WasteNot Consulting

Summary of existing information on domestic food waste in New Zealand

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1. Introduction

WasteMINZ is the largest representative body of the waste and resource recovery sector in New Zealand. As part of its role as an organisation that seeks to advance the development of the industry, WasteMINZ facilitates a number of sector groups on specific, key areas of the industry.

One of these groups is the Behaviour Change Sector Group, which was established to share knowledge and resources to develop and encourage the implementation of behaviour change good practice. The Behaviour Change Sector Group's initial focus for 2013-2014 is food waste reduction.

The Sector Group is currently investigating the need for a food waste reduction behaviour change programme in New Zealand, and how the Sector Group might be able to facilitate the introduction of such a programme.

It has been determined that in the first instance existing data on domestic food waste generation in New Zealand is required in order to determine the size of the issue. In addition, to evaluate the need for a behaviour change programme, information on existing food waste diversion programmes and existing food waste behaviour change programmes is also required.

This report has been prepared for the WasteMINZ Behaviour Change Sector Group by Waste Not Consulting, with assistance from several other members of the Sector Group, to bring together existing information on domestic food waste in New Zealand. As there has, to date, been limited research undertaken in New Zealand on food waste, overseas research is also presented.

This document will be used as a 'living document' to assemble all relevant information as it comes to hand. All members of the Behaviour Change Sector Group can have information added to the report by emailing the information to Waste Not Consulting. Updated versions of the report will then be distributed to the members.

This report does not attempt to interpret or analyse any of the available research.

Some of the key findings of this report include:

Total food waste to landfill from residential waste	258,886 tonnes per annum (Section 2.1)
Kg per capita of residential food waste to landfill	64 kg per annum (Section 2.1)
Kg per capita of food waste in domestic kerbside refuse collections	1.18 kg per week 61.2 kg per annum (40% of domestic refuse) (Section 2.1.1)
Cost of wasted food in NZ (estimates)	$751 million pa $458 per household pa $155 per person pa (Section 5)
Breakdown of avoidable food waste	10% of domestic waste, or about 0.95 kg per household set out is 'wasted food' (that could have been eaten) (Section 6.4)

2. Waste Tonnages and Composition

The latest national data on the quantity of waste sent to landfill in New Zealand was released by the Ministry for the Environment (MfE) in 2012, in the Solid Waste Disposal (quantity) Indicator Update (October 2012)[1]. This document states that in 2011, 2.461 million tonnes of solid waste was disposed of to municipal landfills in New Zealand.

Data on the quantity of waste upon which the waste levy has been paid is updated monthly on the MfE website.[2]

In 2009, the MfE published a Solid Waste Composition Report Card[3], which claims that "Organic waste was the largest proportion of waste disposed of to landfills in 2007–2008, representing 28 per cent of the overall waste stream". This 'Organic' waste includes kitchen/food waste, green waste, and other organic waste such as food processing waste, from both commercial and residential activities.

2.1 Residential waste

Residential waste includes waste collected through a kerbside collection in bags or wheelie bins provided by either a council or private contractor (domestic kerbside waste), garden waste transported to a disposal point by a private contractor (residential landscaping waste), and waste transported directly to a disposal facility by householders or private waste operator (residential general waste). Data on these three individual waste streams is presented in the following sections.

It is estimated that approximately 26% of waste to landfill is generated by residential activities.

A Waste Not Consulting report to the MfE "Household Waste Data 2008", calculated that, in 2008, 1,048,993 tonnes of waste were generated by the residential sector, an average of 260 kg per person or 676 kg per household per annum. Over 44% of this household waste was organic, with 24.7% (or 258,886 tonnes) of the total being kitchen waste, and 19.6% being greenwaste (205,526 tonnes).

Table 2.1 – Residential Organic Waste, 2008

Waste category		% of total	Wt per capita per annum	NZ total per annum
Organics	Kitchen waste	24.7%	64 kg/annum	258,886 T/annum
	Greenwaste	19.6%	51 kg/annum	205,526 T/annum
	Subtotal	**44.3%**	**115 kg/annum**	**464,422 T/annum**

[1] http://www.mfe.govt.nz/environmental-reporting/waste/solid-waste-disposal-indicator/quantity-solid-waste-landfill.html
[2] http://www.mfe.govt.nz/issues/waste/progress-and-outcomes/waste-disposal-levy.html
[3] http://www.mfe.govt.nz/environmental-reporting/waste/waste-composition-2009/index.html

2.1.1 Domestic Kerbside Refuse

A high proportion of New Zealand households are serviced by weekly or fortnightly refuse collections. These collections are provided by local authorities and/or private waste operators, using either refuse bags or wheeled bins. All of the refuse from the refuse collections is disposed of to landfill.

