Health Impact Assessment on the draft Wairoa District Council Waste Management Activity Management Plan

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In partnership with Wairoa District Council

With assistance from Quigley and Watts Ltd
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Acknowledgements

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The assistance we received from Jamie Cox from Opus in Wairoa in setting up the stakeholder workshops was also appreciated.

We would also like to thank the community members, organisations and other individuals that gave their time for the stakeholder workshops. Without their feedback we would not have been able to undertake the Health Impact Assessment.

The administration support from Audrey Garrett and Lynn McCowan has also assisted us greatly in undertaking this HIA.

The Ministry of Health, Health Impact Support Unit Learning by Doing fund has funded this Health Impact Assessment and we have appreciated the support given to us from this unit.

We would also like to thank Rob Quigley from Quigley and Watts for his assistance, facilitation and mentoring in undertaking this Health Impact Assessment. Finally we would to thank Rachel Meikle from Quigley and Watts for undertaking the literature review for us.
Foreword: Whanau Ora - The concept of holistic wellbeing

The relationship between waste and health/wellbeing may be foreign to some people but understanding how broader factors (including waste) might influence health is essential for understanding why a health impact assessment might be undertaken. Further, Maori models of wellbeing are important within a New Zealand context, particularly in Wairoa. Such a model is Te Pae Mahutonga, a Maori conceptual framework which can be used as a guide in developing strategies.

Te Pae Mahutonga is the constellation of stars popularly referred to as the Southern Cross. Each pointer describes an element of wellbeing:

**Mauriora**
access to te ao Maori, which can lead to a secure cultural identity.

**Waiora**
acknowledges environmental protection. It acknowledges the link between people and the natural environment. It encourages people to take care of their communities and the natural environment.

**Toiora**
- promotes health lifestyles

**Whaiora**
- participation in the wider community

**Nga Manukura**
- supporting Maori leadership

**Te Mana Whakahaere**
- autonomy, self governance.

(Adapted from Professor Mason Durie’s Te Pae Mahutonga Model)
Maori Community Development

The foundation of good decision-making in environmental health issues such as waste management lies in the meaningful involvement of affected people in the community and giving them control over planning processes.

Community development is recognised as a key mechanism of achieving population health targets. Maori community development requires recognition of the needs, concerns, interests and distinctive situations of Maori. This requires government, non-government organizations and hapu and Iwi to work together in partnership.

*(ESR – Waste Management, Models of Maori Community Development 08)*
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# Glossary

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<th>Definition</th>
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<tr>
<td><strong>Fly Dumping</strong></td>
<td>Illegal dumping of any waste material on either public or private property</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td>Any material, solid, liquid or gas that is unwanted and or unvalued and discarded or discharged (NZ Waste Strategy: Towards zero waste and a sustainable New Zealand Ministry for the Environment 2002)</td>
</tr>
<tr>
<td><strong>Waste Minimisation</strong></td>
<td>Refers inclusively to all activities aimed at preventing, reducing, reusing or recycling product. (NZ Waste Strategy: Towards zero waste and a sustainable New Zealand Ministry for the Environment 2002)</td>
</tr>
</tbody>
</table>
Executive Summary

Wairoa District Council (WDC) recognises that waste management is an issue for the district and already provides significant resources for waste management and litter control. Despite these commitments, the management of waste in the District is not perceived to be ideal by the council or the community. The draft Wairoa Waste Management Activity Management Plan has been developed to provide options to create a more coordinated approach to Waste management.

The Wairoa District Council (WDC) was invited to engage with the Hawke’s Bay District Health Board (HBDHB) to conduct a Health Impact Assessment (HIA) on the Wairoa Waste Management Activity Management Plan.

Health Impact Assessment is a multidisciplinary approach that investigates the potential public health and wellbeing outcomes of a proposal. Its aim is to deliver evidence based recommendations that inform the decision-making process, to maximise gains in health and wellbeing and to reduce or remove negative impacts or inequalities. It aims to help the council to deliver the best possible service within the available resources. HIA uses the broad definition of health used by the World Health Organization:

“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

Public health and wellbeing are not solely determined by the health sector, as many people assume. The health sector spends the majority of its budget on treating unwell people but only a very small amount (approximately 2 percent in direct funding channels) on trying to prevent illness. Other public sector areas outstrip the health sector in their potential to affect, protect, and promote population health, their actions can have a significant impact on environmental and social health.
The four stages of a typical HIA have been undertaken, drawing together evidence from the social science literature, community representatives, community organisations and the Council.

