FINAL REPORT

Business and Employment Opportunities From Waste Minimisation

Prepared for

Ministry of Economic Development
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URS
NZIER
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Introduction

1.1 Background

As part of the work programme for the New Zealand Waste Strategy, the Ministry for the Environment (MfE) and the Ministry of Economic Development (MED) wish to establish more clearly the business and employment development potential associated with waste minimisation activities (for example, reuse, recycling and composting). They also wish to consider barriers that exist to realising the business and employment potential of waste minimisation, what interventions might remove, or reduce, such barriers and the likely consequences of such interventions.

URS New Zealand (URS) and the New Zealand Institute of Economic Research (NZIER) were commissioned by MED to undertake a study into the Business and Employment Opportunities associated with Waste Minimisation Activities. This study was conducted in general accordance with URS and NZIER’s joint proposal, dated 15 March 2002, which was accepted by MED on 8 April 2002.

This study is intended as an input to the implementation of the New Zealand Waste Strategy (MfE 2002), and a contribution to economic development. It is intended to help the government, councils and industry better understand the issues involved and what actions can be taken to assist the development of business and employment opportunities, while also meeting waste minimisation objectives.

1.2 Project Objectives

The principal objectives of the study are as follows:

• to assess the quantity of solid waste generated in New Zealand, including a breakdown of the waste types and potentially recyclable materials;

• to establish the types of recycling activities currently being undertaken in New Zealand, including quantities and end markets, where available. The types of activities include:
  – collection, sorting and transport activities;
  – materials processing for export;
  – materials processing within New Zealand; and
  – markets for recyclables.

• to identify business and employment opportunities associated with the above activities, particularly in those waste streams where substantial opportunities exist and where there are current information gaps;

• to identify barriers to business opportunities concentrating on barriers to growth, potential means to enhance growth and issues such as reliance on subsidies; and

• to identify priorities for policy action, including relative benefits and costs of addressing barriers and issues.
Introduction

The following waste streams have been included within the scope of this study:

- paper and cardboard;
- glass;
- steel and aluminium;
- organic wastes (including garden waste, kitchen wastes and biosolids);
- plastics;
- used oil;
- brownware; and
- construction and demolition wastes.

In addition a number of community organisations involved in a range of waste management and/or recycling activities were contacted.

1.3 Scope of Work

For the purpose of this study, waste minimisation activities are defined as those private or public activities that turn waste into a resource with an economic value and improve or maintain environmental outcomes by recovering, reusing or recycling materials that would otherwise be disposed of in landfills or other waste disposal facilities. This excludes ‘reduction at source’ measures such as alterations to production processes and redesign of products. The term “economic” specifically includes employment opportunities.

1.4 Structure of Report

The remainder of the report is structured as follows:

- Section 2 provides information on New Zealand’s solid waste stream;
- Section 3 describes the approach and methodology taken in completing this study;
- Section 4 presents the business and employment opportunities and barriers that were identified for each recyclable waste stream considered in this study; and
- Section 5 sets out the main priorities for policy actions and the study’s conclusions.

A glossary and list of abbreviations used in this report are provided in Appendix A.
2.1 Introduction

This section of the report provides an economic overview of waste management in New Zealand and background information on the New Zealand waste stream, quantities of solid waste disposed of to landfill and current recycling activities. An outline description of waste and the economy is given in Appendix F.

2.2 Economic Overview

Waste is a by-product of economic production and consumption processes. Most production processes involve the assembly of inputs and their transformation through industrial processes into outputs that are consumed either in further production (so-called intermediate consumption) or in final demand in domestic and export markets. Surplus material may be spun off as waste from industrial processes, and after consumption material products can be discarded either by disposing into landfills or incineration, or by recovery for reuse or recycling. These processes are illustrated in Figure 2-1 below.

Figure 2-1 Materials Flow

The New Zealand Waste Strategy sets out to try to change the predominant linear flow in waste generation, from materials through to useable products and disposal in landfills. This can be done by minimising the inputs required for production through more efficient industrial processes, as is the case in cleaner production technologies. Such technologies may be beneficial to producer profitability and hence economically beneficial, but decisions on their adoption are largely internalised by producers. They do not necessarily generate new opportunities for production or employment beyond the initial adoption of new technologies, and they are not the principal focus of attention in this report.

Another way to address the linear flow of materials is to change the balance of options when materials or products are discarded. Discarding materials may result in adverse effects that are external to the person responsible – by using up landfill space, generating smells and other nuisances, using up resources in collecting and transporting waste materials. If disposal is under-priced – i.e. the price per unit disposed is less than the full marginal cost per unit disposed – the rate of disposal can be economically excessive, and there is a justification for some government action to encourage greater flow into the material recovery, reuse and recycling options. To the extent that these activities are recovering materials that would
otherwise be dumped, they create opportunities for new businesses and new employment. It is these activities that are the principal focus of this report.

The New Zealand Waste Strategy identifies five core policies that form the basis for action:

• a sound legislative basis for waste minimisation and management;
• efficient pricing, that reflects the full costs of waste disposal as far as practicable;
• high environmental standards to protect the environment and public health, that will necessitate upgrade and replacement of some waste management facilities;
• adequate and accessible information; and
• efficient use of materials.

Although the New Zealand Waste Strategy is subtitled “Towards zero waste and a sustainable New Zealand”, and a number of local councils have adopted nominal zero waste targets, zero waste is unlikely to be economically attainable. Waste reduction saves resources as long as the cost of recovering and reusing materials is less than the cost of their disposal, and diminishing returns to effort apply as much to waste reduction initiatives as to other economic activities. The implication is that diverting material from the waste stream will become progressively more difficult the larger the volume diverted as a proportion of the whole.

Another implication is that the recovery of materials may not be an unambiguous gain in terms of wider economic activity, because of the interaction with other activities in the economy and the drawing of resources from other productive activity. Recovered and recycled materials are offered back into the market as inputs competing with new or virgin materials, whose production processes have historically become more efficient over time, resulting in long-term decline in prices of most raw materials. This is illustrated in Figure 2-2 below, in which demand for materials (DD) is faced by two distinct sources of supply: a supply of virgin material, for which the price is largely determined by international markets and not influenced by what New Zealand can supply, and a supply of recycled materials (Sr) which, because of diminishing returns to effort, has marginal costs rising with increasing production. Holding other things equal (like qualitative characteristics of the two sources of supply), recycled material can only cover that part of the demand for which it is cost competitive (OQr in the diagram), with the balance of the market demand (OQt-OQr) met by virgin material.

Figure 2-2  Supply and Demand for Materials
Viewed in this light, increasing the amount of recovered material or recycling requires either shifting the supply curve down, or lowering its slope. The former would be consistent with lowering the fixed costs of recycling incurred regardless of activity level; the latter with reducing the marginal cost that is variable with production level. In the long term most economic costs are variable to some degree (even buildings and equipment that are fixed in the short term), so the expansion of recycling materials depends on either improved efficiency in recycling activity, removing any impediments, market distortions or barriers that can practically be adjusted, or on a sustained improvement in the price of materials. The latter is against the long-term trend in raw material prices, so facilitating opportunities is largely a matter of identifying and removing impediments.

2.3 New Zealand Waste Stream

2.3.1 Regional Waste Disposal

There are 16 regional councils and unitary authorities in New Zealand, nine in the North Island and seven in the South Island. The table below outlines the population and refuse tonnage disposed of to landfill in each region on an annual basis. The refuse tonnages are based on:

1. tonnages/volumes received at landfills and reported in the 1998 National Landfill Census Report, and updated where additional information has been available from councils; and

2. tonnages/volumes received at landfills and cleanfills as reported by the MfE Environmental Performance Indicators (EPI) Programme.

It is acknowledged that not all landfills operating in New Zealand are included within this data. However, any landfills not included are likely to receive only small quantities of waste.
Table 2-1 Regional Population and Refuse Disposal Breakdown

<table>
<thead>
<tr>
<th>Region</th>
<th>Population</th>
<th>Refuse Tonnage 1</th>
<th>Refuse Tonnage 2</th>
<th>Average tonnage/person 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>141,600</td>
<td>70,600</td>
<td>97,806</td>
<td>0.69</td>
</tr>
<tr>
<td>Auckland</td>
<td>1,175,400</td>
<td>992,000</td>
<td>990,000</td>
<td>0.84</td>
</tr>
<tr>
<td>Waikato</td>
<td>362,000</td>
<td>201,000</td>
<td>341,050</td>
<td>0.94</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>234,000</td>
<td>202,000</td>
<td>221,649</td>
<td>0.95</td>
</tr>
<tr>
<td>Gisborne</td>
<td>46,800</td>
<td>59,000</td>
<td>21,329</td>
<td>1.26 4</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>146,400</td>
<td>102,400</td>
<td>127,388</td>
<td>0.87</td>
</tr>
<tr>
<td>Taranaki</td>
<td>107,700</td>
<td>63,000</td>
<td>77,470</td>
<td>0.72</td>
</tr>
<tr>
<td>Manawatu-Wanganui</td>
<td>232,900</td>
<td>196,700</td>
<td>184,170</td>
<td>0.79</td>
</tr>
<tr>
<td>Wellington</td>
<td>427,300</td>
<td>416,200</td>
<td>537,203</td>
<td>1.26</td>
</tr>
<tr>
<td>Nelson/Marlborough</td>
<td>119,800</td>
<td>102,500</td>
<td>85,174</td>
<td>0.71</td>
</tr>
<tr>
<td>Canterbury</td>
<td>483,900</td>
<td>322,400</td>
<td>376,282</td>
<td>0.78</td>
</tr>
<tr>
<td>West Coast</td>
<td>33,000</td>
<td>15,693</td>
<td>15,693</td>
<td>0.48</td>
</tr>
<tr>
<td>Otago</td>
<td>188,900</td>
<td>98,200</td>
<td>228,973</td>
<td>1.21</td>
</tr>
<tr>
<td>Southland</td>
<td>97,300</td>
<td>180,738</td>
<td>196,908</td>
<td>2.02</td>
</tr>
<tr>
<td>All Regions</td>
<td>3,797,000</td>
<td>3,022,431</td>
<td>3,501,095</td>
<td>0.93</td>
</tr>
</tbody>
</table>

1 Based on tonnages/volumes received at landfills reported in the 1998 Landfill Census.
2 Based on tonnages/volumes received at landfills and cleanfills as reported by the MfE Environmental Performance Indicators (EPI) Programme.
3 Based on MfE EPI Programme tonnages.
4 Based on URS tonnages.

This information indicates that four regions (Wellington, Gisborne, Otago and Southland) had average refuse disposal tonnages in excess of one kilogram per person per year at the time figures were collected. This could be due to one or more of the following factors:

- low waste disposal costs;
- lack of facilities for collection of recyclable materials;
- high transport costs to markets for recyclables;
- inclusion of cleanfill in tonnage figures collected; and
- errors in data reporting/collation (e.g. varying definitions for waste or volume/tonnage conversion factors between regions).
The West Coast had an average refuse disposal tonnage per person per year of less than 0.5 kilograms per person. This is likely due to either lack of complete information on refuse disposal quantities or refuse not being disposed of to the appropriate facilities.

### 2.3.2 Waste Stream Composition

The composition of the waste stream has been quantified in terms of the types of materials included within the scope of this study. This information has been derived from 26 territorial authorities waste analysis surveys undertaken at disposal facilities (transfer stations and landfills) between 1994 and 2000 (19 rural and 10 urban councils).

<table>
<thead>
<tr>
<th>Classification</th>
<th>New Zealand (%)</th>
<th>Urban (%)</th>
<th>Rural (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>23.7</td>
<td>24.6</td>
<td>17.1</td>
</tr>
<tr>
<td>Plastics</td>
<td>11.4</td>
<td>12</td>
<td>7.3</td>
</tr>
<tr>
<td>Glass</td>
<td>3.2</td>
<td>3.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Metals</td>
<td>8.7</td>
<td>8.9</td>
<td>7.1</td>
</tr>
<tr>
<td>Organic (including soil)</td>
<td>45.9</td>
<td>44</td>
<td>61.4</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>7.4</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Note: the above table excludes potentially hazardous waste categories in waste analysis surveys and does not include used oil. Brownware and C&D waste are included under the appropriate classifications, based on the predominant constituent material.

As the table indicates the most significant components in the New Zealand waste stream are organic wastes and paper.

The rural organic percentage is made up of approximately one third soil.

### 2.3.3 Packaging Materials Produced and Collected for Recycling

Table 2-3 below details the quantities of packaging materials produced and collected for recycling.
Table 2-3  Summary of Quantities of Packaging Materials in 2000 (all quantities are in tonnes)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Quantity Produced</th>
<th>Quantity Consumed</th>
<th>Quantity Collected</th>
<th>Collection as a % of Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>429,250</td>
<td>308,770</td>
<td>202,105</td>
<td>65%</td>
</tr>
<tr>
<td>Glass</td>
<td>112,545</td>
<td>120,810</td>
<td>50,265</td>
<td>42%</td>
</tr>
<tr>
<td>Steel Cans</td>
<td>36,985</td>
<td>28,385</td>
<td>10,750</td>
<td>39%</td>
</tr>
<tr>
<td>Aluminium Cans</td>
<td>8,035</td>
<td>6,965</td>
<td>3,450</td>
<td>50%</td>
</tr>
<tr>
<td>Plastics</td>
<td>107,895</td>
<td>117,475</td>
<td>20,810</td>
<td>18%</td>
</tr>
<tr>
<td>All Materials</td>
<td>694,710</td>
<td>582,405</td>
<td>287,380</td>
<td>49%</td>
</tr>
</tbody>
</table>

1 Includes packaging materials produced in New Zealand and exported.
2 Includes packaging materials imported into New Zealand.
Source: Packaging Council of New Zealand Inc.

This information indicates that approximately 49% of all packaging consumed within New Zealand was collected for recycling in the year 2000. This compares to 29% in 1994. The likely reason for this increase is the increase in territorial authority kerbside collection services and drop-off facilities for the collection of these materials for recycling. Since collation of these figures kerbside recycling services have been introduced by Manukau City and Papakura District councils, in the Auckland Region.

2.4  Existing Waste Minimisation Initiatives in New Zealand

2.4.1  Waste Minimisation Projects

In May 2000, Local Government New Zealand published a report titled “Waste Minimisation in New Zealand – The Results of a Preliminary Assessment of Practice and Policy”. This report stated that there is a great deal of variance in the way councils and other organisations implement the waste management hierarchy (reduce, reuse, recycle, recover and finally disposal of residue). Councils committed to zero waste by 2015 are most active in trying to prioritise and implement the entire hierarchy. It provided the following summary of waste minimisation activities.

**Reduction**

Some councils run intensive education programmes to encourage residents and businesses to reduce the amount of waste they produce. Others support businesses implementing cleaner production initiatives, either directly or through the Business Environment Networks supported by local authorities.

Business advocacy groups and non-profit organisations play a significant role in waste reduction. The Packaging Council of New Zealand coordinates a voluntary accord between the packaging industry and Government to reduce packaging waste. To date, 143 companies are council members. Member businesses redesign packaging to reduce materials used and weight. The development of lightweight
packaging and the growth of recycling over the past decade have led to the amount of packaging waste disposal volume being 42% less.