In 2008, approximately 153 kg per capita of domestic kerbside refuse were disposed of to landfill each year. About half of this waste was organic, with kitchen waste comprising 40% of the total and greenwaste 10%.

Table 2.2 – Domestic Kerbside Refuse, 2008

Waste category		% of total	Wt per capita per week	Wt per capita per annum
Organics	Kitchen waste	40.0%	1.18 kg	61.2 kg
	Greenwaste	9.6%	0.28 kg	14.7 kg
	Subtotal	**49.6%**	**1.46 kg**	**75.9 kg**

2.1.2 Residential General Refuse

Residential general refuse is usually generated by a household clean-up, resulting in a large amount of refuse being generated in a short period of time, which is then transported to a disposal facility. Residential refuse commonly includes household effects, furniture, soft furnishings, clothes and minor amounts of construction and demolition debris and landscaping waste. However, for a load of waste to be classified as 'residential' it cannot be primarily the result of landscaping activity or construction and demolition activity. Bagged domestic refuse is often included in a load of residential refuse. Residential refuse is usually transported to a disposal facility either by the householder, using a car or trailer, or by a commercial waste operator, using a gantry skip.

The disposal of residential refuse is the responsibility of the householder, as opposed to domestic refuse, for which local authorities generally provide kerbside collections. The exception to this is the small number of local authorities that provide kerbside 'inorganic' collections for residents.

About 54 kg per capita of residential general refuse is disposed of to landfill each year. Organic material comprises 17% of the total, with kitchen waste comprising 6% of the total and greenwaste 11%.

Table 2.3 – Residential General Refuse, 2008

Waste category		% of total	Wt per capita per week	Wt per capita per annum
Organics	Kitchen waste	5.6%	0.06 kg	3.0 kg
	Greenwaste	11.2%	0.12 kg	6.0 kg
	Subtotal	**16.8%**	**0.17 kg**	**9.0 kg**

2.1.3 Residential Landscaping Refuse

In most urban centres, commercial operators will collect greenwaste from households and transport it to either a waste disposal facility or a composting operation (which are frequently situated at disposal facilities). Lawn mowing and landscaping contractors also remove considerable quantities of greenwaste from residential properties.

Householders are also able to transport all types of waste, including greenwaste, to transfer stations or landfills for disposal.

While most disposal facilities have separate drop-off points for waste loads composed totally of greenwaste, mixed loads that include other materials must be disposed of with general refuse. Certain types of plant material can not be readily processed or composted and are considered to be contaminants in the composting process. These types of plants, which include bamboo, flax, and cabbage trees, are disposed of with general waste and landfilled.

Approximately 47 kg per capita of landscaping refuse from households is disposed of to landfill each year. Approximately two-thirds of this waste is greenwaste. The remainder is mostly soil and timber.

Table 2.4 – Residential Landscaping Refuse, 2008

Waste category		% of total	Wt per capita per week	Wt per capita per annum
Organics	Kitchen waste	0.0%	0.00 kg	0.0 kg
	Greenwaste	64.7%	0.58 kg	30.3 kg
	Subtotal	**64.7%**	**0.58 kg**	**30.3 kg**

2.1.4 Other Organic Waste

An unknown quantity of organic waste is disposed of onsite by householders through composting and worm farming processes. Several studies into the uptake of home composting in New Zealand are outlined in Section 4.

The kitchens of many residential properties, particularly in urban areas, are also equipped with in-sink food waste disposal units. The ground food waste is disposed of through a sewerage system, treated at a wastewater treatment plant, and, in most cities in New Zealand, the resulting sewage sludge is disposed of to landfill. Estimates suggest that about one-third of households have an in-sink food waste disposal unit.

2.2 Overseas Food Waste Data

A 2011 study by the Swedish Institute for Food and Biotechnology (SIK) on behalf of Food and Agriculture Organization of the United Nations (FAO), Global Food Losses and Food Waste estimated food loss and waste from Oceania of 110 kg per person. This is significantly higher than the 64 kg per person per annum in Table 2.1, however the Swedish figure is for food waste generated, not food waste disposed of to landfill, and therefore does not take into account food waste diverted to composting or in-sink food waste disposal systems. (See Section 6.7 for more information on this study).

3. Organic Waste Collections

There are a number of different types of organic waste collections available in various parts of the country.

Most households and businesses in New Zealand have access to a private collection service for greenwaste. Food waste collections are far less commonly available. A small number of territorial authorities provide their residents with a food waste, green waste, or food and green waste collection, through a private contractor. These are paid for either out of rates or on a user-pays basis. These local authorities are listed in Table 3.1.