The Waste Management Plan has a number of principal objectives. The HIA supports these objectives:

a) Zero waste to landfill by 2015
b) To ensure that waste is handled in appropriate and environmentally sound ways [consistent with all consent requirements]
c) To ensure that individuals within the community understand the options and choices they can make for the disposal of waste
d) Council and community work together to minimise waste and create a clean environment.

The two principal objectives that directly relevant to waste minimisation require a comprehensive approach to be achieved. The Waste Management Plan requires more emphasis on minimisation within the programs/options presented. At present the main approach suggested for minimisation is via user-pays refuse collection, which must be seen as one approach. Other options which support these principal objectives are detailed below, and could be a driving force to complement current minimisation practice.

The following recommendations also address the principal objectives that aim to ‘engage communities in the options and choices for their waste disposal’; and support the principal objective for ‘appropriate and environmentally sound ways to manage waste’:

1. The HIA focussed on rural communities, and it was clear from rural stakeholders (and the literature evidence base) that joint council-community management options are a promising approach to minimise waste, reduce fly-tipping, promote recycling and composting and for collection of domestic refuse. Stakeholders
believed such approaches could work in Waikaremoana, Mahia and Rauponga. Wairoa township would maintain a Council-led service.

2. The HIA does not support disinvestment from education initiatives, and this was backed up by all stakeholders and the literature evidence base. Investigating different ways to educate each community in waste minimisation via education and co-management arrangements is a promising approach. With no additional funding, greater outcomes could be achieved across a broader section of the community by taking into account the following:
   - Use local community members as champions and organisers
   - Personalise the benefits – describe how waste minimisation is important for people, not just the environment
   - Move away from exhortation (i.e I know best) and blame.
   - Move from head focused to heart focused
   - Focus on strong, visual images
   - Focus on positivity and optimism
   - Create a sense of “every little counts” and do not chastise people for the occasional mistake
   - Recognise that different people have different values and motivators - target messages accordingly
   - Associate waste minimisation with other important issues (e.g. safe communities, ethical or economical living).

3. Work in partnership with the Health Promotion workers at the Hawke’s Bay DHB on how to implement community education programmes (as that is a particular skill set of theirs)

4. The school based waste education programmes that are adopted by schools should include a whole-school approach (similar to Health-Promoting Schools), which takes into consideration: curriculum, learning & teaching; school organisation, ethos & environment; and its community links, relationships and
partnerships. The actions flowing from these school-based programmes should align directly with Wairoa District Council’s Waste Management Plan priorities. The Hawke’s Bay DHB Health-Promoting schools Advisor for the district is available to work in partnership with the Wairoa District Council to achieve this outcome.

5. Full subsidy domestic refuse collection works against the waste minimisation principal objectives of the Waste Management Plan. Full user pays stimulates positive waste minimisation behaviours but leads to issues of fly-dumping by a small component of the community and resentment about ‘paying twice’. Partial subsidy is a middle ground which is suitable for Wairoa township, providing some incentive for positive behaviours, equalising the burden of expenditure across all socio-economic households in the district, and potentially reducing fly-tipping.
History of Engagement

The Wairoa District Council (WDC) was invited to engage with the Hawke’s Bay District Health Board (HBDHB) to conduct a Health Impact Assessment (HIA) on the draft Wairoa Waste Management Activity Management Plan. The Hawke’s Bay District Health Board is currently working with local government bodies to incorporate Health Impact Assessment into their planning processes.

This is because public health and wellbeing is not solely determined by the health sector, as many people assume. The health sector spends the majority of its budget on treating unwell people, but only a very small amount (approximately 2 percent in direct funding channels) on trying to prevent illness. Other public sector areas outstrip the health sector in their potential to affect, protect, and promote population health. Actions from other public sector areas, such as local government can have a significant impact on environmental and social health.

This HIA process is supported by a successful application to the Ministry of Health’s Health Impact Assessment ‘Learning by Doing fund’ which supports District Health Board’s and council’s to adopt the tool by engaging ‘experts’ in this area to learn the process. The funding has therefore enabled Quigley and Watts consultants to facilitate the process and Otago University to formally evaluate the Health Impact Assessment process. The evaluation report on this HIA will be available separately to this HIA document and can be obtained by contacting the authors of this HIA report.