There are several networks designed to assist businesses to implement cleaner production methods as well as environmental management systems (EMS). Both types of system require businesses to integrate environmentally sustainable practices (including waste minimisation) into all parts of their business. Councils can support business to implement cleaner production or EMS through Business Environment Networks. Councils, businesses and organisations complain of a lack of national coordination among cleaner production and associated programmes. A group of 11 councils recently submitted an application to the Sustainable Management Fund to support BusinessCare, a vehicle for national networking and mentoring.

The Target Zero programme is a ‘club’ of businesses implementing cleaner production. The programme is a cleaner production joint initiative of local and central government, and industry.

Reuse

Councils and organisations can encourage reuse of waste through education and promotion, by running specialist resource reuse centres and by providing resource exchange networks. Approximately 16% of territorial authorities operate or plan to operate a waste reuse system, many in conjunction with their regional council.

Recycling

Most councils provide a recycling service (kerbside collection or recycling depot). In 1997 MfE estimated that more than 80% of the New Zealand population have access to one or more recycling schemes for paper, aluminium or glass. Recycling, using kerbside collection and recycling depots, is economically unsustainable (it costs more to provide the service than any income generated from selling recyclables). Councils provide recycling because it diverts waste from landfill, fulfils the Local Government Act requirements, and meets public demand.

Recovery

The principal form of waste recovery in New Zealand is composting of organic waste (including garden waste, food and animal products). Most territorial authorities separate green waste at landfill. Approximately ten territorial authorities are investigating or running a specific composting programme.

Effectiveness

There is limited information available on the effectiveness of waste minimisation programmes.

It is difficult to obtain accurate data on tonnage recycled because of the wide variety of collection methods and collection points recyclables are collected from households, commercial enterprises and businesses, and are collected via kerbside schemes, by waste contractors, from schools, at transfer stations and at depots at landfills.
Councills have only recently begun to monitor the amounts of waste diverted from landfill in the last two to five years. It is not possible to measure the impact of waste minimisation schemes over time because of a lack of continuous data.

**Summary**

The report provides the following summary of waste minimisation activities:

- territorial authorities, regional councils, community groups, non-profit organisations and business advocacy groups carry out waste minimisation initiatives;
- territorial authorities carry out most projects. The level of commitment to minimise waste and the associated range of initiatives varies greatly among territorial authorities;
- recycling is the most common initiative. Recycling is rarely self-funding but necessary to reduce the burden on landfills. Eighty percent of the population has access to recycling. Methods of recycling collection vary among councils;
- an increasing number of councils are introducing composting schemes to utilise organic material separated from the waste stream. At least 10 councils are currently operating or investigating composting initiatives;
- community groups play an important role in providing recycling, recovery and reuse facilities;
- very few councils run waste exchange or resource reuse centres;
- councils have very little scope to reduce waste at its sources. Waste reduction is primarily carried out by the packaging industry and by businesses implementing cleaner production or environmental management systems. Some councils are attempting to provide a coordinated approach and a support network to these businesses; and
- there is a lack of information on the effectiveness of waste minimisation initiatives. Separation of green waste and recyclables appears to contribute to 20–40% diversion from landfill.

### 2.4.2 Kerbside Recycling and Resource Re-use and Recycling Programmes

Thirty seven territorial authorities provide kerbside collection of recyclable materials to the majority of households within their district or city. Another territorial authority collects paper and cardboard from commercial areas only. Kerbside recycling collections are available to approximately 760,000 households throughout the country. Details are given in Appendix B.

Recycling facilities in the form of resource re-use and recycling, or drop-off centres at transfer stations and landfills are also available in those territorial authority areas that have kerbside recycling collections.

Of the thirty five territorial authorities that do not provide kerbside recycling collections, approximately two thirds have some resource recovery, or drop-off facilities available.
This information indicates that there is still potential for additional employment in the collection and sorting of recyclable materials from kerbside collections and materials drop-off facilities. However, these jobs would be dependent on territorial authority funding and therefore would eventuate only if the territorial authorities decide to provide new kerbside collection services or drop-off facilities.

Table 2-4 below provides an example of the quantities of materials that are recovered using kerbside recycling and resource recovery programmes. It details the quantities of material recovered through kerbside recycling and resource recovery facilities (drop-off facilities and recycling depots) in territorial authority areas in the Canterbury region.

Table 2-4  Quantities of Materials Recovered in Canterbury Territorial Authorities (all quantities are in tonnes)

<table>
<thead>
<tr>
<th></th>
<th>Kaikoura</th>
<th>Hurunui</th>
<th>Waimakariri</th>
<th>Christchurch</th>
<th>Banks Peninsula</th>
<th>Selwyn</th>
<th>Ashburton</th>
<th>Timaru</th>
<th>Waimate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerbside Population</td>
<td>2000</td>
<td>5,000</td>
<td>324,300</td>
<td>3,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerbside Recycling Households</td>
<td>671</td>
<td>1,678</td>
<td>108,826</td>
<td>1,007</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource Recovery</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>121</td>
<td>415</td>
<td>563</td>
<td>18,691</td>
<td>213</td>
<td>89</td>
<td>981</td>
<td>2,099</td>
<td>23</td>
<td>23,194</td>
</tr>
<tr>
<td>Plastic</td>
<td>26</td>
<td>65</td>
<td>63</td>
<td>899</td>
<td>4</td>
<td>3</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>1,073</td>
</tr>
<tr>
<td>Glass</td>
<td>112</td>
<td>340</td>
<td>366</td>
<td>5,942</td>
<td>217</td>
<td>144</td>
<td>414</td>
<td>38</td>
<td>7,537</td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td>39</td>
<td>65</td>
<td>49</td>
<td>857</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1,027</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>298</td>
<td>885</td>
<td>1,041</td>
<td>26,389</td>
<td>444</td>
<td>237</td>
<td>1408</td>
<td>2,142</td>
<td>23</td>
<td>32,867</td>
</tr>
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2-9
3.1 Approach and Methodology

In order to identify business and employment opportunities associated with waste minimisation activities within New Zealand the methodology outlined below was used.

3.1.1 Information Collection

Questionnaire

A questionnaire was developed to obtain business specific information relating to a number of operational, employment and financial parameters. A total of 47 questionnaires were either distributed via email or fax to a number of businesses and community organisations involved in waste minimisation activities, or used as the basis of a telephone discussion. The businesses and organisations were selected on the basis of identification by MED, contacts obtained through previous studies and referrals from others involved in the industry.

The objective of the questionnaire and discussions was to obtain information on industry perceptions of the business and employment opportunities associated with waste minimisation activities, the barriers to the realisation of these opportunities and the interventions that could potentially be made to remove these barriers.

A total of 29 responses were received. There was resistance to the participation in the study from a number of the companies contacted, including major players in the industry. This limited both the representativeness of responses in relation to business opportunities and barriers and the collation of meaningful quantitative data.

This study should not be regarded as a statistically designed survey. The information collected represents the activities and comments of those organisations, involved with the waste streams included in the study, that responded to enquiries. Therefore, the responses are considered to provide only an indication of trends within each waste stream sector.

Other Studies

A number of studies undertaken on related issues, both within New Zealand and overseas were also reviewed within the context of this study.

Information on waste minimisation activities and barriers to the realisation of business and employment opportunities for specific waste material types was not sought from other countries. A number of differences exist in the environment in respect of waste management in countries like Australia, the United States of America and parts of Europe, that would limit the validity of any direct comparison. These include:
Approach and Methodology

3. Approach and Methodology

- population size and density;
- disposal costs;
- local large scale materials processing industries;
- waste minimisation targets set through legislation or regulation;
- product stewardship legislation; and
- deposit/refund schemes.

The use of material specific information from overseas would require a level of analysis, to determine its usefulness in the New Zealand context, that is beyond the scope of this study.

3.1.2 Reporting

For ease of reporting, Section 4 has been broken down according to the waste material types included in this study, namely:

- paper and cardboard, based on two responses from five enquiries;
- glass, based on one response from four enquiries;
- steel and aluminium, based on two responses from three enquiries;
- organic wastes, based on four responses from six enquiries;
- plastics, based on three responses from six enquiries;
- used oil, based on four responses from six enquiries;
- brownware, based on four responses from five enquiries; and
- construction and demolition waste, based on three responses from four enquiries.

In addition, the study incorporated a number of community organisations, involved in waste minimisation initiatives relating to a diversity of waste materials. Six responses were received from eight enquiries.
4.1  Paper and Cardboard

4.1.1  Sector Overview

The paper recycling industry in New Zealand comprises two activities:

- paper collection and processing (sorting and baling) for on selling to paper mills in New Zealand and overseas; and
- manufacture of paper products using post consumer material as feedstock, or a portion of the feedstock.

The dominant company in paper recycling in New Zealand is Carter Holt Harvey (CHH). CHH manufactures paper products, using post consumer paper as a feedstock. Carter Holt Harvey employs approximately 75 contractors. Of those positions, between 15 and 20 have been created in the last five years. It is estimated that approximately 60% of paper collected in New Zealand is recycled by CHH, sourced from its own Paperchase operation and other paper collectors.

Paper collectors include councils, who collect newspaper and cardboard as part of kerbside recycling collections and drop off facilities and a number of independent paper collection companies, who accept paper from council collections and/or collect and process paper from their own sources.

There are over 50 grades of paper which are collected and sorted for recycling. These can generally be described in the following categories:

- newspaper;
- cardboard (old corrugated card or OCC);
- mixed paper (which includes a number of grades including office paper, magazines, printer offcuts and light cardboard (for example Weetbix boxes)); and
- office paper (which includes a number of speciality grades, but mostly white ledger).

Products manufactured in New Zealand with a recycled paper content include:

- packaging paper (including egg, kiwifruit and apple trays);
- carton board and carton board filler;
- writing paper; and
- bag paper.

Paper is an internationally traded commodity with world market prices for various grades. Therefore, the price paid for paper by New Zealand mills must reflect this market price to secure supply.
4.1.2 Business and Employment Opportunities

One respondent predicted a 4% expansion is predicted over the next five years. This expansion is anticipated to incorporate both an increase in the scale of operation, and diversification into other operations, although the nature of these proposed operations was specified as being commercially sensitive. Such expansion is supported both by internal markets (particularly own paper mills), and economies of scale associated with the existing operation.

Expansion to the degree envisaged could result in between 10 and 15 new positions in the next five years at that company.

In addition, a major appliance manufacturer indicated that there is potential to increase the recycling of cardboard packaging through take-back schemes associated with appliance sale and delivery.

4.1.3 Barriers to the Realisation of Business and Employment Opportunities

Key barriers to the expansion of existing paper recycling business include:

- foreign exchange fluctuations; and
- commodity market volatility.

Key barriers to the realisation of potential future business activities include:

- environmental impacts of processing;
- the use of non-recyclable packaging; and
- the relatively low costs of landfilling.

One respondent has subsidised collection of recyclable materials (paper and cardboard) over the years to even out commodity price cycles and maintain continuity of supply.

The overall economics of recycling was stated as a potential barrier to the establishment of new paper and cardboard recycling businesses in New Zealand.

4.1.4 Interventions

No intervention measures that may assist companies to realise potential future growth opportunities were specified by respondents.
4.2 Glass

4.2.1 Sector Overview

Glass recycling in New Zealand is dominated by ACI Glass (ACI) in Auckland. They are principal customers for cullet glass, co-ordinating recovery within designated areas. ACI send glass to Visy Recycling, an operation situated on ACI land, who process in the order of 1500 tonnes per week of glass cullet to ACI specification.

The Recovered Materials Foundation (RMF) in Christchurch operates a glass crushing facility and is currently trying to develop large-scale markets (e.g. use of crushed glass in road construction) and niche markets (e.g. glass tile manufacture) for crushed glass. Development of local markets for crushed glass would reduce the requirement for transport to the existing cullet recycling facilities in Auckland.

There are a number of small companies that wash and sterilise wine bottles for local re-use.

4.2.2 Business and Employment Opportunities

Processing of glass cullet for ACI is expected to expand in scale within the next five years, resulting in the projected addition of ten more personnel to existing operations. Current operations may also diversify into kerbside collection and handling of additional materials.

4.2.3 Barriers to the Realisation of Business and Employment Opportunities

Potential barriers to the realisation of business and employment opportunities include lack of control of the total supply chain. However, the operation included within the scope of the study was restricted to cullet processing, and was not involved in either collection or delivery.

Discussions with a number of organisations involved in collection indicate that the price paid for glass in relation to sorting and transport costs is a major impediment to the recycling of glass from areas outside of Auckland.

The presence of only one recycler is not so much a barrier as a function of the economics of glass container manufacture in New Zealand. Trying to establish such an operation outside Auckland would face the diseconomies of dispersion and transport for cullet even more acutely than those experienced in the current operation, and be uncompetitive with alternative suppliers of containers in glass and other materials.

A lack of standardisation of bottle shapes was cited as a problem for companies that wash and sterilise wine bottles for local re-use.
4.2.4 Interventions

The following intervention measures that may assist companies to realise potential future growth opportunities were identified by respondents:

- faster internal decision making in respect of capital investment; and
- assistance from central government.

4.3 Metals

4.3.1 Sector Overview

The current quantity of ferrous and non-ferrous metals collected in New Zealand for recycling in both New Zealand and overseas is estimated to be between 400,000 and 450,000 tonnes per year.

This sector is dominated by Sims Pacific Metals, who account for approximately 60% of the current New Zealand market for recyclable metals.

Metals recycling also includes the recycling of whiteware.

4.3.2 Business and Employment Opportunities

Ferrous and Non-ferrous Metals

Responding businesses predicted either no expansion or a small rate of expansion (2.5% per year over the next five years). Expansion would include an increase in the scale of existing operations in New Zealand. The expected increase in employment is in the order of between two and three people per year. The potential for diversification was also identified, although the possible nature of this diversification was not specified.

Factors supporting business success and expansion include overseas market prices for metals, volumes of material available and demand for metals.

Whiteware

The appliance manufacturer contacted operates an appliance take back programme. It currently collects appliances from the North Island only but intends expanding into the South Island. The programme relies on appliance trade-ins, that is, the old appliances are taken back when a new appliance is delivered. The majority of appliances are dismantled to recover different metals for recycling by a major metals recycling company. This programme has been in place since 1993, but has only been financially viable for the last three years.
The operation experiences peaks and troughs in terms of volume of appliances received, but expansion would improve continuity of supply.

Other factors supporting appliance recycling include support from management and staff, who perceive marketing benefits from this initiative, and a good relationship with a metals recycling company.

4.3.3 Barriers to the Realisation of Business and Employment Opportunities

Barriers to the expansion of existing metals recycling businesses include:

- transport costs (which also affects appliance recycling, given the size of appliances involved);
- world market prices and market price stability; and
- landfill costs not reflecting the true costs of disposal.

Resource management legislation and the small size of the New Zealand market were also cited as barriers to potential future business opportunities.