Table 3.1 – Council collections of food and green waste

Local Authority	Service
Christchurch City Council	Weekly organic waste (food and green) collection using 80-litre wheelie bins. Rates funded.
Kawerau District Council	Fortnightly green waste collection in 240-litre wheelie bins. Rates funded.
Selwyn District Council	Weekly user-pays (added to rates) organic waste (green and food) collection using 240-litre wheelie bins.
South Taranaki District Council	Fortnightly user-pays (pre-paid stickers) green waste collection using 240-litre wheelie bins.
Timaru District Council	Weekly collection of organic waste (food and green) using 240-litre wheelie bins. Funded through targeted rate.
Whakatane District Council	Fortnightly green waste and food waste collection in 240-litre wheelie bins. Rates funded.

There are currently no private food waste collections for households, but in certain urban areas businesses are able to contract a collection service for food waste.

In Auckland several companies collect commercial food waste for composting or stock feed. Most of the post-consumer food waste is transported to Envirofert in Tuakau for composting, by a number of commercial contractors, including Reclaim, Transpacific Industries, and We Compost. Rubbish Direct collect food waste to be processed by BioCosmo. A large proportion of pre-consumer commercial food waste in the greater Auckland region is collected by EcoStock Supplies Limited and processed into stock feed.

In Wellington, businesses can contract Kai to Compost to collect food waste, which is then delivered to the council's commercial composting facility. Another initiative called Kaibosh provides an avenue for retailers to dispose of food that's good enough to eat, but not good enough to sell, and redistribute it to Wellington charities that work with people in need.

In Christchurch, the council food waste collection is available to all rateable properties, including businesses.

4. Home Composting

The following data has been provided by Jenny Marshall from a Literature Review into Composting as part of a Special Topic Community-Based Social Marketing paper at Massey University, in 2013.

Two nationwide surveys of food waste composting have been undertaken in New Zealand. A survey of 1,930 people for the Ministry of the Environment in 2003 evaluating the "Reduce your rubbish campaign" found that 43% composted at every opportunity; 14% at most; 6% at 'some' and 3% at a 'few' opportunities (Feldhaeuser, 2003).

Out of 1,000 people surveyed for the 2008 Household Sustainability Survey, 63% said they composted garden waste and kitchen scraps at home with 10% stating they had a worm farm. In the urban North Island (cities with >30,000) they found that 58% composted and 12% worm farmed (Johnson, Fryer, & Raggett, 2008).

In Christchurch in 2002, 57% of those surveyed were found to compost at home, yet 60% still got rid of their kitchen waste in the council collection or via their insinkerator. Kitchen waste at 30% made up the largest proportion of rubbish in council bags (Moore, Pontin, Duggan, & Selby-Neal, 2002).

By comparison, research in Auckland in 2011 found that only 39% of Aucklanders composted at least some of their garden waste, with just 31% of Aucklanders stating that they compost half or more of their garden and kitchen food waste (Mobius Research and Strategy Ltd, 2011).

A survey of 323 people in Tauranga found that 50.8% of those surveyed composted food scraps compared to 60% who composted garden waste (Banks, 2012).

In 2012, Auckland Council undertook a "Composting for Communities Trial", the primary objective of which was "to develop an effective means of encouraging composting behaviour among targeted communities in a culturally appropriate and empowering way." The trial monitored food waste generated by 53 households of Chinese, Niuean and Samoan decent and found that the average quantity of food waste generated across the households was 6.7 kg per week. By the end of the 10 week trial, on average each household had reduced the amount of waste they sent to landfill by 52%.

5. Estimated Costs of Wasted Food

There has not, to date, been any thorough analysis of the cost of wasted food in New Zealand. An estimate of the cost of wasted food in New Zealand has been put forward by The Australian Institute, but these costs are based on a survey sample of only 204 households. Several overseas studies have also been completed, and these are provided in Table 5.1.

Table 5.1 – Cost of avoidable food waste[4]

Country	Cost of wasted food	Reference
New Zealand	NZ$751 million per year NZ$458 per household per year NZ$155 per person per year	The Australia Institute, 2009
Australia	AU$5.1 billion per year AU$616 per household per year AU$239 per person per year	The Australia Institute, 2009
United States	US$43 billion per year US$147 per person per year	Jones, 2004
United Kingdom	£10.2 billion per year £420 per household per year £167 per person per year	Ventour, 2008
Scotland	£1 billion per year £430 per household per year £193 per person per year	Ventour, 2009

[4] From Food Waste Literature Review, Waiheke Resources Trust, 2009

6. Food Waste Research

Research into the potential for reducing avoidable food waste is relatively recent and, by necessity, methodologically complex. As in most matters related to waste, there are no standardised protocols for defining or quantifying food that is wasted, so it is not possible to directly compare the results of different studies. The results of several studies are summarised in the sections that follow.