Background

In March 2008 the Hawke’s Bay District Health Board held an “advocacy” HIA seminar. As a result of this seminar the HBDHB was approached by the Engineering Manager of the Wairoa District Council with the possibility of undertaking an HIA on the Waste Management Policy for the Wairoa district. Following a meeting with some of the senior
management at the council it was decided to proceed with doing the HIA on the Waste Management Activity Management Plan.

Wairoa District Council has tried many different initiatives to manage waste in the district. The council have found it difficult to find a model that works for the district and this is compounded by the fact that the district is diverse in its make up and hence its needs. There has been feedback from stakeholder consultation that each community is unique in its make up and hence requires a localised solution e.g. rural farming, geographically isolated, and holiday populations each require a considered response.

Feedback from a community stakeholder group also stated that Wairoa is a community that sometimes does not fit with national directives or strategies. While many regions are looking for solutions that minimise landfill use, Wairoa landfill has an option for another 100 years at current volumes. However this option is not the most cost effective option – see Level of Service component – Long Term Disposal Options – option 2 below

Currently the Wairoa District Council has a problem with illegal dumping and the associated risks (including health). Annual clean-up costs to the council are approximately $60,000. During holidays there is a significant increase in the districts population, with increased littering on beaches, reserves and roadsides.

The Wairoa District Council has a planned approach to waste management in its district and conducted a survey of the residents asking them to give their feedback and recommendations on solutions to the situation. This comprehensive survey received a response of over 200 surveys returned from the 5400 households in the district. Following the survey the council convened a forum of respondents who worked through some of the issues in more detail to develop options. It is on these draft plan options that the HIA has been undertaken.
The Health Impact Assessment report (with recommendations relating to the Waiora Waste Management Activity Plan) will be given to the Wairoa District Council to assist them in their decision making process for the Long Term Community Consultation Plan (LTCCP). The key officer involved in writing the plan is involved in the HIA approach.

The Hawke’s Bay District Health Board would like to strengthen its partnership with the Wairoa District Council to support the recommendations in this report.

Overview of the Wairoa Waste Management Activity Management Plan

The plan gives background information on the waste situation in Wairoa, community outcomes and four proposed levels of service. Each of these four levels of service has subsequent service components, including total annual cost estimate, annual cost per ratepayer and discussions around the risks and opportunities. Three of these levels of service were the focus of the HIA, as decided by the scooping meeting.

Overview of activity and Councils involvement

The council is responsible for the management of waste in the Wairoa District. Council owns and operates (through private contractors) a central landfill and recycling facility.

There is a strong legislative basis for Council’s involvement in the Waste Management Activity. Specific legislation relevant to the waste management and minimisation planning processes are the:

- Health Act 1956
- Local Government Act 2002
- Litter Act 1979
- Resource Management Act 1991
- Hazardous Substances and New Organisms Act 1996
- Waste Minimisation Act 2008
- Health and Safety in Employment Act 1992

Other relevant legislative, regulatory and advisory documents include

- Wairoa District Council Waste Management Plan 2005
- Wairoa District Council Solid Waste Bylaw
- Regional Resource Management Plan (NB this document includes the Regional Policy Statement -2006) (Hawke's Bay Regional Council)


**Community Outcomes To which the activity contributes and how it contributes**

<table>
<thead>
<tr>
<th>Community Outcomes</th>
<th>How the Activity Contributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Safe And Secure Community.</td>
<td>By ensuring commercial, industrial and private consumers have a means of waste disposal to facilitate business operations.</td>
</tr>
<tr>
<td>A Life Time Of Good Health And Wellbeing.</td>
<td>By reducing public health risks that could arise from uncontrolled disposal of waste.</td>
</tr>
<tr>
<td>An Environment That Is Appreciated, Protected And Sustained For Future Generations.</td>
<td>By providing a means of waste management and facilitating education of the</td>
</tr>
</tbody>
</table>
Activity Goal and Principal Objectives

a) To ensure that relevant legislation, regulations plans, policy and bylaws are monitored and enforced such that Council meets its requirements.

b) Zero waste to landfill by 2010

c) To ensure that waste is handled in appropriate and environmentally sound ways consistent with all consent requirements

d) To ensure that individuals within the community understand the options and choices they can make for the disposal of waste

e) Council and community work together to minimise waste and create a clean environment

Proposed levels of service covered in the HIA

The three proposed levels of service covered in the HIA are:

1. Level of Service: Council Will Provide a Landfill Facility for Disposal of Domestic and Commercial Refuse

1a) Level of Service component – Long Term Disposal Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Option Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 - Close Landfill</td>
<td>Land filling operation ceases. All residual waste is transported out of district. Recycling centre still in operation.</td>
</tr>
<tr>
<td>Option 2 - Status quo</td>
<td>Will require a new cell every 5 – 6 years. Current gate charges not covering all costs. Waste Management Specialist report indicates gate charge would need to increase to $245 per tonne.</td>
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1b) Accepting Waste at the Landfill
<table>
<thead>
<tr>
<th>Option</th>
<th>Option Description</th>
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</thead>
<tbody>
<tr>
<td>Option 1 - Compulsory to sort refuse</td>
<td>Only sorted waste to be accepted at landfill. Green waste and recyclables must be separated. If not separated customers guided to sorting area before waste is accepted.</td>
</tr>
<tr>
<td>Option 2 - Status quo</td>
<td>Individual choice whether to recycle - if you want to pay to dump in landfill it's up to you.</td>
</tr>
<tr>
<td>Option 3 - Encouragement to sort refuse.</td>
<td>All landfill traffic directed to recycling centre prior to weighbridge</td>
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2. Level of Service – The Council will Actively Promote and Educate the Public about Waste Minimisation

<table>
<thead>
<tr>
<th>Option</th>
<th>Option Description</th>
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<tbody>
<tr>
<td>Option 1 - No Waste Education</td>
<td>Discontinue education programme in schools and general education initiatives for general public</td>
</tr>
<tr>
<td>Option 2 - status quo</td>
<td>Education programmed focussed on schools with some initiatives moving into marae, businesses, general public</td>
</tr>
<tr>
<td>Option 3 - More expenditure</td>
<td>Increase spending on education to target a broader cross-section of the community</td>
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</table>

3. Level of Service – The Council will provide a domestic refuse collection service

<table>
<thead>
<tr>
<th>Option</th>
<th>Option Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status Quo</td>
<td>Fully user pays refuse collection. Customers have the option of using the Council Contractor's collection service, using a different supplier or taking their own refuse to the landfill.</td>
</tr>
<tr>
<td>Partially subsidised system</td>
<td>Bag rate set at $1.00 (for example) Remainder of costs funded via a uniform charge on rates</td>
</tr>
</tbody>
</table>
The plan discusses other options around possible levels of service, which are as follows:

- Adequate litterbins in streets and public places
- Council will operate a 3-Bin Collection System (Wairoa Urban area)
- Stop urban recycling collection service
- Rural recycling drop-off centres
- Increase rural recycling pick up frequency
- Green waste service for Mahia
- More bins and/or a litter warden for Mahia at Christmas Holidays

The final sections of the plan address the existing situation, maintenance and operation, future demand, new capital expenditure, and funding the annual net cost etc.
HIA Process Used


It is usual within an HIA to compare one proposed option against another, either comparing a proposal with business as usual or comparing various proposed options available. In this instance the status quo was compared with the following levels of service:
1) The council will actively promote and educate the public about waste minimisation,
2) Domestic refuse collection service
3) Landfill minimisation options as they relate to the above

The four key stages in a Health Impact Assessment used were

- Screening
- Scoping
- Appraisal
- Evaluation and Reporting

**Screening**

Screening was the initial selection process to assess whether the waste management plan was suitable for a health impact assessment. The screening for the Wairoa Waste management activity management plan HIA was undertaken by a small team with representatives from Wairoa District Council and the Hawke’s Bay District Health Board. This process showed that it would be appropriate to undertake a HIA on the Wairoa Waste management activity management plan.

**Scoping/setting the priorities of the HIA**

Scoping highlighted the key issues that needed to be considered and set out what was going to be done in the HIA. The scoping meeting was held with a group of key stakeholders on the 6 March 2009 and was facilitated by Robert Quigley from Quigley
and Watts, and Ana Apatu from the Hawke’s Bay District Health Board. A full copy of the scoping report is available from the authors of this report.

From the scoping meeting the group made the following recommendations about the HIA and its scope:

Suggested new wording:

At the scoping meeting the group made recommendations about the HIA and its scope, and these are summarised in the next section.
Aims and Objectives of the Health Impact Assessment

Aim:
To inform the decision makers of the potential health and wellbeing positive and negative health and wellbeing impacts of the Wairoa Waste Management Activity Management Plan.