In respect of appliance re-use it was stated that there is a stigma attached to the use of second-hand appliances. However, there are companies that will accept appliances that are still in working condition for sale on the second-hand market.

4.3.4 Interventions

The following intervention measures, that may assist companies to realise potential future growth opportunities, were identified by respondents:

- a ban on landfilling of recyclable metals;
- a ban on landfilling of whiteware;
- the introduction of landfill levies to increase landfill disposal costs; and
- the introduction of recycling rebates for activities that result in an environmental benefit.

4.4 Organic Wastes

4.4.1 Sector Overview

In recent years a number of greenwaste (garden waste) composting operations have been established throughout the country. These range from small operations (less than 5,000 tonnes per year of greenwaste) undertaken in conjunction with other recycling operations at landfills and transfer stations to 35,000 to 45,000 tonne per year purpose designed facilities using specialised equipment in Christchurch.
and Auckland. A fully enclosed plant to compost sewage sludge and green waste is also operating in Wellington.

The majority of composting operations were started with the primary aim of diverting greenwaste from landfill disposal, and are undertaken by councils or by private companies under a contractual arrangement with councils. The notable exceptions are the Living Earth Company, part of Waste Management NZ Limited, and Perry Waste Services, which are private companies that undertake a range of activities associated with waste collection, recycling and disposal.

Even more recently a range of new organic waste recycling operations have been established using the following processes:

- worms to compost putrescible organic material (for example kitchen wastes) and sewage sludge (vermicomposting);
- vertical composting units of green waste; and
- in vessel composting systems for sewage sludge.

### 4.4.2 Business and Employment Opportunities

In general the organic waste recycling sector expects to expand in the next five years. Expansion will include an increase in the scale of traditional green waste composting operations and also diversification into new technologies and an increase in the range of organic materials processed and compost products produced, including:

- in-vessel composting systems;
- food waste composting; and
- kerbside collection of organic wastes.

Some companies expect to increase their number of employees by up to 50% over the next five years.

Factors supporting expansion include:

- demand for organic waste processing services;
- new technologies;
- expanding markets for compost products (e.g. agriculture, horticulture and viticulture in addition to domestic markets); and
- environmental awareness and positive attitudes towards recycling/composting.

One company, which undertakes a range of waste management activities, cited synergies in operations, the ability to use products from other areas of the business and the scale of the operation (enabling ease of finance and speed of decision making) as factors that contribute to success.
4.4.3 Barriers to the Realisation of Business and Employment Opportunities

A range of barriers to the realisation of potential business and employment opportunities for existing companies were identified by the respondents. These included:

- herbicide contamination and residues in green waste (e.g. clopyralid);
- transport and operating costs;
- landfill costs not reflecting the true costs of disposal;
- short term contracts;
- uncertainty in markets;
- low costs of competing compost products; and
- public perception and a lack of willingness to pay for compost products.

A number of barriers to the establishment of new companies were cited including:

- the availability of finance and resources;
- market uncertainty; and
- competition and knowledge of the market place.

4.4.4 Interventions

The following intervention measures, that may assist companies to realise potential future growth opportunities, were identified by respondents:

- public education;
- banning of the chemical clopyralid;
- a ban on landfilling of some organic wastes;
- tougher legislation – more accountability for producers of waste;
- legislation to ensure that landfill disposal costs reflect the true cost of waste disposal and prevent cheap landfills with minimal environmental controls; and
- assistance in the dissemination of information on new technologies.
4.5 Plastics

4.5.1 Sector Overview

There are a number of organisations that collect plastics for recycling, including councils, which collect plastics through kerbside recycling collections and drop off facilities and a number of independent plastic collection companies or non-profit organisations, who accept plastic from council collections and drop-off facilities and/or collect and process plastic from their own sources.

Plastics collected for recycling come from three general sources:

- industrial (post consumer);
- industrial (pre consumer); and
- residential (post consumer).

Industrial post consumer and pre consumer plastic is mostly HDPE shrinkwrap and manufacturers’ offcuts and some PET, acrylic, polycarbonate and PVC.

Residential post consumer plastics include HDPE milk bottles, PET drink bottles, HDPE janitorial bottles and containers, HDPE and polypropylene ice cream containers and ABS margarine containers.

Information from the Plastics Institute of New Zealand (PINZ) indicates that in 1996 approximately 27,000 tonnes of plastic were recycled nationwide. This included:

- 11,000 tonnes residential post consumer plastic from kerbside recycling. Most of the collection is undertaken in Auckland, Wellington, Hutt City and Christchurch, through kerbside collections. Over the rest of the country collection is generally through drop-off facilities; and
- 16,000 tonnes from in-house recycling (re-pelletising of off-spec material) and industrial post consumer plastic.

The quantity of post consumer (industrial and residential) plastics recycled had increased to nearly 27,000 tonnes in the year 2000.

As a general rule of thumb, the quantity of residential post consumer plastics collected at kerbside can be broken down as 1/3 HDPE milk, 1/3 clear PET, 1/3 other (coloured PET ice cream and margarine containers, polypropylene and HDPE janitorial bottles).

A significant proportion of the plastic recycled in New Zealand is pre consumer industrial plastic. This is manufacturer’s off-cuts or off specification products which are reground in house to be reused.

Processing of post consumer plastic comprises sorting to remove contaminants and separation into different grades and either baling, regrinding or chipping for transport.
Identification of Business and Employment Opportunities and Barriers

There is a high demand and strong competition between recyclers for PET soft drink and HDPE milk bottles from kerbside collection and film or shrink wraps from the commercial sector. Most recovered material is recycled within New Zealand, the exception being PET which is all exported, some to Australia, but most to China for use as fibre.

Examples of items that can be manufactured in New Zealand using recycled plastics (generally HDPE) include:

- cable cover fill;
- playground matting;
- transport pallet slipsheets;
- pots and buckets; and
- compost bins and worm farms.

There are several programmes and initiatives currently underway for plastics recycling. The principal ones are:

- a farm plastics waste project, which has received $300,000 funding from MfE through the Sustainable Management Fund; and
- a series of workshops with manufacturers, recyclers, marketers and labelmakers to improve communication between these groups.

### 4.5.2 Business and Employment Opportunities

In general those businesses responding expect to expand over the next five years in the following ways:

- expansion in the scale of existing businesses to service a larger geographical area, including overseas;
- an increase in volume of materials recycled, by use of new technology to increase productivity; and
- diversification of operations (e.g. extrusion process for pipe and sheets).

Expansion is supported by the large number of territorial authorities that operate kerbside collections, or alternative collection methods for recyclable materials.

### 4.5.3 Barriers to the Realisation of Business and Employment Opportunities

A range of barriers to the realisation of potential business and employment opportunities for existing companies were identified by the respondents. These included:
Identification of Business and Employment Opportunities and Barriers

• a generally held opinion that products manufactured from recycled materials should be cheaper than products manufactured from virgin materials;

• short contracts with territorial authorities which inhibit capital investment in plant and technology;

• lack of finance;

• competition; and

• lack of sustainable markets for materials.

PINZ consider the main barrier to plastic recycling in New Zealand to be the low volumes of plastic and our wide geographical spread which make many of the less used plastics uneconomic to recycle.

4.5.4 Interventions

The following intervention measures, that may assist companies to realise potential future growth opportunities, were identified by respondents:

• research and development into other uses of recycled products;

• financial assistance;

• education and increased public awareness of recycled products and uses; and

• central government intervention to ensure that:
  – all manufactures take responsibility for the products they produce; and
  – all territorial authorities operate kerbside collections for recyclable materials.

4.6 Used Oil

4.6.1 Sector Overview

Used oil is the single largest non-watery liquid waste stream in New Zealand, of which an estimated 30 million litres is generated per annum (MfE, 2000). During use, oil becomes contaminated with a number of substances that are hazardous to human health and the environment. A recent study conducted by MfE in respect of used oil recovery, reuse and disposal in New Zealand concluded that an adequate management structure does not currently exist to ensure that all used oil is used, stored or disposed of in such a way that it does not cause environmental damage or harm to human health.

The management options for used oil\(^1\) include re-refining, reprocessing and various forms of disposal, as described below. Current information (MfE, 2000) suggests that between 50 and 60 million litres of

\(^1\) Upstream activities that improve the efficiency of oil use, and therefore the rate at which oil becomes 'used' are excluded from consideration within the context of this study.
Identification of Business and Employment Opportunities and Barriers

Lubricating oil is imported into New Zealand on an annual basis, of which approximately 30 million litres of used oil is available for pick-up from:

- garages and workshops;
- industrial sites;
- service stations; and
- landfill and refuse transfer station collection points.

The largest end user of used lubricating oil in New Zealand is the Milburn New Zealand cement kiln, which burns approximately 12 million litres of untreated and reprocessed oil per year, as a supplementary fuel to coal (pers.comm. Alison Handley, April 2002). The majority of used oil received at Milburn is collected by transporters, contracted for used oil recovery through the major oil companies, and is shipped to Westport from major ports in New Zealand. Other end users include small businesses and individuals (for use in glass houses, space heaters and road oiling), asphalt plants, industry and horticultural use as fuel oil (once reprocessed), and re-use as a lubricant by industry.

Although substantial markets for used oil already exist in New Zealand and a considerable amount of used oil is collected for reuse in a number of ways, the existing markets do not ensure that all oil is collected for recovery, reuse and safe disposal. In this respect, it is estimated that a minimum of 12 million litres of used oil generated each year is unaccounted for (pers.comm. Alison Handley, April 2002), and may be disposed of to the environment in an unsafe and inappropriate manner.

A co-ordinated national collection system for used oil (the Used Oil Recovery Programme) has been in place since 1996. This programme was launched by the major oil companies operating in New Zealand, with the exception of Mobil Oil, which established its own recovery programme. The Used Oil Recovery Programme aimed to recover 50% of recoverable used oil generated in New Zealand within 12 months of establishment, and 95% by 2000, and was intended to meet the Dominion Oil Refinery’s need for used oil, with the remainder to be sent as fuel to Milburn Cement Limited (MfE 2000). However, as described below, the collection networks have not met these targets, or indeed the expectations of many of the stakeholders involved.

Although it is recognised that a potentially significant volume of used oil is applied to unpaved roads as a dust suppression in some parts of the country, the practice of road oiling is not included within the scope of this study.

4.6.2 Business and Employment Opportunities

The following potential business and employment opportunities have been identified on the basis of interviews with industry representatives, as well as a review of existing information relating to the used oil sector in New Zealand.
Identification of Business and Employment Opportunities and Barriers

**Expansion of Existing Collection and Recovery Systems**

From information obtained during the course of this study, it appears that the quantities of used oil being recovered in New Zealand have increased over the past five years, with further significant expansion projected over the next five years in respect of all operations included within the context of this study. The economic value of oil appears to be a contributory factor to this expansion, since although costs are associated with collection and processing, used oil is often available free of charge to those prepared to collect it. At the same time however, shortage of supply of used oil was identified as a potential barrier to future expansion, which all respondents attributed largely to the significant volume supplied directly to the Milburn cement kiln. In this respect, several respondents suggested that ongoing supply of used oil to Milburn would not be sustainable in the long term, due to operational and regulatory compliance constraints. However, the MfE study states that as long as Milburn continues to fulfil the conditions of its resource consent, then this will continue to represent an environmentally acceptable disposal method for used oil (MfE, 2000).

The used oil market attracts good prices, such that operations are, in general terms, commercially viable. However, respondents varied in terms of their perception of the profitability associated with used oil reprocessing. The largest operation included within the scope of this study noted, for example, that the price levied for reprocessed oil (for use as boiler fuel) is highly dependent upon the cost and availability of other forms of fuel (such as gas reticulation).

Several companies identified diversification as being the key to continued economic viability, as described below.

**Diversification**

All respondents involved in the recovery, reuse and disposal of used oil identified opportunities to diversify from their existing operations. Examples of the types of opportunities to diversity that were cited include:

- generation of power through the burning of treated oil, both to meet on-site requirements of reprocessing plant, and supply to the National Grid;
- production of bio-diesel to fuel vehicles required for used oil collection and delivery operations; and
- processing of additional used oil product grades.

Other opportunities were alluded to by several respondents, but were defined as being commercially sensitive. These include the possible purchase of proven technology to enable the large-scale recovery of used oil, the feasibility of which is currently reported to be inhibited by a shortage of supply of used oil in the market place.
Identification of Business and Employment Opportunities and Barriers

SECTION 4

4.6.3 Barriers to the Realisation of Business and Employment Opportunities

The following barriers to the realisation of business and employment opportunities were identified within the context of this study:

**Lack of Level Playing Field in Market for Used Oil**

As described above, a large proportion of the used oil that is generated in New Zealand is collected on behalf of the major oil companies through the Used Oil Recovery Programme, and is transported directly to Milburn Cement for burning as a supplementary fuel to coal. Several of the reprocessing operations contacted within the context of this study identified the shortage of supply as being the most significant constraint to future expansion of operations, with lack of certainty of supply being a factor inhibiting investment in new technologies. One respondent suggested that a system that enabled fair allocation of used oil to the market place, based on a combination of economic and environmental criteria would be desirable. In this respect, the example of the voluntary levy scheme, managed by the Rose Foundation in South Africa was cited.

At the same time, the MfE Issues and Options Report for Used Oil Recovery, Reuse and Disposal in New Zealand argues that if, for some reason, Milburn was unable to burn the large quantities of oil that it currently does, then large quantities of oil may be burned in technologies that produce far greater volumes of environmental pollutants. In this respect, the appropriateness of burning used oil at low temperatures has been the subject of significant debate (MfE, 2000).

**Limitations in Existing Used Oil Recovery Programmes**

While the major oil companies provide and pay for national networks for the collection of used oil from the service stations and large workshops to which they supply virgin oil, limitations of the recovery network were identified by all companies involved in the collection, re-use and re-processing of used oils that were contacted within the context of this study. The key issues raised were consistent with those identified within the context of the Issues and Options Report for Used Oil Recovery, Reuse and Disposal in New Zealand (MfE, 2000). In particular, the following limitations were highlighted:

- users who generate small to medium quantities of oil often experience difficulty finding outlets for collection. To some extent, a number of reprocessors have responded by providing small scale drop-off facilities, although this often attracts a charge;
- small users, or those who purchase oil from either specialist oil companies or direct importers are effectively required to pay to have their used oil collected by transporters that are part of the Used

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2 ROSE: Recovery of Oil Saves the Environment. The Rose Foundation is a non-profit company, owned by eight major oil companies in South Africa, and funded through a voluntary levy on oil sales. The foundation operates without any Government involvement.
Oil Recovery Network. Accordingly, some opt to sell or give their oil to reprocessing companies, or may burn the oil at low temperature themselves;

- some small towns and rural areas do not have access to public collection points for used oil, with companies involved in the recovery programmes having indicated a reluctance to extend the scheme or fund it to a higher level, unless all oil suppliers are sharing the costs;  

- landfill and transfer station operators who collect used oil are often required to pay to have it removed. As such, collection facilities are not available at all landfills and transfer stations;  and

- many waste oil igloos have been removed from service station forecourts, in response to the higher safety standards imposed following classification of used oil as a Class 3A Dangerous Good.

