group