Objectives:
- Enhance working partnerships between the Wairoa District Council and Hawke’s Bay DHB through shared planning and resourcing.
- Assist the Wairoa District Council to build on the positive aspects of the strategy and reduce any unintended negatives impacts and hence develop a well rounded strategy.
- To build capacity for Hawke’s Bay District Health Board and Wairoa District Council staff to use HIA in Hawke’s Bay.
- To support the Wairoa District Council’s consultation process with the community
- To provide recommendations on the implementation of the Wairoa Waste Management Strategy from the Health Impact Assessment process to the decision makers
- To disseminate the HIA findings into the wider policy arena of all relevant agencies.

Determinants of Wellbeing/Health
The stakeholder community group identified the following key areas of wellbeing they felt would be impacted as a result of the plan being implemented and hence would be the focus of the HIA:

- Community Pride/Involvement/ownership
- Community Education/awareness/empowerment
- Waste Management (excluding wastewater)

Populations Affected
The following population groups affected by plan were prioritised by the stakeholders as:
- Rural Community (e.g. low income through to farming etc)
• Low income groups
• Holiday Population

It was felt that the population group who reside in the urban environment were not a priority for this HIA. The community representatives expressed concern regarding agrichemicals, waste in rivers, and rubbish on road sides that disproportionately affects the rural environment.

It was also identified that there was concern with waste from holiday makers in the Wairoa District Council district.

**Appraisal**
The aim of this stage was to appraise the draft Strategy’s potential to affect wellbeing and population health, if the strategy is implemented. This stage also determined what practical changes could be made to the policy to promote and protect wellbeing and health.

For this Health Impact Assessment several sources of evidence were used to assist in undertaking the appraisal. These were:

• Literature review (undertaken by Quigley and Watts)
• Community profile
• Interviews with community and key stakeholder groups
• Scan of relevant policy and strategy documents.

**Evaluation**
This assesses how the HIA process was undertaken (process evaluation) and the extent to which the recommendations were taken up by the policy makers (impact evaluation). The evaluation was undertaken by the HIA Research Unit at the University of Otago.
Appraisal Findings

Literature review

The full literature review is available in appendix one. A summary of the literature review is as follows:

Safe disposal of all waste is important for health, well being and environmental sustainability.

This review of literature addresses the following questions:

- What interventions are effective in changing waste behaviour?
- What domestic refuse collections are effective in changing waste behaviours?
- What is the relationship between waste and health?

Interventions that address waste reduction are more effective in total waste management than recycling alone. While recycling is important it is only one part of total waste management. Perhaps the most important contribution recycling makes is that it is often the starting point for people to go on to adopt other more effective waste management and waste reduction behaviours. People generally “feel good” about participating in recycling and it requires few real lifestyle changes. Waste reduction requires a much greater commitment and effort from citizens.

Interventions that address the full combination of factors involved in waste behaviour are more likely to succeed. It is essential that barriers to participation are minimised, particularly for those in low socio-economic groups. Providing accessible infrastructure for waste disposal, management and recycling is vital. The infrastructure must be easy for people to get to, both for urban and rural dwellers, it should be in areas where people will feel safe and the cost must not be prohibitive. High cost options discourage use and encourage illegal dumping.
Regulated interventions which are well monitored are more successful than voluntary interventions. However there is still value in offering voluntary interventions if regulated options are not possible or until regulation can be introduced.

In a hierarchy of options for waste management reducing waste takes priority, followed by re-using, recycling, recovery, treatment and, lastly, disposal.

A variety of school-based interventions have been found to be useful in raising awareness and increasing knowledge about waste reduction and management. Some of these have resulted in positive behaviour change. Interventions that involved intergenerational input from youth seem to have worked well and have generally been considered worthwhile. School children have been able to influence the behaviour of their families.

Managing domestic refuse is an important part of waste management. Facilities to deal with domestic refuse must remain accessible to all community members and especially those with the least resources. Domestic refuse collection services are important and the most effective way to encourage participation in managing waste.

Kerbside collections act as a visual prompt and a social pressure to recycle. Research has found kerbside recyclables collection to be more effective than drop-off sites. Rural communities need modified collection services to make them economic.

How often recycling collections are made depends on the community. Some literature suggested less frequent collection services can be more effective.

The demographics of the local community influences the type of interventions required, a one-size-fits-all is unlikely to be successful.