Previous studies have reported that even where access points are available, use has dropped off due to public perceptions that the Used Oil Recovery Programme is no longer in place (MfE, 2000).

Absence of Specifications for Reprocessed Fuel Oil

The degree to which oil is processed differs from one processor to another, and may differ for different types of oils was cited by several respondents as being a barrier to future expansion of the industry. For example, some processors are removing only the water fraction, while others are removing a greater number of contaminants to provide a cleaner grade of oil. This has implications in terms of the quality of product available in the market, and therefore, the perception of potential customers.

The current absence of any legal requirement for oil products to conform to particular specifications was cited by several respondents as a barrier to increasing future demand for reprocessed oil. In this respect, adoption of a fuel specification as a means of controlling the flashpoint of used oil was identified as one option for overcoming this issue. This could have the effect of ensuring that used oil does not contain contaminants with low flashpoints (such as solvents), which could in turn affect the operation and performance of burners which the reprocessed oil was intended to fuel.

The requirement to ensure a high quality product was highlighted as being key to the future growth of this industry.

Shortages of Skilled Labour

Several respondents reported that they had experienced difficulties in sourcing appropriately skilled labour. This was particularly apparent in respect of small scale reprocessors, which cited labour shortages as posing constraints to increased production.

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3 Ministry for the Environment (2000) report that the major oil companies that currently fund used oil recovery sell approximately 65% of the total amount of lubricating oil sold in New Zealand (with the remainder being sold through smaller oil companies who neither pay the cost, or shoulder obligations to promote these schemes).
SECTION 4
Identification of Business and Employment Opportunities and Barriers

Seasonal Fluctuations in Demand

Two of the small scale reprocessing operations emphasised their vulnerability to fluctuations in demand for reprocessed oil. This was attributed largely to the existing market base, which is dominated by horticultural and timber processing customers. Diversification was cited as one mechanism to reduce vulnerability to such fluctuations.

Uneven Environmental Standards for Use and Disposal

Several respondents indicated that confusion exists among used oil users, collectors, processors, as well as some regional and local councils, in terms of the ways in which used oil should be used. In terms of the burning of used oil, for example, inconsistent rules and application of rules in regional plans was identified within the context of the MfE study (MfE, 2000), and this was endorsed by feedback received from respondents included within the context of this study.

One respondent cited the protracted consenting processes associated with the Resource Management Act 1991 (RMA) as being a major constraint to future expansion.

4.6.4 Interventions

The following intervention measures that may assist companies to realise potential future growth opportunities were identified by respondents:

- strengthened collection system;
- national environmental standards;
- guidelines for use and disposal of used oil;
- fuel specification;
- accreditation of oil processors; and
- provision of consistent rules in Regional Plans (in terms of burning used oil and road oiling).

4.7 Brownware

4.7.1 Sector Overview

For the purposes of this report the term “brownware” is used to describe a wide range of electronic equipment and home appliances (excluding whiteware). Brownware includes:

- Radios, stereos and other audio equipment;
- televisions, VCRs and DVD players;
Identification of Business and Employment Opportunities and Barriers

• computers; and
• cellphones.

Given the range of products and businesses involved in the sale and re-use or recycling brownware, it was not possible to quantify the degree of business activity and recycling undertaken throughout this sector.

4.7.2 Business and Employment Opportunities

Companies contacted in this sector involved in the reuse/recycling of computer hardware ranged from those not expecting to expand their operations and those that anticipated that significant expansion over the next five years is likely. Those companies who anticipate an expansion in their business indicate that this expansion is likely to take the form of:

• broadening the range of equipment handled and recycled; and
• recycling of precious metals.

The Computer Access New Zealand (CANZ) initiative, established by the Department of Internal Affairs, enabled one company to provide 2000 computers to schools in the East Cape. The CANZ initiative is ongoing, and reportedly sets the price of used computers in the market place.

Telecommunications companies involved in the collection of mobile phone equipment for recycling overseas that were contacted in the context of this study indicated that the collection is undertaken as a customer service (marketing initiative) and is not a viable business opportunity due to restrictions on the resale of second hand mobile phones and the cost involved in recycling the constituent materials.

Factors enabling existing business to realise their future development potential were cited to include:

• the frequency with which users upgrade computers and the resulting large potential supply of computer hardware;
• high demand for computers from individuals and schools; and
• improved community awareness and the involvement of non-profit organisations (e.g. CANZ assisting in sourcing computers and co-ordinating with schools).

4.7.3 Barriers to the Realisation of Business and Employment Opportunities

A range of barriers to the realisation of potential business and employment opportunities were identified by the respondents, including:

• capital cost of equipment (e.g. granulator/sorter to enable the recycling of plastics and metals);
• transport costs;
Identification of Business and Employment Opportunities and Barriers

- sourcing quality products in bulk;
- apathy of some businesses and schools on the benefits of computer recycling;
- high expectations of individuals for the latest technologies (obsolescence); and
- cost charged by suppliers, such as Microsoft, for relicensing computers.

Companies that were not expecting to expand in the next five years indicated that the recycling of computers as a core business is not commercially viable. In order to realise the potential for expansion in this area investment in equipment that would enable the recycling of computer by-products (e.g. plastics) would be required.

4.7.4 Interventions

The following intervention measures, that may assist companies to realise potential future growth opportunities, were identified by respondents:

- territorial authority diversion of computers from the waste stream;
- a ban on landfilling of electrical goods;
- the introduction of landfill levies to increase landfill disposal costs;
- education and increased awareness; and
- the government using existing companies as authorised electronics recyclers/re-users.

4.8 Construction and Demolition Wastes

4.8.1 Sector Overview

Construction and demolition (C&D) waste includes materials typically resulting from building activities, such as:

- wood;
- wood products;
- plaster board;
- concrete;
- bricks; and
- rubble.

The majority of C&D waste produced in New Zealand currently gets disposed of to land, either to municipal solid waste landfills, C&D landfills or cleanfills (bricks, concrete and rubble only).
Identification of Business and Employment Opportunities and Barriers

There appears to be a market opportunity to develop C&D landfills, as alternative disposal sites for these materials, in areas where the disposal costs at municipal solid waste landfills are high.

A report, (“Preliminary Investigation of Construction and Demolition Waste in the Auckland Region” prepared by Project C&D (co-ordinated by the Auckland Regional Council) in July 1995) estimated that approximately 200,000 tonnes of C&D waste per year was disposed of in the Auckland Region.

4.8.2 Business and Employment Opportunities

Responding businesses predicted no expansion in their operations over the next five years and in some cases reduction in the scale of operations was thought to be likely. Accordingly, the potential for establishment of new businesses in this sector was also reported to be low.

4.8.3 Barriers to the Realisation of Business and Employment Opportunities

Respondents cited a number of factors that inhibit the expansion of existing C&D waste recycling activities and the establishment of new companies. These include:

- low quarried aggregate prices;
- low landfill disposal fees;
- no demand for, and reluctance by local authorities to use, recycled concrete;
- the development of low cost C&D and cleanfill disposal sites; and
- difficulty in getting consent for a suitable site to locate future construction and demolition recycling plant.

Concrete recycling can be done on-site or at a centralised recycling plant. The costs of concrete recycling can be recovered by charging a tipping fee and by selling the recycled concrete products. High local landfill disposal costs and a central location will help make a plant viable. Quantity of concrete crushed in Auckland is limited compared with estimated quantities of demolition material produced annually.

4.8.4 Interventions

The following intervention measures, that may assist companies to realise potential future growth opportunities, were identified by respondents:

- legislation mandating a percentage of recycled product to be used in construction;
- territorial authorities promoting the use of recycled concrete and asphalt;
- a ban on landfilling C&D wastes;
- subsidies for the recycling of C&D materials; and
Identification of Business and Employment Opportunities and Barriers

• territorial authorities identifying potential sites for future recycling plants.

4.9 Community Organisations

4.9.1 Sector Overview

The heading community organisations is used as a general description to cover the following types of organisation involved in the recycling, collection, sorting and materials resale activities:

• council recycling operations based at refuse transfer stations;
• community trusts undertaking recycling activities at council refuse transfer stations and, in some cases, operating kerbside collection schemes; and
• the Recovered Materials Foundation (RMF), set up by Christchurch City Council to market recyclables from the City Council’s operations and develop new markets and businesses associated with recycling.

Mr Warren Snow, a former trustee of the Zero Waste Trust, was also interviewed within the context of this study.

The types of materials collected and sorted for final markets within and outside New Zealand include:

• newspaper and cardboard;
• selected plastics;
• steel and aluminium cans;
• scrap metals (ferrous and non-ferrous);
• whiteware/brownware, furniture and other household items;
• green waste;
• used oil;
• glass; and
• timber, and other construction and demolition items (e.g. door, window frames).

Funding for the community organisations contacted during this study is derived from a variety of sources, including:

• council contracts;
• council grants;
• council subsidies (particularly with respect to land and buildings);
Identification of Business and Employment Opportunities and Barriers

- Zero Waste Trust;
- government subsidies (e.g. WINZ employment subsidy); and
- local community trusts.

Returns from the sale of recyclables (such as glass, plastics, paper) are highly material dependent and variable depending on market prices and costs of transport. Where an outlet for second hand goods is operated, this generally provides a significant proportion of sales revenue.

The RMF is funded from a levy on the cost of waste disposal at Christchurch City Council transfer stations.

4.9.2 Business and Employment Opportunities

All community organisations included in the study expect to undertake significant expansion, in some cases being up to 100% over the next five years.

Types of expansion that were identified include:

- increasing scale of operations, namely:
  - increase in tonnages of paper, cardboard, plastics, glass processed, including increasing facility size; and
  - expansion into new local and overseas markets;
- diversification of operations including into:
  - kerbside collections,
  - native tree nurseries,
  - mini skip businesses,
  - plastics granulation plant/more high tech processing,
  - green waste composting,
  - tenders for district refuse collection and sorting, and
  - new types of materials (such as plastic chemical drums, farm plastics).

The projected number of new full time jobs over the next five years ranged from two to five employees, which in some cases would represent a 100% increase in current employment base.

The community organisations contacted consider themselves to be successful, with this success being attributable to the following:

- large population growth within isolated areas (such as Wanaka);
- good publicity and community education programmes;
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- competitive prices for second hand goods;
- business planning;
- council endorsement; and
- enthusiastic and knowledgeable employees.

A number of factors were identified to support future expansion, these included:

- growth in population and waste collection catchments;
- expansion in Zero Waste initiatives by councils, including flexibility in existing and future contracts;
- sustained and expanding demand for second hand materials;
- reduction in materials sent to landfill;
- community participation (such as schools, rotary clubs); and
- capital support from external sources.

A range of potential future opportunities were identified for other businesses to utilise materials sourced by existing community organisations. These recycling businesses generally rely on local sourcing of materials and local markets (or the development of local markets), which avoids some of the costs associated with transport. These include:

- glass crushing;
- wine bottle sterilisation;
- fertiliser production; and
- biogas production.

The establishment of Waste Exchange Databases was identified as one potential mechanism for facilitating the increased use of materials sourced from waste transfer stations and waste generators.

Resource recovery parks were cited as being the heart of any community’s waste management system. These facilities which collect both recyclable materials and used items for re-sale are said to provide instant waste reduction results, while creating large numbers of jobs and a new ecology of resource recovery.

4.9.3 Barriers to the Realisation of Business and Employment Opportunities

A number of factors potentially inhibiting the realisation of future business opportunities were identified by community organisations contacted. Competition with councils for long term collection and recycling contracts was identified as a barrier by the majority of respondents. In this respect, existing council
refuse collection contracts do not require the separation of recyclable materials, which results in a proportion of materials being transferred directly to landfill.

The small size of the New Zealand market for recyclable materials was cited as a major barrier to future expansion by many respondents. As such, the industry is highly dependent upon world commodity markets.

Expansion into new operations is also inhibited by a lack of development finance to fund research and development, as well as capital equipment.

Development of new recycling opportunities can be hindered by material supply issues, which relate predominantly to continuity of supply of quality materials. This makes it especially difficult to set up businesses in rural areas, where material quantities are low and transportation costs are proportionately higher.

The lack of skilled labour was cited by several respondents as being a barrier to the realisation of future growth opportunities. Business acumen and planning skills have also been cited as a major barrier to the success of new businesses.

While community organisations appear to be developing successful recycling operations and anticipate significant expansion over the next five years, such organisations have tended in the past to have a limited life span. In many cases, these depend upon a small number of highly motivated and enthusiastic individuals. One respondent stated that such people-focused organisations tend to falter due to the loss of key individuals.

4.9.4 Interventions

The following intervention measures, that may assist community organisations to realise potential future growth opportunities, were identified by respondents:

- subsidised transport costs for remote/rural areas (especially for materials like glass where the only processing facility is in Auckland);
- phasing out of long term refuse collection contracts that have no requirement for recycling;
- availability of grants or loans at low interest to help with initial development of new business initiatives;
- recognition of recycling as an industry;
- a ban on landfilled of certain materials;
- sponsored work programmes to overcome lack of labour;
- processing plants in areas other than Auckland;
- refund schemes for recyclable materials (e.g. bottles);
Identification of Business and Employment Opportunities and Barriers

- central government to promotion of waste minimisation and recycling; and
- education and awareness.

4.10 General Themes

4.10.1 Previous Studies

Survey of Recycling Businesses in the Auckland Region

In October 1998, Waste Not Limited (with support from the Auckland Regional Council, Community and Employment Group, Manukau City Council, Recycling Operators of New Zealand and Zero Waste New Zealand) published a report “Survey of Recycling Businesses in the Auckland Region”. Summary details of the survey are contained in Appendix C.

The survey had 80 respondents and found that:

- 64 Auckland based recycling businesses, collect a total of about 641,000 tonnes of material for reuse and recycling per year;
- 69% of recyclable materials collected were post-consumer materials;
- 71% of recycling businesses in operation today in the Auckland region started less than 20 years ago.

In respect of obstacles to business growth the survey found that generally a combination of more than one obstacle prevents growth. Forty percent of respondents found that a lack of markets was an obstacle to growth. Prime obstacles for 30% of respondents were a lack of economic supply of materials and, for 25%, limited access to capital.

Secondary obstacles included environmental regulations (some recycling businesses claimed to be suffering from legislation such as the RMA) (20% of respondents), cash flow (14%), technical limitations (13%), land use and zoning (11%) and lack of trained workers (10%).

Lack of stable markets for recycled materials has historically been the major constraint on the industry and it is notable that local markets, which are less volatile than commodity prices, now form the base of the industry. The survey stated that development and diversification of these local markets is key for the future of the industry.

In respect of obstacles to financing expansion, 50% of respondents felt that there were no obstacles in raising capital to finance their expansion. The remaining half had come across obstacles which included 19% who had found that potential investors thought the markets were unproven, while a further 13% found that their lack of collateral was the chief obstacle to gaining finance for any expansion.
The Economics of Waste Management and Recycling

In July 1999 the New Zealand Institute of Economic Research and Woodward-Clyde (NZ) Ltd prepared a report on “The Economics of Waste Management and Recycling in New Zealand”, for the MfE Sustainable Management Fund. A summary of the key findings from the report is set out below.