6.1 Auckland Household Waste Prevention Study, 2013

In August 2013 Auckland Council completed *The Auckland Household Waste Prevention Study*. The aim of the study was to support the development of communications and waste education programmes for waste minimisation. The overall research objective was to provide a current picture of the factors influencing domestic waste behaviour (barriers and enablers) in Auckland. The study looked at these for seven different waste types; recyclables, food, garden, nappies, hazardous, large household and e-waste. The focus was on behaviours higher up in the waste hierarchy; reducing, reusing and recycling.

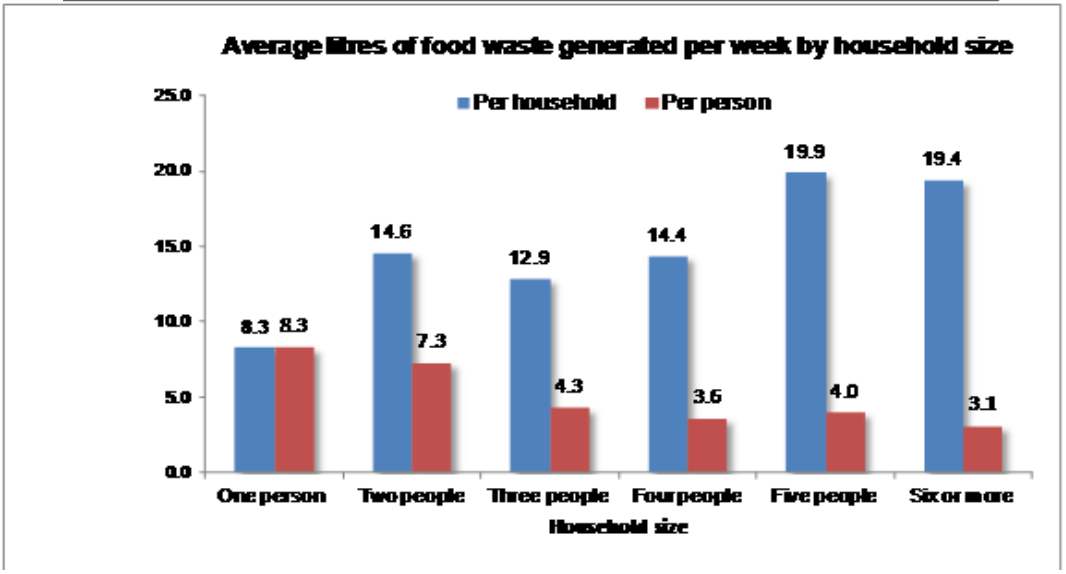
A representative sample of 3,210 Auckland residents was interviewed in the study which comprised a main online survey and four booster surveys.

A comprehensive literature review informed the design of the quantitative phase, and an additional online Waste Behaviour Diary was completed by 218 respondents to the main online survey.

The survey found that 74% of Aucklanders agree that waste is an important issue and that 83% of Aucklanders think that wasting food is wrong.

The following table illustrates the average quantity (in litres) of food waste generated by households of different sizes in Auckland.

Base size n=	25**	68*	24**	51*	25**	20**
Number of daily measures	175	476	168	357	175	140



NB. The above results should be treated with caution due to a number of small (*) and very small (**) sample sizes

6.2 Richard Denniss, Executive Director of The Australia Institute, 2011

In 2009, Richard Denniss, Executive Director of The Australia Institute, undertook a food waste survey 204 New Zealand households. The study found that each New Zealand household throws out $458-worth of food a year on average; $155 for every person in the country. This equates to a national figure of about $751 million of food being discarded annually. Australians disposed of food worth A$5.2 billion ($6.88 billion) each year - an average of A$616 ($815) for each household. 84 per cent of New Zealand householders said that they usually take a list when they go shopping and 77 per cent reported that they usually plan ahead and only buy what they came for. 85 per cent of New Zealanders said that the personal financial savings to be made from reducing food waste would be a motivating factor behind any effort they made to reduce their level of food waste. But only around 40 per cent identified environmental concerns as a motivating factor. Only 45 per cent of New Zealanders reported being concerned about their household food waste, while three in ten were not very concerned. A quarter of New Zealand households said they are not at all concerned.

www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10720052

6.3 Food Waste: Literature Review, unpublished, Waiheke Resources Trust, 2009

In 2009, as a precursor to the design and implementation of a food waste behaviour change programme on Waiheke, the Waiheke Resources Trust undertook a review of literature dealing with food waste behaviour change in New Zealand and overseas. The report concluded that:

"There are several implications from the literature on the proposal of a food waste pilot on Waiheke.