To achieve long term success, waste education requires consistent messages and regular updating to keep messages fresh and relevant to each particular community.
Communication can be effective in increasing awareness but does not guarantee behaviour change. Generally other activities which support the desired behaviours are also necessary eg easy and/or improved access to recycling and appropriate disposal methods.

A collaborative approach to community waste issues is likely to be the most powerful way to demonstrate desired waste behaviours and local community events and festivals are a useful way of getting the message to large numbers of people.

There are a number of regional and national waste management strategies existing in New Zealand which would assist Wairoa District Council in the development of its waste strategy.
Wellbeing and Health Pathways Identified in the Health Impact Assessment

**Community Education**
- Status quo in schools
- More quality education
  - Parental and wider community involvement
  - Co-management by local community leadership
  - Known community offenders
  - Link with other community agencies
  - Local interest
  - Known offenders
  - Local employment
  - Link to local solutions and other programmes

- Allows different ………….for education eg tourists

**Domestic Refuse Collection**
- Status quo Full user bays
  - Positive waste management behaviours
  - Recycling
  - Minimisation
  - Composting

- Community option
- Partial subsidy
- Full subsidy
- More affordable
  - Pay per bag
  - Less driving to landfill

- Compost locally
- Support community gardens
- Grow household food/kai.
- Feel good about the behaviours
- Social connectedness
- Local governance
- Wairua
  - Positive

- Whanau ora
  - Better use of council money from fly-dumping clean up
  - Reduced: visual pollution, transmission of disease, contamination of waterways, increased community pride, gathering kai and activity
  - Reduced litter
  - More equitable $1 per bag for all
  - Less likely to fly dump
  - Reduced: vermin, cats, pests
  - Less likely to fly dump

- Wairua
- Whanau ora

**Health Impact Assessment on the draft Wairoa District Council Waste Management Strategy**
None

Status quo in schools

More quality education

Decreased Whanau Ora

Negative Health & Wellbeing

Domestic Refuse Collection

Full user pays status quo

Partial Subsidy

Community option

Full subsidy

Does not meet Central Government priorities

Job losses from contractor service

No incentive to change waste minimisation or recycling

More waste to landfill

Abused by outsiders

Opportunity cost

Community anger

Health Impact Assessment on the draft Wairoa District Council Waste Management Strategy
Discussion

In Aotearoa/New Zealand and internationally there is increasing recognition of the role that various social, economic, environmental and political factors play in determining the health experiences and outcomes for individuals and social groups. These factors include such determinants as income, employment status, housing, education, social position and social exclusion. They can have both direct and indirect impacts on health as well as having interrelated and cumulative effects over lifetimes.

There is clear evidence of the differential distribution of the above determinants of health for Maori and non-Maori and they are the known cause of higher rates of death and disability for Maori.

It is therefore important to concentrate on upstream measures and interventions that impact on these determinants of wellbeing, and this includes waste and waste management.

The evidence base linking health and waste is not as clear as many would hope. Expert opinion from the World Health Organization suggests there are likely to be some negative health effects on populations living near waste disposal sites, however gold-standard research that measures exposure and isolates exposure from other confounding factors has not been undertaken. Studies have been done, and the studies show associations with negative health outcomes, but the studies lack the rigour required by the World Health Organization for them to state that there is a ‘casual relationship’ between exposure to waste and health outcomes, and hence the World Health Organization falls back on expert opinion.

However an absence of evidence does not mean absence of effect, and given that there are obvious plausible risks associated with waste eg toxic leachates in water supplies from landfills, it is important a precautionary approach is used.
There are obvious points in the waste chain where careful management can protect the environment and consequent the health of citizens.

The Christchurch City Council has used the evidence available and highlighted the following areas where there may be an association between waste management and health:

- Avoiding any environmental chemical contamination may prevent physical and emotional illnesses caused by chemical pollution. Keeping waste to a minimum has the potential to limit the spread of water-borne or infectious disease and improve the aesthetics of an area which enhances the sense of pride and community spirit.
- Not implementing or enforcing strict criteria may result in excessive waste production and contamination through inadequate waste disposal or air pollution from residential or commercial development sites that has the potential to adversely affect the health of the local residents
- Excessive waste in a residential area has the potential to not only affect the aesthetic quality of the neighbourhood but may also affect the mental and social health of the residents (Billante, Christchurch City Council).

The evidence that has been gathered for this report has now been described under the levels of service for Community Education and Domestic Refuse collection.