Waste management is an industry with a large local government involvement, partly for historical reasons but more particularly for legislative requirements under the Health Act 1956, which gives councils responsibility for waste collection in their territories. But it is also an industry with an increasing private sector involvement, both as contractors providing council-funded services and more recently as providers of collection and landfill services used by a number of councils.

The recycling industry within New Zealand is diverse, difficult to quantify and portrays varying characteristics according to materials collected. There is strong, unassisted private sector involvement in recycling of metals, and more intermittently of paper and glass, all of which materials may be used as feedstock for large, vertically integrated industries situated in the North Island. Plastics recycling has a more variable record, with no dominant local producers and most material destined for export. Export markets provide benchmark prices for most materials, and are the dominant destination for materials collected in the South Island because of internal transport costs.

A number of councils run recycling schemes, concentrating on post-consumer waste in which materials for collection are dispersed, low volume and often contaminated by mixed materials. Most commercial interest is in industrial waste, yielding volumes which are larger, less dispersed and less likely to be contaminated. A recent development is the emergence of large scale recycling of greenwaste for compost, often involving co-operation between councils diverting waste from their landfills, and production and marketing of compost by commercial concerns.

The principal incentives for recycling are market prices for recovered materials, the public relations benefit of recycling items which are not strictly worthwhile, and, for the local government sector, the reduction in costs of landfill depletion. Principal barriers are transport costs for what are often low value high volume materials, and distorted incentives, such as that caused by landfill charges set at less than full cost. Principal strengths are the existence of private operators able to exploit opportunities which arise. However, there are also inconsistencies such as councils simultaneously holding waste minimisation objectives while encouraging refuse volume increases by other means, for instance by under-pricing landfills by subsidising gate fees out of rates.

The report outlines some possible future directions including:

- providing information and co-ordination to reduce the inconsistencies across and between council practices;
- improving recognition of the social benefit of recycling in saving landfill costs;
- disseminating information on recycling costs and benefits reflecting the volume of landfill space likely to be saved; and
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- removal of impediments that remain for those operations which are successfully recycling materials without explicit assistance, while recognising that there are some impediments, such as international price volatility, on which no action can be taken.

4.10.2 This Study

Based on the limited information available, this study of businesses and community organisations involved in waste minimisation activities identified a number of themes common to two or more of the sectors surveyed.

Business and Employment Opportunities

With the exception of construction and demolition, all sectors surveyed expect some expansion over the next five years. The degree of expansion for the traditional recycling sectors (i.e. metals, paper, plastics, glass) is relatively low (less than 5%, and in line with the general forecast for economic growth). This likely reflects the established nature of the market for these sectors and the reliance on world commodity market prices. Given the current quantities of these materials already recycled and infrastructural issues (e.g. the concentration of processing/recycling facilities in Auckland and transport costs) the scope for significant increases in material volumes recycled and therefore expansion in business and employment, is limited.

There appears to be potential for significant expansion in the processing of organic wastes (up to 50% over five years for some companies). The key factors supporting this expansion include:

- local materials sourcing, processing and product sale, which reduces the potential limiting costs and effects of transport;
- demand for organic waste processing services to reduce waste requiring landfill disposal;
- new technologies, that enable the processing of more putrescible wastes (e.g. kitchen wastes and sewage sludge) in addition to green waste; and
- expanding markets for compost products.

Community organisations undertaking recycling activities at council refuse transfer stations, resource recovery parks and, in some cases, operating kerbside collection schemes, expect to undertake significant expansion and increased employment opportunities. The scale of expected expansion is up to 100% over the next five years. The key factors supporting this expansion include:

- the relatively new nature of this type of business/organisation;
- local materials sourcing, processing, product sale and sale of second-hand items, which reduces the potential limiting costs and effects of transport;
- minimal requirement for expensive processing plant; and
- availability of funding from:
Identification of Business and Employment Opportunities and Barriers

- territorial authorities, in the form of contracts and subsidies on land and buildings;
- government agencies, in the form of employment and other subsidies; and
- grants from a number of community focussed agencies (e.g., community trusts, Zero Waste Trust).

In many cases community organisations receive a significant portion of their income from contracts to undertake waste management activities in addition to resource recovery, reuse or recycling. These include the operation of landfills, transfer stations and refuse collection contracts.

Where recycling is undertaken as an adjunct to a company’s existing core business, it is considered to have more chance of success. A number of respondents cited the difficulties in starting up a new recycling business. These difficulties relate primarily to lack of business acumen, market knowledge and finance (where capital is required for processing equipment). With an existing business, start-up costs are avoided and the necessary business acumen and market knowledge already exists. Recycling operations and research and development can be supported by the businesses’ core activities. In some cases businesses will also operate take-back schemes predominantly as a marketing exercise, or customer service. The types of recycling operations undertaken in these cases tend to relate to specialised materials or products and niche markets.

The C&D sector expected the scale of operations to remain the same or contract over the next five years. The primary reasons for this appear to be the low costs of disposal at some municipal solid waste landfills, C&D waste landfills, or other low cost disposal sites and the low price of competing aggregate products.

**Barriers to the Realisation of Business and Employment Opportunities**

The following were identified as the common barriers to the realisation of opportunities:

- foreign exchange fluctuations and commodity market volatility;
- low costs of landfilling;
- transport costs;
- capital cost of equipment;
- availability of finance;
- short term contracts which inhibit capital investment;
- limited markets development of markets; and
- lack of continuity of material supply, in terms of quantity and quality.

The most common theme with respect to barriers appears to be limited markets for most recyclable materials, coupled with high transport costs. There is a predominance of high volume/low value commodity materials, prone to price volatility. In cases where the value of materials is relatively high
Identification of Business and Employment Opportunities and Barriers

(e.g. metals) or large volumes of materials are available within a short distance of processing facilities (e.g. paper in Auckland), businesses have been operating viably for some time and are expected to continue to do so.

Interventions

The following were identified as the common intervention measures, that may assist in the realisation of future growth opportunities:

• a ban on the landfilling of recyclable materials;
• landfill levies to increase disposal costs;
• rebates on recyclable items;
• education; and
• financial assistance.

Summary

Table 4-1 overpage summarises the barriers to the realisation of business and employment opportunities and interventions considered necessary in respect of each sector included in this study.

This table summarises the key barriers and interventions identified by those involved in the particular material sectors. As such it reflects specific industry preoccupations, not a comprehensive pattern of issues and remedies from an economy-wide perspective. It may also reflect a degree of topicality. For instance, apart from metals, the sectors that identify landfill levies, material disposal bans and financial assistance as potential interventions are different from those that identify low disposal costs as a problem, although all these proposed interventions have the same aim of diverting more material away from landfills.
### Table 4-1 Summary of Barriers and Interventions by Sector, as Reported by Respondents

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<th>Plastics</th>
<th>Used Oil</th>
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5.1 Introduction

The identification of priorities for policy action has been addressed by the NZIER through a commonly used framework for policy analysis, entailing assessment of opportunities and barriers in light of stated policy objectives for waste minimisation and economic development. This involved the development and application of a set of criteria by which business and employment opportunities could be compared at a general level.

5.2 Identification of Business Opportunities

5.2.1 General Characteristics

Types of Recycling Business Opportunities Found Overseas

Because business opportunities are driven by economic considerations, the types and combinations of recycling activity in each country are likely to vary according to local characteristics of demographics, resource availability, production and consumption patterns. This means that what works in one country need not necessarily make economic sense in another. There will be greater incentive to adopt capital intensive processes that substitute for land and labour where these other resources are scarce and more expensive than in countries where they are relatively abundant and cheap.

Nevertheless the bulk of recycling business in New Zealand at present is in activities that are also common in other developed countries, e.g. recycling of scrap metal, paper, greenwaste, glass and plastics. For instance, a 1998 study from the United States Environmental Protection Agency (USEPA) notes rising recycling in aluminum, paper and particularly the steel industry, where mini-mills using recycled feedstock have grown rapidly whilst traditional integrated mills using virgin ores have declined (USEPA, 1998). Similarly, a study that uses an input-output model of the Iowa state economy to estimate the direct and indirect impacts of recycling notes particular activity in that state’s aluminum, paper and plastics industries (R W Beck, Inc and Ames Economic Associates, 2001).

While the USEPA study simply enumerates the size of recycling industries and why they may be significant to the economy as a whole, the Iowa study uses its input-output model and a recyclable material balance model to project economic impacts by commodity type and calculates change in quantities recycled over time, as a basis for making recommendations for further assisting recycling activities. It compares economic multipliers to determine which commodities generate the most income and create the most jobs when recycled, and makes recommendations such as a state-wide landfill disposal ban on old corrugated card and wood waste to increase supply of these materials. The methods used, although sophisticated, are questionable for identifying overall economic development implications. For instance, multiplier analysis does not explicitly account for changes in prices or factor costs that can arise when one sector is boosted to the exclusion of others, and the report recommends a subsidy to increase supply of old corrugated card to reverse a short term cyclical decline caused by weak prices. The
Identification of Priorities for Policy Actions and Conclusions

The report illustrates that other countries may be more pro-active in boosting recycling industries but it does not demonstrate that this provides value for money, or that New Zealand could afford to follow such a course.

Such economic impact and multiplier analysis could be undertaken for New Zealand from the national inter-industry table. However, there are many practical difficulties in doing so due to the small size of the waste management sector in the national economy and the need to disentangle the recycled component from larger commodity-based sectors. Such an exercise is beyond the scope of this current study.

5.2.2 Costs and Benefits of Business Opportunities

Identification of Costs and Benefits

The economic benefits of realising business opportunities in recovering material from the waste stream comprise the net proceeds from recyclables, plus the value of savings in landfill space depletion. The net proceeds comprise the sale proceeds from domestic and export sales of recycled material, less the costs of labour, depreciation, indirect taxes paid and intermediate consumption of inputs. The net proceeds are the recycling activity’s operating surplus, which for sustainable business needs to be sufficient to provide a return on capital employed and provision for new investment.

The full opportunity cost of all inputs must be covered by the net proceeds for the activity to be economically worthwhile. For a number of current recycling activities this does not appear to be the case. Some treat voluntary labour as a resource with almost zero cost; some receive subsidies, such as the use of facilities at zero cost, or grants towards operating expenses. Such subsidies can be justifiable if less than the value of landfill space saved, but it is not clear that they are all provided on that basis. Only labour that was previously unemployed has a zero opportunity cost from a community perspective. When those otherwise employed are drawn into subsidised recycling operations, there is a risk of diverting them from other, more productive activity.

There is some possibility of displacement effects between recycled materials and virgin materials, that simply diverts business between material suppliers rather than creating new business. For instance, construction material recycling could displace new quarrying production. This is unlikely to be significant until recycling becomes large and will not be inefficient if any subsidy is confined to justifiable levels. If it does become significant, then displacing imported product may still be beneficial but displacing local product is more ambiguous.

The USEPA study examines macro-economic effects of recycling businesses, such as the value of their output, their employment and their relative growth compared to other sectors (USEPA, 1998). It identifies four reasons why recycling and remanufacturing industries are important from a macro-economic perspective:

- they directly employ individuals and supply valuable materials to downstream industries;
- they are high growth industries;
Identification of Priorities for Policy Actions and Conclusions

- they lower energy and municipal solid waste disposal costs; and
- by lowering costs, they have improved the competitive position of some domestic industries.

These attributes need to be interpreted with caution and cannot be directly taken as “benefits” from recycling. Producing something valuable from what was once waste is a benefit as long as the value exceeds the opportunity cost of all the inputs used in production. That value in turn depends on there being downstream industries and markets ready to take them and on the materials being competitive on price and quality.

Employment may be considered a benefit but it is really an input into the production process whose benefit is subsumed in the value of output. It is only unambiguously beneficial to the extent that labour is as productive in recycling as it would be elsewhere. This condition holds where recycling businesses pay the full opportunity cost of their labour but is questionable where they depend on subsidised labour or volunteers. Volunteers may give freely of their time but some of them at least may be more productive working overtime and investing the proceeds in some other activity.

The potential for high growth from recycling activities is a desirable attribute for regional and economic development. However, many such activities are starting from a low base, so high growth will not necessarily translate into large absolute increases in production or associated employment.

Comparison of the energy saving from recycling against use of virgin materials needs to be interpreted with some caution because unless there is serious mis-pricing of input resources in the economy, energy costs will be fully reflected in the relative prices for recycled and virgin material. Virgin material may be more energy-intensive per tonne produced and recycled material more labour-intensive but as long as all inputs are fully costed, energy saving cannot be claimed to be an additional benefit. This can be illustrated with a simple example of a virgin material on the market at $50/tonne and an equivalent recycled material that can be brought to market at $55/tonne. As both prices are set to cover the respective costs of production, on this analysis the virgin material is preferable, even though it may have a higher energy content in production. But if there is also an external benefit from recycling of $5/tonne or more – such as a saving in landfill costs not covered in prices – recycled material can be competitive with virgin material if it is credited with this external benefit.

The above example draws distinction between landfill space savings, which can be a legitimate benefit from recycling, and energy cost savings which are internal to the respective production processes. It also illustrates the risks of focusing on single-resource issues (such as energy saved, jobs created) as measures of economic desirability. The key economic consideration is the return from various combinations of all resources, which are reflected in market prices or adjusted market prices if there are known and correctable market distortions.

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4 In principle, fully costed landfill charges would also be internalised in the cost of recycling, but this may not always be the case. For instance, if a business faces a $30/tonne landfill cost but instead pays a recycler $25/tonne to remove its discarded material, the landfill saving is $5 more than the value the recycler gets out of taking the waste. If landfill charges do not cover full costs, it is likely that discard choices will be distorted and the landfill operator will be receiving waste whose marginal cost of disposal exceeds its marginal receipts.
Identification of Priorities for Policy Actions and Conclusions

The fourth source of economic importance for recycling, that of lowered costs and improved competitiveness for domestic industries, is valid but varies with the particular circumstances of each recycled material. While some businesses may save input costs by using recycled inputs, for others the material savings may be too small to offset differences in quality or reliability of supply of the recycled material.

Where recycled materials struggle to be cost competitive with virgin materials, as seems to be the case for many New Zealand operations, there are unlikely to be large savings in material input costs for downstream industries. The principal benefits of recycling lie in the net returns from materials plus any savings in landfill depletion. This landfill depletion component is internalised where waste generators pay the marginal cost of disposal avoided to recyclers for the removal of their waste material, but if landfill disposal is under-priced the saving can be externalised and may warrant a subsidy.

5.3 Barriers to Realisation of Business Opportunities

Recyclers have indicated a range of barriers to realising business opportunities. These can be divided between “intractable” obstacles, that relate to the characteristics of their operations and the markets in which they operate, and “tractable” obstacles that are more amenable to potential remedy through policy response. Any barrier can be considered “tractable” if enough effort and resources are put into making it so, but for some the costs of changing can become so high as to be prohibitive. For instance, volatile prices can be remedied through price stabilisation schemes, but these entail cross-subsidising operations in low price periods out of surpluses gained during high price periods, and may distort incentives for choosing the mix of activities that maximises long term return. Social values expressed through political processes may support some level of cross-subsidisation, but these do not change the fundamental resource use implications reflected in economic costs. The distinction between intractable and tractable obstacles is based primarily on these economic considerations.