- Food waste is a problem with society level impacts, but behaviour change is influenced by factors both external and internal to individuals. The literature shows that the different levels of change are interconnected and mutually reinforcing (Darnton et al, 2006). Influencing individual behaviour change is, therefore, an important factor in broader change and remains a valid focus for intervention. However, if this is to effect sustainable systemic change, opportunities to transition individual behaviours and values to societal norms will need to be exploited. Interventions that use existing communities (whether these are communities of interest or communities defined by geographic boundaries) offer a way of linking these two parts together.
- With the topic of waste minimisation behaviour in regard to food waste having been little researched, the evidence based 'right answers' do not exist yet. As such, action learning is a relevant model to base a small scale pilot upon.
- With the economic cost of food waste being so great, and a common motivation for behaviour being that people are self-interested, pairing these two facts together seems an obvious and important inclusion in any intervention.
- Having an action plan (a set of steps that people can take to change their behaviour) makes good use of the motivating factors that can effect behaviour change. In regard to food waste, practical ways of dealing with food differently, such as portioning, freezing food and using leftovers, would provide simple steps that people can do easily."

6.4 Waste Not Consulting Ltd, unpublished SWAP research, 2008

To provide local data on the quantity of food wasted by New Zealand's households, in December 2008 Waste Not conducted a brief analysis as part of a regular domestic waste audit conducted for a local authority in the Auckland region. The audit involved sorting domestic kerbside refuse into 31

categories, including two separate categories for kitchen waste: 1) food waste (including waste from preparing food and spoilt food) and 2) 'wasted food' (defined as being food that, were it not for being in the refuse bin, could otherwise have been eaten). The analysis included 48 samples, each containing five wheelie bins of domestic refuse.

Results showed that 24% of the kitchen waste could have been eaten and was therefore classified as 'wasted food'. As kitchen waste comprised 42% of the total refuse, by weight, wasted food represented 10% of the total domestic kerbside refuse set out by households. This equated to approximately 0.95 kg every time a household sets out domestic kerbside refuse for collection.

Although specific data were not recorded, it appeared to the staff involved in the waste audit that bread was the most frequently wasted food item.

6.5 FoodWise Australia, 2013

The following data was used by Do Something! (on the FoodWise website) to calculate the new national food waste figure for Australia of $8 billion.

To better understand community knowledge, attitudes and behaviours about household food waste, 1,200 NSW households were surveyed as part of the 'Food Waste Avoidance Benchmark Study'. This NSW Government study was the most comprehensive analysis of community knowledge, attitudes and behaviours yet conducted in Australia about food waste.

As a result of this study, NSW Government stats from 'Love Food Hate Waste' estimate that the average NSW household throws out $1,036 of food every year.

Do Something! found that this $1,036 figure was similar to unpublished food waste research from a Government department in another state.

In NSW, food waste also makes up to 38% of the total rubbish in household garbage bins. Garbage bin analysis in other states reveals a similar percentage of food waste in household garbage bins (up to 41%).

Given the national consistency that we found on food waste levels across Australia, we arrived at the $8 billion figure by extrapolation. The $1,036 figure was multiplied by the number of households across Australia. The recently released ABS 2011 Census stats says there were 7,760,320 populated households.

7,760,320 populated households multiplied by $1,036 is $8.04 billion.

The following Government data was used to calculate the 4 million tonnes of food waste figure:

The National Waste Report 2010 by the Department of Environment, Water, Heritage, and the Arts estimated that 35% of municipal waste is food (equivalent to 2.675 million tonnes of household food waste).

The National Waste Report also estimates that 21.5% of commercial and industrial waste is food. This is equivalent to 1.388 million tonnes.

Adding these figures together, Australia discards an estimated 4.06 million tonnes of food every year.

http://foodwise.com.au/food-waste/food-waste-fast-facts/

6.6 Global Food Waste Not, Want Not, Institute of Mechanical Engineers, 2013

Today, we produce about four billion metric tonnes of food per annum. Yet due to poor practices in harvesting, storage and transportation, as well as market and consumer wastage, it is estimated that 30–50% (or 1.2–2 billion tonnes) of all food produced never reaches a human stomach. Furthermore, this figure does not reflect the fact that large amounts of land, energy, fertilisers and water have also been lost in the production of foodstuffs which simply end up as waste. This level of wastage is a tragedy that cannot continue if we are to succeed in the challenge of sustainably meeting our future food demands.

In order to help prevent a future global food crisis, the Institution of Mechanical Engineers recommends:

1. The UN Food and Agriculture Organisation (FAO) works with the international engineering community to ensure governments of developed nations put in place programmes that transfer engineering knowledge, design know-how, and suitable technology to newly developing countries. This will help improve produce handling in the harvest, and immediate postharvest stages of food production.

2. Governments of rapidly developing countries incorporate waste minimisation thinking into the transport infrastructure and storage facilities currently being planned, engineered and built.