**Community Education**

The Wairoa Waste Management Activity Management Plan has three options to Actively Promote and Educate the Public about Waste Minimisation
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</tbody>
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During the Health Impact Assessment there has been no suggestion from the consultation held that ‘option 1 –no waste education’ is a favoured option, or should be an option considered by council. Both the stakeholder group and council value education and or providing information as a means to change behaviour with regards to waste management.

The discussion from various stakeholders, who were also representatives from their various communities, quickly progressed from the ‘status quo of education focused on schools’ to discussions about option 3 -reaching a broader cross section of the community. A fourth option ‘community ownership, or co-management of waste management was put forward by stakeholders. A similar discussion occurred with the stakeholders looking at domestic refuse.

Although an ‘option 4’ was not explicitly offered as part of the council plan, the council have voiced they would be open to exploring community co-management as an option to consider. Therefore this report will also include feedback, relevant evidence from the literature review and case studies to further
explore the option of co-management or total management of waste in communities.

The stakeholder group had mixed feelings about the education currently being offered in schools as a means to change behaviour regarding waste. Currently in Wairoa the council funds a Zero Waste school based programme which has been adopted by several schools throughout the Wairoa district.

The Zero Waste School Programme
This was aligned with the Zero Waste New Zealand Trust which is a charitable organisation and has dedicated its efforts towards zero waste and sustainable New Zealand for nearly 10 years. It has a facilitator which is funded by the Wairoa District Council that visits the schools and assists them with implementing the zero waste concept into the schools via a curricula based programme.

There is also two other school based programmes that address waste management within Wairoa/ Hawkes Bay. These are Enviro Schools and Health Promoting Schools.

Enviro Schools
Enviro Schools is a national programme which works towards a whole school approach to environmental education. Students develop skills, understanding, knowledge and confidence through planning, designing and creating a sustainable school. Action projects undertaken by Enviro schools have both environmental and educational outcomes that have the potential to benefit the school and the wider community, however projects are not required to align with issues of importance to local government.

In Hawke’s Bay it is championed by the Hawkes Bay Regional Council and there are 11 schools in the Hawke’s Bay District on the Enviro Schools ‘waiting list’.
This is indicative of the popularity of this approach and in part could be due to a facilitator being available to assist schools in Hastings/Napier regions due to limited resourcing being available. There are only two schools in Wairoa who are signed up to the programme, however because there is no Enviro schools facilitator for the Wairoa district they are currently inactive.

Enviro schools is perceived to be a Hastings/Napier programme, perhaps because there is no local coordinator and quarterly waste minimization group meetings are always held in Hastings. Rotating meeting venues and/or teleconferencing may assist to alleviate this issue.

**Health Promoting Schools**
Health Promoting Schools (HPS) in Aotearoa/New Zealand is based on the principles of the Treaty of Waitangi, Te Whare Tapa Whā model for hauora/well-being and the Ottawa Charter for Health Promotion. It is an effective way to improve the learning outcomes and health and well-being of all students in the school setting through a whole school approach. HPS focuses on schools as an integral part of the wider community and offers practical ways for children and young people, teachers, managers, parents and community members to contribute to schools and the wider community becoming healthy settings.

While it is not the purpose of this report to critique each programme and recommend one over the other, there were some valuable findings from both community feedback and literature for the council to consider.

The community representatives voiced that the status quo option had limited effect. While they value the education offered to schools, they felt that the parental and wider community involvement could be strengthened. There were feelings that those parents who were resistant to change would not be good role models for their children and that the change in behaviour would be through a generation growing up with this information so the change would be very slow.
Both Enviro Schools and Zero Waste target the child and there is no explicit effort to link back into the community needs. It is solely dependent of the child’s advocacy. Stronger mapping of such school programmes to Wairoa District Council priorities should be attempted, e.g. recycling or fly dumping. They also felt there would be limitations of targeting certain populations e.g. tourists, gangs etc.

The literature review also found that:

*Education based interventions alone are unlikely to change waste behaviour. This is because there is a broad set of factors that determine environmental behaviours, and consideration and incorporation of these into education programmes is required to improve the likelihood of successful change.* Timlette (2007), Tucker et al (2000), Berger (1997), Price (2001) and Margal (1997)

An evaluation of a four month school education based programme upon students’, parents’ and teachers’ environmental knowledge, attitudes and behaviour in Poland had a positive impact on students’ knowledge, and provided opportunities for further discussion with parents. 70% of parents reported discussing waste issues with their children while 34% of students had made suggestions to parents on how to improve their waste management practices.