5.3.1 Intractable Obstacles to Realising Business Opportunities

Costs of Collection, Handling, Sorting and Transport Services

As in previous studies, the costs of collection, handling, sorting, storing and transporting recovered materials are perceived as major obstacles to expanding recycling businesses, particularly in the glass, metals and brownware areas. This is a characteristic of recycling in New Zealand, where population is relatively dispersed and transport costs figure as a significant cost for all physical production activities.

Volumes are higher and collection costs lower when collecting from industrial sites rather than residential but the modest scale of many New Zealand manufacturing operations (by world standards) and their dispersion across the country makes collection and transport economies more elusive than in more densely settled countries.
Market Prices for Recyclable Materials

Price volatility and or foreign exchange fluctuations were noted as particularly inhibiting for paper, glass and plastics recycling, all of which are particularly reliant on export markets for certain grades of material, or for material from certain locations. This is a common characteristic of commodity markets and there are various ways in which businesses can manage the risk of such volatility. These include diversifying into a wider range of products whose prices do not move in synchronised fashion, entering into long term supply contracts at fixed rates, or trading on the futures market. If businesses lack the expertise to do this themselves, agents and brokers may emerge with the expertise and scale to manage these risks.

Much recycling in New Zealand focuses on low value, high volume commodities that are prone to price fluctuations. Greater diversity and scale of operation would help to counteract this, which is perhaps why some of the most successful operations currently appear to be on material recovery parks, or offshoots of existing businesses where some of the fixed costs of establishment and operation are shared across activities. The extent to which operators in New Zealand could achieve greater diversity and scale of operations is worthy of in-depth research on a material specific basis.

5.3.2 Tractable Obstacles to Realising Business Opportunities

Policies at Cross-Purposes

A number of recyclers cite environmental impacts and the consent procedures under the RMA as inhibiting factors to further development, particularly in the paper, metals, used oil and C&D sectors. A particular example of policies acting against recycling objectives has been the removal from petrol station forecourts of igloos for collecting used oil following its changed classification as a Class 3 Dangerous Good.

Consent processes can be justified by the assessment of consequent effects but there is a possibility of inconsistencies emerging in the application of RMA across districts, as well as different pieces of legislation producing counter-acting incentives. Specific case studies or cross comparisons of the treatment of recycling proposals in different areas could establish the extent to which this is happening and possibly help to identify some best practices and standardised approaches to apply in different situations.

Under-pricing of landfill disposal is still cited as a deterrent to further recycling by some businesses, particularly with respect to paper and metals. This is a particular type of contradictory policy which, although well-recognised and addressed through promotion of full cost pricing, continues to persist.

Issues Associated with New Market Development

Outside of the established recycling of bulk materials – paper, glass, metals – a characteristic of many recycling enterprises is that they are relatively new and small scale. They share many of the issues and
problems of other small business start ups, in identifying a market, developing a business plan and securing sufficient backing for the venture to become established and move on to self-sustained growth. As such, existing programmes in place to assist business start-ups, such as business mentoring schemes, should be applicable to businesses associated with waste minimisation and recycling.

Issues surrounding developing markets for specific materials are more related to specific industries and may be assisted by pan-industry organisations undertaking some generic research and promotion. However, such bodies may be limited in support and in what they can achieve because of the incentive for some firms to free ride off the actions of others. New Zealand has a long history of commodity marketing boards formed under statutory compulsion but they have had a chequered history and most have now been dismantled. Many innovative uses for recycled materials currently under investigation – such as ground glass as a component in road surfacings, or ground plastic as a filler in concrete building products – are bulky and predominantly destined for the domestic market and there may be a case for local authority waste managers getting alongside their infrastructure counterparts to examine the practical applications and specifications required of such new products.

**Finance and Capital Availability**

Some recyclers list the availability of finance and capital as a constraint to realising business opportunities. While individual businesses may have difficulties in raising the finance they need, there is no particular shortage of capital in the New Zealand economy as a whole. Various financial institutions are willing to lend money and support business propositions where the potential payback is right. Perceptions of capital availability are more a function of the inherent volatility and uncertainty of recycling activities, than of any deficiency in the capital market. The remedy lies in the development of realistic business plans and larger, diversified operations more resilient to fluctuating fortunes and more attractive as investment propositions.

**Existing and Potential Future Reliance on Subsidies**

Many recycling activities connected with the local government sector receive explicit or implicit subsidies, though operational grants, rent free use of property, inclusion in publicity material and so on. Such subsidies can be justified if they result in a saving elsewhere in the system as large or larger than the subsidy. For instance, if the marginal cost of disposal in a landfill is $30/tonne, it would be worthwhile paying up to that amount to divert material to recycling, if in turn that payment makes the recycled material competitive. The difficulty with this approach is in identifying true marginal costs of disposal. If the subsidy is based on an average cost that includes fixed costs incurred regardless, it will be overstated and overall waste management costs will rise.

Such a rationale does not necessitate the continuing use of subsidies. Generators could pay recyclers directly as an alternative discard option to council-managed disposal. Long term use of a subsidy may increase the volume of material being recycled but it may not be economically worthwhile unless there is some other externality that it is helping to offset. The use of subsidies always has potential to confer advantage on one type of business over others and distort resource allocation between activities. Reliance
Identification of Priorities for Policy Actions and Conclusions

on subsidy leaves businesses susceptible to changes in council preferences that have led to periodic rise and fall in recycling activity in the past and subsidy is most useful as a judicious, short term measure to address a specific issue.

One argument for subsidising business activities concerns protecting infant industries in the early stages of development, whose share of the market is small due to competition and whose output is therefore constrained below their minimum efficient scale. It can be argued that short term assistance to such industries that allows them to grow and achieve economies of scale can be beneficial to economic development. Such assistance policies also carry inherent risks of “gaming”, adverse selection and resource misallocation. Detailed case studies of industry business plans and market potentials would be required to implement such a policy and the implementation costs for both those administering it and applicants complying with it are likely to be high.

5.4 Identification of Priorities for Policy Action

The New Zealand Waste Strategy articulates a long term challenge to break the link between waste production and economic growth and has an overall aim of moving towards zero waste and sustainability. It identifies three core goals:

1. lowering the social costs and risks of waste;
2. reducing the damage to the environment from waste generation and disposal; and
3. increasing economic benefit by more efficient use of materials.

The first and third of these clearly relate to the economic efficiency criterion, implying the removal or reducing of waste costs and risks where it is economically worthwhile to do so. The second is also related to efficiency, to the extent that reductions in environmental damage can be expressed in economic terms. Other criteria commonly used to assess policy initiatives are their effectiveness in addressing the problem at hand, their equity in distributing burdens across society and their contribution to achieving more sustainable outcomes.

The strategy identifies a number of core policies, including efficient pricing, achievement of high environmental standards, and improving information but its principal policy focus is a quantity-based measure – waste minimisation. Diverting material from the waste stream into new business opportunities can contribute to this end and the question addressed here is where to place the priority for reducing impediments to business opportunities?

What are the Obstacles to Business Opportunities?

This study and previous surveys of waste and recycling have highlighted some key characteristics of businesses diverting material from the waste stream in New Zealand:

• the predominance of high volume, low value materials being recovered;
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- difficulties created in gathering materials from dispersed sources and low pick up loads;
- limited outlets for reprocessing in New Zealand (concentrated in Auckland for many materials); and
- high internal transport costs which make the viability of many operations precarious and force a reliance on exports with volatile commodity markets.

Most of these characteristics are functions of the New Zealand landscape, with a small and dispersed population strung across a long country. They are not characteristics that are likely to be remedied by any sustainable policy measure. They are market characteristics that recyclers will have to learn to live with.

Having said that, the prospects are not all gloomy. Many recycling businesses are relatively small and recent arrivals in the market. Outside of the main recycled products – paper, glass, metals – the market for recycled materials still appears relatively new and undeveloped. Entrepreneurial initiatives that identify new uses for recycled material, such as incorporating plastics into building materials, still emerge.

Greater diversity and scale of operation could make recycling activities less precarious than they currently appear. Over time, the local market may consolidate and achieve both. At present there is a strong local community focus to some new recycling initiatives but this may be limiting in spreading expertise in recycled materials too thinly across too many operators. Over time the market could evolve in various ways to counteract this. Material or industry-oriented bodies could provide research and services, sharing information around operations that share common interests. Agencies or brokerages could grow to coordinate marketing from dispersed local suppliers, and private companies could act as franchise operators for a range of different local body schemes, achieving economies of scale and scope beyond the reach of the individual operations.

In the meantime the emergence of new recycling operations needs similar support to that of other start-up operations – guidance on how to assess the opportunity, how to make a business case for gaining financial support, how to structure the operation to manage the risks and fluctuations in activity that can be expected.

What are the Externalities or Market Failures?

Discussions on waste generation often note the disjunction between material use decisions and the consequences for waste management. The cost of disposing of products does not figure large in manufacturers’ consideration of how to produce the product. In addition, the use of subsidies in recycling operations would be more justifiable if they can be shown to counteract some external effect or market failure.

One market imperfection that persists is the mis-pricing of landfill disposal, either because landfills are not fully costed or because their marginal cost in use is partly covered by rates funding. This is still widely perceived as a problem, although there does not appear to be a comprehensive study confirming how widespread such mis-pricing might be. However, over time it is likely to become less problematic. The number of landfills is expected to continue declining as old, sub-standard landfills come to the end of
their consented lives, and there is a move towards more uniform standards and a more commercial approach to costs and pricing, than hitherto, that should reduce the mis-pricing problem.

There may be external effects from diverting material from landfills that are currently unpriced and warrant a subsidy. An obvious example is the impact of emissions from landfill material. In particular, greenhouse gas emissions from landfills would impose a cost on New Zealand meeting its obligations under the Kyoto Protocol, should this international agreement be ratified and come into force after 2008. At present, however, there is no cost to place on greenhouse gas emissions – the international market does not yet exist. Subsidising waste diversion to reduce emissions might emerge under the “project funding” provisions of the government’s Kyoto policy package but how this would be implemented has yet to be determined.

A third source of market failure is distortions in market structure, such as the existence of market dominance and monopoly. New Zealand recycling has a number of large, monopsony buyers in the local market for aluminium, paper, steel, and glass, and their geographic concentration in the North Island certainly affects the viability of recycling from distant parts. But all these materials can be exported, so the effective market dominance of these large players is less than at first appears.

Another aspect of market dominance is whether the nature of the market presents disincentives to new investment. For instance, whether businesses that develop a new market can recover those establishment costs without new entrants free riding on their efforts. If a business allows easy entry and easy exit – i.e. it has a low proportion of costs sunk in highly specific assets – it could be contestable and vulnerable to such hit and run entry. Many recycling operations appear to be of this nature, with largely generic assets of trucks and premises and employing relatively unskilled labour. However, this also suggests the markets are relatively competitive and responsive to changes. Newly developed markets can be made secure through private contractual arrangements and it is not evident that this is a serious disincentive to new business opportunities being realised.

**What are the Remedies Available?**

To the extent that landfill prices are distorted, or other factors lead to discard choices being tilted in favour of landfilling over recycling, a number of remedies could be applied. Uncertainty over supply of materials is a common comment from recyclers, that might be remedied in a number of ways.

One popular suggestion is a ban on landfilling of certain recyclable materials. This is a quantity measure that would increase the availability of material for recycling and reduce its cost to recyclers, aiding the viability of their businesses. However, the implementation of such a ban could be costly, both for those administering it and those having to comply with it. It could also be allocatively inefficient if it results in low-grade materials being forced back into the recycling stream.

Another common suggestion is a landfill levy, although at present there appears to be no consensus whether this would be designed to incentivise behaviour changes of simply to raise funds for supporting other waste minimisation options. Such a levy entails some administrative and compliance costs, and it is only economically efficient if the levy is set equal to some externality cost (such as the cost of emission...
permits). It would change the relative choices between discard options, but the additional diversion to recycling remains indeterminate. A fund raising levy is set low and spread widely so as minimise incentive for behavioural change, but it still incurs compliance and administration costs. Following the precepts of optimal taxation, it is usually more efficient to raise funds through general taxation than through specific levies, although the appearance of user-group pays makes a levy attractive from an equity perspective.

A third suggestion is financial assistance to recycling, either capital or operational grants or assistance in kind. These support the viability of businesses directly but their effects on waste flow diversion depend on how they are applied. They can be efficient if they counteract an external benefit of diversion that is otherwise unpriced. Another possible use is in supporting an infant industry until it reaches an efficient level of production. There is no evidence that current subsidies conform to either of these conditions, and further investigation of the use of subsidies and their possible distortion of local markets could be warranted.

**Priorities for Action**

From the foregoing, the main priorities for action on business opportunities from waste minimisation are:

- encourage exchange of information on markets and supply options that remove some of the uncertainties facing recycling operations;
- ensure recycling start-ups and related enterprises can access the same support that is available to other small business;
- investigate the substance behind claims of contrary policies impeding expansion of recycling businesses;
- investigate the use of subsidies and their impacts on local markets; and
- anticipate further evolution and maturing of the market for recyclables by avoiding measures that perpetuate the small scale and dispersion that threaten viability (e.g. encourage formation of material recovery parks, offshoots etc).

**5.5 Conclusions**

A number of general conclusions can be drawn from the information obtained in this study. These are outlined below.

**5.5.1 Recycling Industry**

With the exception of the composting sector and a number of community organisations involved in waste management and/or recycling, growth in the recycling industry is expected to be around the general level of growth forecast for the economy as a whole.
Identification of Priorities for Policy Actions and Conclusions

There is a claimed limited availability of capital to the recycling industry in general, which may reflect a lack of long term sustainability of some recycling businesses through the inability of a business to present sound investment proposals in respect of materials that are low in value and subject to price variations. This means that the industry relies on funding from agencies that have other criteria for making finance available.

There is some concern that potential government interventions in the industry could result in unfair competition and detrimental effects on existing, financially viable, businesses that have survived to date through their knowledge of the industry.

Businesses would welcome direct contact with government departments that have an interest in the waste management and recycling industry.

5.5.2 Commodities

In respect of commodities (metals, paper, plastic and glass) the potential for additional employment is likely to be restricted mainly to an increase in collection and sorting activities. That is, the introduction of kerbside recycling collections and drop-off facilities in those parts of the country where they do not already exist, and sorting of the collected materials. However, these require territorial authority funding.

In all cases where kerbside recycling is used there is the potential for funds to be diverted, in the future, from waste minimisation to other activities in response to competing demands on resources.

There is a predominance of high volume, low value commodity materials in most recycling operations. Markets are limited, generally require high transport costs and are prone to price volatility of international markets.

Those employed in the collection, sorting and recycling are generally low skilled, or unskilled, labour.