3. Governments in developed nations devise and implement policy that changes consumer expectations. These should discourage retailers from wasteful practices that lead to the rejection of food on the basis of cosmetic characteristics, and losses in the home due to excessive purchasing by consumers.

www.imeche.org/docs/default-source/reports/Global_Food_Report.pdf?sfvrsn=0

6.7 Global Food Losses and Food Waste, Swedish Institute for Food and Biotechnology (SIK), 2011

A 2011 study by the Swedish Institute for Food and Biotechnology (SIK) on behalf of Food and Agriculture Organization of the United Nations (FAO), Global Food Losses and Food Waste estimated food loss and waste from different area of the world as shown in the table below.

Food loss and waste per person and year	Total	At the production and retail stages	By consumers
Europe	280 kg	190 kg	90 kg
North America and Oceania	295 kg	185 kg	110 kg
Industrialized Asia	240 kg	160 kg	80 kg
sub-Saharan Africa	160 kg	155 kg	5 kg
South and Southeast Asia	125 kg	110 kg	15 kg
Latin America	225 kg	200 kg	25 kg

The study suggests that “roughly one-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year”.

www.fao.org/docrep/014/mb060e/mb060e00.pdf

6.8 What a waste: An analysis of household expenditure on food, The Australia Institute, 2009

This paper examines who is wasting food and the motivations behind this behaviour. The research is based on an online survey of 1,603 main grocery buyers across Australia.

The average Australian household throws out an estimated $616 worth of food a year, which equates to $239 per person. Households throw out more than $1.1 billion worth of fruit and vegetables each year, more than any other food type, followed by restaurant and take-away food that is bought but left uneaten. Australian households are also throwing out $872.5 million worth of fresh meat and fish every year.

The data reveals that the extent of food waste is related to both household income and the number of household occupants. The amount of food wasted increases with household income and decreases with larger household sizes. Households with four or more occupants waste the least food per person, while people living by themselves waste the most. The report concludes that most people are aware that they waste a significant amount of food and know what kinds of behaviour are likely to help them reduce their waste. The problem is not a lack of awareness but of translating this into behaviour change. If government policy is to be effective in reducing food waste, it will need to focus on discouraging retailers from promoting wasteful purchasing activities.

www.tai.org.au/index.php?q=node%2F19&act=display&pubid=696

6.9 New South Wales: Food Waste Avoidance Benchmark Study, 2009

These research findings have been used to develop the NSW Love Food Hate Waste program which aims to minimise food wastage in the home.

The people who waste the most food are:

Young consumers (aged 18–24) are:

- more likely to feel that a busy lifestyle makes it hard to avoid wasting food
- more likely to throw away food that has passed its ‘best before’ date (regardless of quality)
- less likely to consider whether food will be eaten (at time of purchase)
- less likely to shop to a set budget.

Households with incomes more than $100,000 per year are:

- more likely to make extra just in case
- more likely to use leftover food for other meals
- less likely to have members of the household eat the same meal
- less likely to consider portion sizes when cooking.

Families with children are:

- more likely to do one large shop
- more likely to buy items on special and in bulk
- less likely to check ‘best before’ and ‘use by’ dates when shopping
- less likely to make meals from assorted ingredients that need using up.

www.lovefoodhatewaste.nsw.gov.au/resources/fact-sheets.aspx

6.10 WRAP – The food we waste, 2008

The UK government-funded organisation WRAP (Waste & Resources Action Programme) published a report in 2008 entitled 'The food we waste'. This report showed that one-third of all food purchased in the UK is disposed of without being eaten. The study also found that most of the food wastage by UK households was avoidable and 61% of the food that was wasted could have been eaten had it been better managed (e.g. left-over takeaways, food that was past its expiry-date). According to the research, about 115 kg of food per person is wasted each year, 70 kg of which could have been avoided. This figure includes all types of waste disposal, including landfills and composting.

'Truly unavoidable' food waste, like vegetable peelings, meat bones and carcasses, tea bags, coffee-grounds etc, accounted for 19% of the total food waste and the remaining 20% was classified as 'possibly avoidable' food waste, such as bread crusts or potato skins that do not necessarily need to be discarded if the food is prepared in specific ways. Over one-quarter of the avoidable food waste thrown away each year is either whole or still in its unopened packaging.

The top ten types of avoidable food waste, as a percentage of all avoidable food waste, were found to be:

1. Potatoes
2. Bread slices
3. Apples
4. Meat or fish mixed meals
5. World breads (e.g. naan, tortilla)
6. Vegetable mixed meals
7. Pasta mixed meals
8. Bread rolls/baguettes
9. Rice mixed meals
10. Mixed meals

www.wrap.org.uk/thefoodwewaste

6.11 Wasteful Consumption in Australia, The Australian Institute, 2005

Based on a national survey of 1644 respondents carried out by Roy Morgan Research in November 2004, this research was designed to assess the extent of behaviour that can be defined as wasteful consumption together with its prevalence among different types of households and individuals. The survey also set out to understand some of the attitudes associated with wasteful consumption.