5.5.3 Markets

The apparent success and expected expansion of some composting operations appears to reflect localised availability of materials and markets. These types of operations are less apparent in dispersed population areas.

The apparent success of resource recovery parks reflects localised market and also subsidies for infrastructure and labour. Little information on the quantities (either volume or weight) of household items recovered for resale exists. However, the level of subsidy may, in some cases be less than the cost of transporting and disposing of the materials to landfill.

Niche markets appear to exist for some used items and recyclable materials. However, they are small and generally dependent on specialised knowledge and/or skills of companies or individuals. In some cases the recycling operations are undertaken as an adjunct to existing business activities.

There is little evidence of high value recovered products.
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In brownware and whiteware there appears to be the emergence of a service ethic in some businesses, whereby businesses take responsibility for recovery of used products when they are upgraded or replaced by new products. This type of activity is used to hook in customers in as a repeat buyers. However, this may result in re-use or recycling of part or all of the used products, or simply disposal of the recovered items.

5.6 Future Directions

The following sectors are recommended for future, more in-depth, study in respect of business and employment opportunities from waste minimisation.

5.6.1 Organic Waste

There appears to be potential for expansion of organic waste composting activities. The following issues would need to be addressed in determining more accurately the potential for expansion:

- the number and scale of existing organic waste composting facilities, both local authority and private;
- current and potential future markets for products;
- the potential for new technologies to compost a wider range of organic wastes; and
- the costs of obtaining resource consents, and possible methods to reduce these (e.g. guidelines for operators and consent authorities).

5.6.2 Resource Recovery Parks

Resource recovery parks were cited as having a high potential to create employment. The following issues would need to be addressed in determining more accurately the potential for expansion:

- reasons for the apparent success of existing operations;
- the types of activities also undertaken in conjunction with resource recovery (e.g. transfer station/landfill operation or refuse/recycling collection contracts) and their role in financing resource recovery;
- the extent of reliance on subsidies and/or grants for establishment and continued operation; and
- the potential for clustering of a number of waste minimisation activities to reduce set up costs and encourage cooperation.
## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brownware</strong></td>
<td>A wide range of electronic equipment and home appliances (excluding whiteware), including radios, stereos and other audio equipment, televisions, VCRs and DVD players, computers and cellphones.</td>
</tr>
<tr>
<td><strong>Cleaner production</strong></td>
<td>Cleaner production practices are those that reduce adverse environmental impacts by improving resource efficiency and reducing waste.</td>
</tr>
<tr>
<td><strong>Cleanfills</strong></td>
<td>Cleanfills are waste disposal sites that accept only inert wastes. These include materials such as clay, soil, rock, concrete and bricks.</td>
</tr>
<tr>
<td><strong>Design for the environment</strong></td>
<td>Design for the environment refers to products that are designed and managed so that minimum environmental impact is caused by their generation, use, recovery and disposal.</td>
</tr>
<tr>
<td><strong>Extended producer responsibility</strong></td>
<td>Extended producer responsibility (EPR) puts the onus on businesses to look for and capitalise on, opportunities for resource conservation and pollution prevention throughout a product’s life cycle, including disposal.</td>
</tr>
<tr>
<td><strong>Green waste</strong></td>
<td>Garden waste.</td>
</tr>
<tr>
<td><strong>Landfill</strong></td>
<td>A landfill is an area used for the controlled disposal of solid waste.</td>
</tr>
<tr>
<td><strong>Organic waste</strong></td>
<td>Organic waste includes garden and kitchen waste, food process wastes, and sewage sludge.</td>
</tr>
<tr>
<td><strong>Solid waste</strong></td>
<td>Solid waste is all waste generated as a solid or converted to a solid for disposal. It includes wastes such as paper, plastic, glass, metal, electronic goods, furnishings, garden and other organic wastes.</td>
</tr>
<tr>
<td><strong>Special waste</strong></td>
<td>Special wastes are wastes that cause particular management and/or disposal problems and need special care. Examples include used oil, tyres, end-of-life vehicles, batteries and electronic goods.</td>
</tr>
<tr>
<td><strong>Stewardship</strong></td>
<td>Stewardship puts a duty of care on everyone – government, business and the community – for waste prevention and resource recovery.</td>
</tr>
<tr>
<td><strong>Used oil</strong></td>
<td>Oil contaminated through use with substances that can be hazardous to human health and the environment.</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td>This project defines waste as any material, solid, liquid or gas, that is unwanted and/or unvalued and discarded or discharged.</td>
</tr>
<tr>
<td><strong>Waste hierarchy</strong></td>
<td>The waste hierarchy orders preferred waste management options. The most preferred option is reduction, followed by re-use, recycling, recovery, treatment and disposal.</td>
</tr>
<tr>
<td><strong>Waste minimisation</strong></td>
<td>Waste minimisation refers inclusively to all activities aimed at preventing, reducing, re-using or recycling waste.</td>
</tr>
</tbody>
</table>
Appendix A
Glossary & Abbreviations

Waste prevention refers to practices that avoid and reduce the generation of waste.

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;D</td>
<td>Construction &amp; Demolition</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>LATE</td>
<td>Local Authority Trading Enterprise</td>
</tr>
<tr>
<td>MED</td>
<td>Ministry for Economic Development</td>
</tr>
<tr>
<td>MfE</td>
<td>Ministry for the Environment</td>
</tr>
<tr>
<td>NZIER</td>
<td>New Zealand Institute of Economic Research</td>
</tr>
<tr>
<td>PCBs</td>
<td>Polychlorinated biphenyls</td>
</tr>
<tr>
<td>RMA</td>
<td>Resource Management Act 1991</td>
</tr>
<tr>
<td>RONZ</td>
<td>Recycling Operations of New Zealand</td>
</tr>
<tr>
<td>URS</td>
<td>URS New Zealand Limited</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
</tr>
</tbody>
</table>
## Appendix B

### Kerbside Recycling Collection Details

**Kerbside Recycling and Resource Recovery Areas**

(Unless otherwise stated kerbside recycling and resource recovery centres collect glass, plastic, paper and metals (including aluminium cans).)

<table>
<thead>
<tr>
<th>Regional Council</th>
<th>TLA</th>
<th>Kerbside recycling areas (township/city)</th>
<th>population</th>
<th>households</th>
<th>Resource recovery facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland RC</td>
<td>Auckland CC</td>
<td>All domestic refuse collection households</td>
<td>378,000</td>
<td>129,000</td>
<td>30+ schools involved as drop-offs stations</td>
</tr>
<tr>
<td>Auckland RC</td>
<td>Franklin D.C.</td>
<td>Paper only in Pukekohe, Waiuku and Tuakau</td>
<td>47,826</td>
<td></td>
<td>Transfer stations at Pukekohe and Waiuku</td>
</tr>
<tr>
<td>Auckland RC</td>
<td>Manukau CC</td>
<td>All domestic refuse collection households</td>
<td>77,000</td>
<td></td>
<td>Recovery centre at Whitford transfer station caters for whole district</td>
</tr>
<tr>
<td>Auckland RC</td>
<td>North Shore CC</td>
<td>All domestic refuse collection households</td>
<td>185,700</td>
<td>70,000</td>
<td>Constellation Drive recycling centre, caters for whole district</td>
</tr>
<tr>
<td>Auckland RC</td>
<td>Papakura DC</td>
<td>All domestic refuse collection households</td>
<td>39,200</td>
<td>15,176</td>
<td>Commercial activity for paper and green waste</td>
</tr>
<tr>
<td>Auckland RC</td>
<td>Waitakere CC</td>
<td>All domestic refuse collection households</td>
<td>170,700</td>
<td>55,000</td>
<td>Voluntary activities only</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Banks Peninsula D C</td>
<td>Akaroa</td>
<td>3000</td>
<td>1007</td>
<td>All of district</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Christchurch CC</td>
<td>Christchurch</td>
<td>324,300</td>
<td>108,826</td>
<td>Christchurch (at 3 transfer stations)</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Hurunui DC</td>
<td>Amberly, Cheviot, Leasefield, Waikari, Hawerden</td>
<td>5000</td>
<td>1678</td>
<td>Culverden, Waiaku</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Kaikoura DC</td>
<td>Kaikoura</td>
<td>2000</td>
<td>671</td>
<td>Kaikoura</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Timaru DC</td>
<td>Geraldine</td>
<td>20,000</td>
<td>6711</td>
<td>8 dropoff stations that cater for whole district</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Waimakariri DC</td>
<td>All domestic refuse collection households</td>
<td>20,000</td>
<td>6711</td>
<td>Rangiora, Oxford</td>
</tr>
<tr>
<td>Environment BoP</td>
<td>Opopiki DC</td>
<td>Opopiki, Te Kaha, Waia</td>
<td>1700</td>
<td></td>
<td>3 recycling centres, cater for district, 45L recycling bin and 25L bags provided for weekly disposal to landfill recycling centres at the 2 transfer stations, cater for district</td>
</tr>
<tr>
<td>Environment BoP</td>
<td>Tauranga DC</td>
<td>Tauranga, paper and cardboard only</td>
<td>822,87</td>
<td>276,13</td>
<td></td>
</tr>
<tr>
<td>Environment BoP</td>
<td>Whakatane DC</td>
<td>All domestic refuse collection households</td>
<td>9,000</td>
<td></td>
<td>Recycling centres at Whakatane and Murupara, cater for district</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Hamilton CC</td>
<td>Hamilton City, paper only</td>
<td>117,100</td>
<td>39,295</td>
<td>Hamilton City, recovery centre at transfer station</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Matamata Piako DC</td>
<td>Te Aroha, Morrinsville, Matamata</td>
<td>15,000</td>
<td>5,034</td>
<td>Te Aroha, Morrinsville, Matamata</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Otorohanga DC</td>
<td>Otorohanga, Kaipara</td>
<td>5,000</td>
<td>1,678</td>
<td>Otorohanga</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>South Waikato DC</td>
<td>Tokoroa, Putaruru, Tirau</td>
<td>8,000</td>
<td>2,685</td>
<td>Tokoroa, Putaruru, Tirau</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Taupo D.C.</td>
<td>All domestic refuse collection households</td>
<td>15,000</td>
<td>5,034</td>
<td>Located at 5 transfer stations, cater for district</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Thames Coromandel D.C.</td>
<td>All domestic refuse collection households</td>
<td>14,000</td>
<td>4,698</td>
<td>Located at 7 transfer stations, cater for district</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Waikato DC</td>
<td>Huntly, Ngakuruwahia, paper and glass only</td>
<td>10,000</td>
<td>3,356</td>
<td>Huntly</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Waitomo DC</td>
<td>Te Kuiti, Pio Pio, Hangatiti</td>
<td>4,000</td>
<td>1,342</td>
<td>Located at 6 transfer stations, cater for whole district</td>
</tr>
</tbody>
</table>
## Appendix B
### Kerbside Recycling Collection Details

**Areas with Kerbside Recycling**

<table>
<thead>
<tr>
<th>Region</th>
<th>District/Code</th>
<th>Area Details</th>
<th>Population</th>
<th>Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawkes Bay RC</td>
<td>Hastings DC</td>
<td>Hastings City</td>
<td>58494</td>
<td>10629</td>
</tr>
<tr>
<td>Hawkes Bay RC</td>
<td>Napier City Council</td>
<td>Napier City</td>
<td>52953</td>
<td>17769</td>
</tr>
<tr>
<td>Hawkes Bay RC</td>
<td>Wairoa DC</td>
<td>Wairoa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Horowhenua D C</td>
<td>Levin</td>
<td>10000</td>
<td>3356</td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Palmerston North CC</td>
<td>Palmerston Nth</td>
<td>73860</td>
<td>24785</td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Tarana DC</td>
<td></td>
<td>10000</td>
<td>3356</td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Wanganui DC</td>
<td>Wanganui, paper and cardboard only</td>
<td>41097</td>
<td>13791</td>
</tr>
<tr>
<td>Northland RC</td>
<td>Far North DC</td>
<td>some recycling by private contractors in townships, paper only</td>
<td>Located at 6 transfer stations, cater for district</td>
<td></td>
</tr>
<tr>
<td>Taranaki RC</td>
<td>New Plymouth DC</td>
<td>New Plymouth, Waitara, Okato</td>
<td>48870</td>
<td>16399</td>
</tr>
<tr>
<td>Taranaki RC</td>
<td>Stratford DC</td>
<td>private operator in urban areas only</td>
<td>Hutt City, 5 drop offs in the district</td>
<td></td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Hutt CC</td>
<td>All domestic refuse collection households</td>
<td>98100</td>
<td>32919</td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Kapiti Coast DC</td>
<td>Waikanae, Otaki, Paraparaumu (paper only)</td>
<td>Located at 6 dropoff stations, cater for district</td>
<td></td>
</tr>
<tr>
<td>Wellington RC</td>
<td>South Wairarapa DC</td>
<td>Greytown, Martinborough</td>
<td>4000</td>
<td>1342</td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Wellington CC</td>
<td>All domestic refuse collection households</td>
<td>Located at 4 dropoff stations, cater for district 8 drop off stations around the city</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>762723</td>
<td></td>
</tr>
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**Areas Without Kerbside Recycling**

<table>
<thead>
<tr>
<th>Region</th>
<th>District/Code</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland RC</td>
<td>Rodney DC</td>
<td>Voluntary activities only</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Ashburton DC</td>
<td>Ashburton, Rakaia, Mt Sommers, Methvan, Willoughby</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Mackenzie DC</td>
<td>Fairlie, Twizel, Tekapo</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Selwyn DC</td>
<td>Springfield, Springfield, Kilinchy (paper only)</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Waimate DC</td>
<td>Waimate transfer station (car bodies and greenwaste shredding)</td>
</tr>
<tr>
<td>Canterbury RC</td>
<td>Waitaki DC</td>
<td>Oamaru and Palmerston landfills (paper and glass only)</td>
</tr>
<tr>
<td>Environment BoP</td>
<td>Kawerau DC</td>
<td>private operators collect paper in urban areas</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Hauraki DC</td>
<td>Ngatea, Wahi, Paeroa</td>
</tr>
<tr>
<td>Environment Waikato</td>
<td>Waipa DC</td>
<td>I recycling centre at Rotorua landfill</td>
</tr>
</tbody>
</table>
## Appendix B
### Kerbside Recycling Collection Details

<table>
<thead>
<tr>
<th>Areas Without Kerbside Recycling</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gisborne DC</td>
<td>Gisborne DC</td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Manawatu DC</td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Rangitikei D C</td>
</tr>
<tr>
<td>Horizons Manawatu</td>
<td>Ruapehu DC</td>
</tr>
<tr>
<td>Marlborough DC</td>
<td>Marlborough DC</td>
</tr>
<tr>
<td>Nelson CC</td>
<td>Nelson CC</td>
</tr>
<tr>
<td>Northakand RC</td>
<td>Kaipara D.C.</td>
</tr>
<tr>
<td>Northakand RC</td>
<td>Whangarei DC</td>
</tr>
<tr>
<td>Otago RC</td>
<td>Central Otago DC</td>
</tr>
<tr>
<td>Otago RC</td>
<td>Clutha DC</td>
</tr>
<tr>
<td>Otago RC</td>
<td>Dunedin CC</td>
</tr>
<tr>
<td>Otago RC</td>
<td>Queenstown Lakes DC</td>
</tr>
<tr>
<td>Southland RC</td>
<td>Gore DC</td>
</tr>
<tr>
<td>Southland RC</td>
<td>Invercargill CC</td>
</tr>
<tr>
<td>Southland RC</td>
<td>Southland DC</td>
</tr>
<tr>
<td>Taranaki RC</td>
<td>South Taranaki DC</td>
</tr>
<tr>
<td>Tasman DC</td>
<td>Tasman DC</td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Carterton DC</td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Masterton DC</td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Porirua CC</td>
</tr>
<tr>
<td>Wellington RC</td>
<td>Upper Hutt CC</td>
</tr>
<tr>
<td>Westland RC</td>
<td>Buller DC</td>
</tr>
<tr>
<td>Westland RC</td>
<td>Grey DC</td>
</tr>
<tr>
<td>Westland RC</td>
<td>Westland DC</td>
</tr>
</tbody>
</table>

Source: Solid Waste Environmental Performance Indicator information, supplied Ministry for the Environment.
Appendix C
Summary of Waste Not Limited Report


Obstacles to Growth in the New Zealand Market

80 respondents: Generally, it is not just one obstacle that prevents growth, but a combination of obstacles. The table below identifies the main obstacles to growth encountered.