Overall, Australians threw away $2.9 billion of fresh food, $630 million of uneaten take-away food, $876 million of leftovers, $596 million of unfinished drinks and $241 million of frozen food, a total of $5.3 billion of all forms of food in 2004.

Young people waste more than older people. Wasteful consumption of food, for instance, falls sharply as age increases. Among 18-24 year olds, 38 per cent admit to wasting more than $30 on fresh food per fortnight, whereas only seven per cent of people aged 70 or over admit to similar levels of waste. Households with higher incomes waste more than those on lower incomes. Parents of young children throw out more fresh food than any other household type. 60 per cent of Australians say they feel some guilt when they buy items that do not get used while 40 per cent say they do not feel guilty.

Australians can be divided broadly into four types according to the amount of wasteful consumption they engage in and their attitudes to spending on goods they do not use. The four types are as follows.

Guilty wasters: accounting for around 14 per cent of the population, these are people who say they feel guilty when they buy things they do not use but are wasters nevertheless.

Who cares wasters: also accounting for around 14 per cent of the population, these are people who say they are not bothered about spending money on goods and services they don't use. Whether big wasters or not, they are relaxed about buying things that are not subsequently used.

In-denial wasters: accounting for around 15 per cent of the population, in-denial wasters are those who waste a lot but say they hardly ever buy things that don't get used.

Saints: these are Australians who waste little, think carefully about how much use they are going to get out of the things they buy and feel guilty when they do waste things. Around 40 per cent of Australians fall into this category.

www.tai.org.au/documents/dp_fulltext/DP77.pdf

6.12 Using Contemporary Archaeology and Applied Anthropology to Understand Food Loss in the American Food System, Timothy Jones, 2005

This study by the United States Department of Agriculture sought to quantify food losses throughout the marketing system – from harvesting and processing through to retail distribution and the household.

Household food loss was estimated to be 82 kg per person per annum. This total consisted of the following foods:

1. Grain 20%
2. Meat 11%
3. Fruit 16%
4. Vegetables 27%
5. Fats 2%
6. Liquid 5%
7. Slop 4%
8. Other 13%

Of this total, about 14% was packaged edible food (food that had not been taken out of its original packaging and was not out of date).

www.ce.cmu.edu/~gdrg/readings/2006/12/19/Jones_UsingContemporaryArchaeologyAndAppliedAnthropologyToUnderstandFoodLossInAmericanFoodSystem.pdf

6.13 The Soggy Lettuce Report, Prudential UK, 2004

A UK study, completed in 2004, by insurance and investment firm Prudential found more money is wasted on food each year in the UK than any other category of goods or services – "a whopping £424 per person" per year. In this report, a "shopping list of shame" revealed that over half of the 1000 people interviewed discarded lettuce, bags of salad, loaves of bread and fruit every week. Other items that were commonly discarded were milk, cooked meat, biscuits, and wine.

www.recycleforgloucestershire.com/shopsmart/assets/soggy_lettuce_pru.pdf

7. Food Waste Behaviour Change Programmes

The following section provides an overview of behaviour change reports and projects from New Zealand and abroad.

7.1 Waiheke Resource Trust, 2013

Following on from a small trial undertaken in 2010, The Waiheke Resource Trust has received a grant from Auckland Council to undertake a food waste reduction behaviour change programme on Waiheke.

The project, which has just begun (August 2013), will start with a sample of 50 local 'early adopter' households, and work with them over eight weeks to further develop a series of tools to reduce food waste disposal, and encourage home composting.

The Waiheke Resource Trust has identified five skills required to reduce food waste in a household, including:

1. Planning
2. Storage
3. Portions
4. Leftovers
5. Recycling

These early-adopter households will be provided with a booklet of skills and a clear bench top container to collect food waste. They will be encouraged to record the weight or volume of food waste generated each week. Once an eight-week programme has been completed with these households, and the findings from their participation, including their feedback, has been analysed, the Waiheke Resource Trust will undertake a pilot programme with up to 250 households in a predetermined area of Blackpool on Waiheke.

7.2 Create Your Own Eden, 2013

Create Your Own Eden (CYOE) is a programme aimed at encouraging adults to compost, and is currently being run by Auckland, Nelson and Invercargill council's.