Forty percent of respondents found that a lack of markets was an obstacle to growth. The prime obstacle for 30% of respondents was a lack of economic supply and, for 25%, limited access to capital. Secondary obstacles included environmental regulations (20%), cash flow (14%), technical limitations (13%), land use and zoning (11%) and lack of trained workers (10%). The mention of environmental regulations is important as legislation such as the Resource Management Act has taken large steps towards helping the New Zealand environment, but some recycling businesses claim to be suffering from this and other legislation.

Key Obstacles to Growth Identified:

<table>
<thead>
<tr>
<th>Details of Obstacles</th>
<th>Percentage Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of market</td>
<td>40</td>
</tr>
<tr>
<td>Lack of supply</td>
<td>30</td>
</tr>
<tr>
<td>Access to capital</td>
<td>25</td>
</tr>
<tr>
<td>Environmental regulations</td>
<td>20</td>
</tr>
<tr>
<td>Cash flow</td>
<td>14</td>
</tr>
<tr>
<td>Technical limitations</td>
<td>13</td>
</tr>
<tr>
<td>Zoning</td>
<td>11</td>
</tr>
<tr>
<td>Lack of trained staff</td>
<td>10</td>
</tr>
<tr>
<td>Local council/body interference/lack of support</td>
<td>14</td>
</tr>
<tr>
<td>Lack of central government support (not financial)</td>
<td>9</td>
</tr>
<tr>
<td>Uneducated public, lack of awareness and understanding</td>
<td>9</td>
</tr>
<tr>
<td>Contamination with poor quality oversized material</td>
<td>7</td>
</tr>
<tr>
<td>Tighter regulations for our material</td>
<td>6</td>
</tr>
<tr>
<td>Competition</td>
<td>5</td>
</tr>
<tr>
<td>Tipping costs to low</td>
<td>3</td>
</tr>
<tr>
<td>Restricted access to waste stream</td>
<td>3</td>
</tr>
<tr>
<td>Price fixing of virgin materials</td>
<td>3</td>
</tr>
</tbody>
</table>
Appendix C

Summary of Waste Not Limited Report

<table>
<thead>
<tr>
<th>Details of Obstacles</th>
<th>Percentage Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1</td>
</tr>
</tbody>
</table>

Chief Obstacles to Financing Expansion

80 respondents: The table below presents the chief obstacles encountered by respondents to financing expansion. Fifty percent of respondents felt that there were no obstacles in raising capital to finance their expansion. The remaining half had come across obstacles which included 19% who had found that potential investors thought the markets were unproven, while a further 13% found that their lack of collateral was the chief obstacles to gaining finance for any expansion. This shows the diverse variety of issues that recycling businesses may encounter as they try to either consolidate or expand their operation.

Chief Obstacles to Financing Expansion:

<table>
<thead>
<tr>
<th>Details of Obstacles</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>50</td>
</tr>
<tr>
<td>Lack of collateral</td>
<td>13</td>
</tr>
<tr>
<td>Poor cash flow</td>
<td>5</td>
</tr>
<tr>
<td>Unproven markets</td>
<td>19</td>
</tr>
<tr>
<td>Unproven technology</td>
<td>5</td>
</tr>
</tbody>
</table>

Summary of Key Findings of Waste Not Research

Respondents identified significant obstacles, the major obstacle being the lack of stable markets for recycled materials. This has historically been the major constraint on the industry and it is notable that local markets, which are less volatile than commodity prices, now form the base of the industry. Development and diversification of these local markets is key for the future of the industry.

The other key restraint for many operators is difficulty in obtaining an economic and consistent supply of environmental regulations and restrictions are seen as another obstacle to growth by some operators. The perception of environmental regulations being an obstacle may be linked to a perception that there is a lack of real local government and central government support for the industry.

Greater flexibility in current environmental legislation at both a local and national level is required to provide valuable guidance for businesses and allow the businesses that are going to do the work to achieve the overall vision. Industry organisations need to be proactive in lobbying local and central government to see the necessary changes put on the agenda.

Identification of Measures to Address Obstacles

The Waste Not survey provided a number of measures that could be used to address obstacles for the recycling industry.
1. Promotion of “Buy Recycled” and “Buy Back” schemes by local and central government and the adoption of purchasing policies for buying recycled products, would benefit New Zealand owned and based recycling businesses, by stimulating the demand for recycled products, and hence for recycled feedstock materials.

2. An education program which can be inexpensive and tied to current programs, could be initiated by industry associations, and supported by councils and private business to increase awareness that the recycling industry has a number of positive spin-offs for society. By raising the awareness of some of the issues and the subsequent business opportunities, more kiwi ingenuity will focus on related issues that are currently hindering the recovery of resources. Highlighting the extent of the commercial recycled market could help foster an appreciation of the recycling industry overall.

3. Local and central government should encourage the recovery of greater percentages of materials currently landfilled could provide feedstock for many businesses. This could be done through development and promotion of clear waste minimisation targets.

4. Greater flexibility in current environmental legislation at both a local and national level is required to provide valuable guidance for businesses and allow the businesses that are going to do the work to achieve the overall vision. Industry organisations need to be proactive in lobbying local and central government to see the necessary changes put on the agenda.

5. Existing business support organisations and industry association should work together to provide guidance in helping recycling businesses obtain funding and business and technical assistance. Many businesses don’t have the time or ability to undertake this themselves, and this would remove significant obstacles for them.
Appendix D

Bibliography

Reports


Other Materials

Solid Waste Environmental Performance Indicator information, supplied Ministry for the Environment.

Data on packaging use and collection, supplied by the Packaging Council of New Zealand.

Data on plastics manufacture and recycling, supplied by the Plastics Institute of New Zealand Inc.
Appendix E
Questionnaire Respondents

The assistance of the following companies and individuals in the preparation of this study is acknowledged.

ARK Recycling Ltd (Bob Lye)
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Auckland City Council (Jan Burberry)
Auckland Regional Council (Allan Goddard)
Bens Oil Ltd (Reg Stuart)
Burrell Salvage (Alex Burrell)
Carter Holt Harvey (Craig Forman)
Core Technology Ltd (Gordon Laurie)
Envy Garden City Composting (Gill Pontin)
Fisher & Paykel (George Grey)
Gamma Corporation (Mike Morris)
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Nuplex (Gary Brockett)
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Recovered Materials Foundation (Joan McSweeney)
Sims Pacific Metals (Tom Graham)
Smart Recycling Limited (John Forbes)
Tararua Resource Recovery (Peter Forman)
Visy Recycling Glass Division (Peter Grierson)
Wanaka Wastebusters (Maree Horlor)
Ward Demolition (Peter Ward)
Warren Snow
Waste Petroleum Combustion (Lynette Whitford)
Vodafone (Sarah McGloven)
Appendix F
Waste And the Economy

Waste and the Economy

Economics is concerned with how relatively limited and scarce resources are used in the satisfaction of relatively unlimited human wants and demands. It assesses real world behaviour against a model in which some individuals and firms act as suppliers, harnessing inputs to produce goods and services so as to maximise profits and returns to input factors; while others act as consumers, aiming to maximise the satisfaction derived from their consumption within the constraints of their income and wealth. Intermediaries between these two groups are the process of market exchange that links willing buyers with willing sellers, and the medium of money, acting through the price mechanism to signal, on the one hand, the relative scarcity of input resources and, on the other, the relative strength of demand for the products derived from them.

The basic economic model is illustrated in the diagram overpage, extended to link it to the natural environment. The solid arrows represent physical flows of materials, goods and effort, whereas the dashed arrows represent financial flows.

The top half of the diagram shows the conventional economic model as found in standard economics texts. Households supply labour and capital (savings) to firms who engage in economic production, generate income and provide a return to households as wages and dividends. Households also act as consumers, purchasing goods from firms. Government is a third agent in the economy, a collective consumer that extracts money from households and firms through the tax system in exchange for providing goods and services to the community that the market is unable to supply. In reality the picture is complicated by international transactions that mean that both inputs and outputs may originate from, or be sent to, foreign countries, but the general interdependencies still hold.

The bottom half of the diagram illustrates how the economy is rooted in the natural environment, using it as a source of space and materials for input into the production process, a source of amenity for direct consumption, and as a sink for depositing wastes that are generated from both production and consumption. At some level of concentration wastes can impinge on ecological processes and detract from both the amenity and material supply functions of the environment. Waste minimisation, material recovery and recycling are primarily intended to reduce pressures on the environment, both for material supply and waste assimilation.
For material recovery and recycling to be worthwhile for private firms, they must receive value for their output that covers all their production costs, otherwise the business will be unsustainable. That value can come from market prices, or it could come from subsidy. Even if the recovered material is given away and its costs are covered in full by subsidy, it must be fit for some intended purpose or use, otherwise it is likely to be displaced by higher quality materials and end up back in the waste stream. This use confers on it an economic value, since it avoids the costs of procuring alternative materials for that purpose.

From a macro-economic perspective, the value of material recovery is determined by its value added, or contribution to gross domestic product. In the national accounts this is defined as its output value less the value of inputs and comprises the following:
Appendix F
Waste And the Economy

Gross value of output
less Intermediate consumption (consumable inputs)
equals Value added
comprising
Fixed capital consumption (depreciation)
Employee compensation (wages, salaries etc)
Indirect taxes (net of subsidies received)
Operating surplus (profit)

This formulation recognises that production is the primary source of value, and that taxes are a claim on productive value that is transferred from income producers to other uses elsewhere in the economy. Private businesses tend to focus on profit and regard the other components of value added as costs alongside the consumable inputs, in which case a subsidy received is a negative cost that bolsters profitability. From the viewpoint of the whole economy, however, the economic worth of material recovery or recycling depends on gross output value exceeding the cost of inputs used up in production, and the resulting residual value added being sufficient to cover the opportunity cost of labour and capital used in generating the output.

From this perspective, the benefit of job creation is subsumed in the value added of new production. The value of new jobs is measured not by their number, but by their contribution to the realisation of value added, and they are rewarded by the resulting employee compensation. New jobs that can not pay the full opportunity cost of the labour employed (i.e. what it could earn in other uses) are likely to be unsustainable, because the individuals involved will move on to better jobs when the opportunity arises.

If those newly employed were previously unemployed, they are still a cost to their employers but from an economy-wide perspective their opportunity cost (at least in the short term) is closer to zero. Some limited subsidy of new employment (e.g. assisted job search, retraining etc) may be worthwhile if it is less costly than keeping people unemployed and unproductive. Removal of people from the unemployment benefit is not a separate economic gain, although it may appear fiscally beneficial to government. This is because the benefit system involves intra-community transfer payments that do not directly affect the level of production in the economy. Reducing benefit recipients could indirectly affect production levels if lower unemployment leads to a reduction in taxes that has a strong incentive effect for new income earning among taxpayers, or if money returned to taxpayers’ pockets has a stronger wealth effect in stimulating consumption and investment than it had among the previous benefit recipients. Neither of these propositions can be readily verified empirically, and in material recovery and recycling, where the numbers employed are relatively small in the national scene, these indirect effects of fiscal relief from new job creation are likely to be negligible.

New output from waste recovery can stimulate increased activity in other industries “upstream” that supply waste recovery operations, and those “downstream” that use its outputs. These are the effects

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Appendix F
Waste And the Economy

captured by economic multiplier coefficients. However, multipliers as currently calculated off input-output tables have restrictive assumptions about resource availability, ignore the possibility of price changes and do not distinguish between trade creation and trade diversion between sectors and regions. Any new business will produce some multiplier effect of enhanced income and employment for other sectors, but multipliers are not informative of the net increase in business or whether it is likely to be worthwhile in covering full opportunity cost of resources employed.

How Much is Material Recovery Worth?

Material recovery is worthwhile if it can be returned to the market in useful form for less than the cost of disposal in landfill. If a waste generator is faced with a landfill disposal cost of $30/tonne, the material could realise $40/tonne recovered but this would entail $65/tonne of costs for labour, reprocessing and getting the material to market, recovery should be worthwhile, because the waste generator could pay a recycler anywhere from $25 up to $30 to take material away and still be better off than using the landfill. If the recovery costs exceeded $70, landfill would entail less economic cost than recovery assuming all the options are correctly priced.

With landfilling, this is an assumption that is not necessarily correct. If local authorities hold down landfill disposal prices by subsidising gate fees out of rates, there is disincentive for economically worthwhile material recovery. For instance, if the landfill charge is $20/tonne while the marginal cost of landfill disposal is $30, the most a recycler could ask for removing material is $20, which is insufficient for the recycling operation to break even. Under these circumstances, a subsidy of $5 and no more than $10 would make recycling worthwhile and still be less than the saving in marginal cost of landfill disposal. Implementing a subsidy is not costless, however, and it would be more efficient to correct the landfill mis-pricing that caused the disincentive in the first place.

There are two key implications from the above description. First, part of the benefit of material recovery and recycling is the saving in other costs, particularly landfill costs, and some worthwhile recycling will not be financially viable unless this is recognised in some way. In the numeric examples above, the recycling operation covers its costs against two distinct services for which payment is received: the sale of recovered material, and the provision of an alternative disposal option to waste generators. If waste generators are unwilling to pay for alternative disposal, because landfill charges are too low or because generators believe their waste is valuable and recyclers should pay them, some worthwhile recycling will not occur.

Second, from the perspective of economic efficiency – maximising outputs from available inputs – subsidy is only worthwhile in the presence of a market failure or external effect not reflected in relative pricing of discard choices. As well as mis-pricing of landfill space, landfill emissions could warrant a subsidy to remove the material that causes them in the absence of an emissions price measure.
Appendix F
Waste And the Economy

Subsidising material removal where effects are correctly priced simply increases the economy-wide cost of waste management, and is not efficient.