A recently released report Create Your Own Eden, Report on Key Learnings, Auckland Council, 2013, estimates that in the last 10 years, CYOE has reached an estimated 20,000 people in Auckland, and led to the diversion of around 16,600 tonnes of organic waste from landfill.

www.createyourowneden.org.nz/index.html

7.3 Food waste messages for maximum impact – how to engage your residents in prevention and collections, WRAP UK, 2013

The purpose of this guide is to provide advice on how a typical local authority waste/recycling officer can develop and deliver a communications campaign to reduce the amount of good food which goes to landfill from households and maximise participation in food waste recycling collections. This guide is based on new message testing with consumers and the latest findings from WRAP on the relationship between food waste recycling collections and food waste arisings. Getting the communications right will reduce the amount of food wasted in the first place, and that is going to

landfill. This brings financial benefits to local authorities and consumers, and environmental benefits overall.

www.wrap.org.uk/sites/files/wrap/Food%20waste%20messages%20for%20maximum%20impact%20WRAP%20UK.pdf

7.4 Guidelines On The Preparation Of Food Waste Prevention Programmes, European Commission, 2008

This document is aimed primarily at national policymakers developing National Waste Prevention Programmes (NWPP) as required by the 2008 Waste Framework Directive. It can also support policymakers in developing national strategies for biodegradable municipal waste, required under the Landfill Directive.

Many actors are involved in food waste prevention, however, and this document aims to be a useful tool for waste management organisations, businesses, institutions, local authorities and environmental protection agencies as well. It adds to the 2009 Waste Prevention Guidelines, focusing on the opportunities for waste prevention in the food waste stream. It may also be relevant for policymakers to look at the 2011 Methodological Guidance Note on preparing waste management plans.

These guidelines cover the European policy framework for bio-waste and more specifically food waste, approaches to measurement of food waste, target setting, and prevention strategies. A sector-based approach to prevention is proposed, focusing on the key producers of food waste and the different prevention techniques suitable to address the causes of food waste in each sector. Key sectors addressed are local authorities, households, the hospitality industry, the retail supply chain, businesses and institutions (such as schools and hospitals).

http://ec.europa.eu/environment/waste/prevention/pdf/prevention_guidelines.pdf

8. Current New Zealand research

8.1 Massey University - Lindsey du Preez

Lindsey Du Preez, a Massey university student and former waste minimisation officer at Auckland Council, has agreed to undertake research into food waste for WasteMINZ as part of her Massey University coursework.

This research will look at international campaigns to examine what behaviour change tools have been successfully implemented leading to food waste reduction.

Overseas, many different techniques have been used to engage householders ranging from awareness raising events using celebrity chefs to promote ways of reconstituting last night's dinner, to shopping lists, food diaries and what 'best before' means.

The topic will be explored by undertaking the following:

- Conducting a literature research of key international food waste campaigns;
- Establishing which have successfully used behaviour change tools and what these tools are; and
- Considering the feasibility of using one of these tools in the New Zealand context.

The results of this research are expected to provide preliminary information for organisations responsible for campaigns by providing them with a comprehensive list of what has been done and an assessment of behaviour change tools which have been evaluated and shown to lead to behaviour change. However, tools and techniques may differ in different social, political and economic situations and so this information is expected to be a stepping stone to taking New Zealand further along the process to 'reducing its foodprint'.

Due date February 2014

8.2 Otago University - Miranda Mirosa

Miranda Mirosa, Lecturer in Food Science at Otago University, is planning a project in 2014 to investigate how consumers' food stocking and storing practices for perishable products contributes to food waste and what we might we do to improve these practices. Part of this project will involve working with Catherine Irvine and Ian Featherson, the Waste Strategy Officers at the Dunedin City Council, to do a Dunedin resident household waste-stream analysis to determine current waste flows (i.e. what are the range of waste types) and waste practices (i.e. patterns of what's not consumed). To do this, fourth year Consumer Food Science students will work with the Dunedin City Council as part of their in-class activities for FOSC456 (a Consumer Research Methods paper) to sort and measure the contents of householders' black rubbish bags that are collected by the Dunedin City Council in the usual weekly rubbish collection. Fifty bags will be collected from a range of addresses each week over a five week period with a total of 250 bags analysed in total.

8.3 Massey University - Sergio Motta

Sergio Motta, a PhD student at Massey University, will be investigating the risk of food contamination in the home, across stages of food preparation. Sergio has surveyed 2,775 households in Brazil and 658 in New Zealand. The survey includes a questionnaire containing 140 questions covering the practices and behaviour of consumers with regards to food handling. The questionnaire is split into 8 sections.

Stage 1: Choosing & purchasing food
Stage 2: Food safety knowledge & concerns
Stage 3: Food transportation
Stage 4: Storage & preservation of food
Stage 5: Food preparation & cooking
Stage 6: Handling of leftovers
Stage 7: Kitchen layout & the use of kitchen appliances
Stage 8: Personal hygiene & basic health care

Sergio has finished the analysis and is currently writing his thesis which he expects to submit shortly. For New Zealand, choosing and purchasing food, food preparation and cooking, and the handling of leftovers appear to be the stages of most concern.