However though knowledge increased this does not necessarily lead to improved waste management practice, as discussed in the literature review:

*This program did get students to identify specific actions that they could undertake to improve waste management in their house though there was no evidence that such practices had been adopted. It was suggested that following the program it could be possible that practices could change. In Poland the attitude is that cities should take care of environmental quality improvement, so*
there is little individual engagement, perhaps this is because the infrastructure to manage waste has been of poor quality. (tikka et al 2000 in Grodzinska- Jurczak 2003).

The community group were not totally supportive of spending more on education as offered in ‘Option 3 —Increase spending on education to target a broader cross-section of the community’. There was a sense that this would create increased cost to rate payers and impact on household spending. Also the cost to the council could be better spent in other areas. Using existing resources such as Health Promoting Schools, could assist the alignment of the council needs with school education interventions.

The group were focused more on how to get a whole school and hence a whole community response. The education programmes could include ongoing feedback, communication to the community e.g. good news stories, and at times ‘more in your face messages’.


**Communication**
Communication that provides instructional information on how to recycle showed a positive correlation between recognition of instructional information and higher levels of recycling (cited by Thomas (2001) in Timlett (2007). Tucker et al also agreed with the importance of this information. *Hounsham (2006) states that recycling messages should:*

- **Personalise benefits- important for people, not just the environment**
- **Move away from exhortation (i.e. I know best) and blame.**
- **Move from head focused to heart focused**
- **Focus on strong, visual images**
- **Focus on positivity and optimism**
• Create a sense of “every little counts” and do not chastise people for the occasional mistake
• Recognise that different people have different values and motivators - target messages accordingly
• Stop pretending that the environment is the only thing that matters to people. Instead associate waste minimisation with other important issues (e.g. safe communities, ethical or economical living).

Communication methods – leaflets are the most commonly used and are generally well received - though there is a risk that they can be dismissed as junk mail. Usual newspaper, radio, signs in community places such as libraries, community halls and facilities, talks to schools, bin stickers, fridge magnets, websites can be used, but the choice is usually determined by budgets and staff expertise rather than demonstrated effectiveness. One of the stakeholders advised that for getting messages on waste management to rural people to utilise the following:
  • websites for computer literate sector,
  • school news letters are good,
  • Wairoa Star has quite a high rural readership

Martinez (1998) found that in US counties where there were greater media efforts regarding recycling there were higher recycling rates. Martinez also reported that education levels within a particular geographical area were a proxy for receptivity and so challenges communication messages to align with barriers identified in the targeted area. This reinforced that one-size-does-not-fit-all, and that different messages may be required for different groups. Others have suggested education levels and affluence are the main socioeconomic variables linked to recycling participation (Coggins 1994 cited in Perrin and Barton, year). Interestingly, the Margal study (1997) was designed to demonstrate that in low socio economic areas participation rates in recycling can also be raised with the right campaign.
This then lead onto the discussion of co-management and local communities taking ownership of the issues. There were local examples such as the lakes restorative trust at Lake Waikaremoana where they had both issues of tourism-waste and local community members dumping rubbish that they were contending with.

Because there is some local ownership of the problems, people that were dumping rubbish were known to the community. With this model there was potential to work with other community agencies such as Sport HB eg recycling bins at sport events and the potential to target particular groups to foster leadership and ownership e.g. the mongrel mob.

This model would therefore support incorporating the principles of the Treaty of Waitangi:

- **Partnership**, The Wairoa District Council has the opportunity to sharing of power and decision making in better managing its waste in partnership with local communities
- **Active protection of resources**, Katiakitanga, the ability to exercise the stewardship of resources (Hoskins R. 08).
- **Tribal rangatiratanga** which would encompass notions of tribal authority, the ability to exercise control over ones environment.

The group were quick to point out the connectedness to health such as community ownership community pride, fostering leadership, and the potential to create local solutions to local needs.

The negative impact on wellbeing that this model may create is that many of the existing leaders at times are responsible for ‘everything’ in that community and may become overwhelmed or stretched in their capacity to deliver, and therefore ineffective and potentially littering could continue.
Another query raised that was if the community identity those that do litter – how do they deal with them. Could this potentially lead to members being alienated or victimised as a result?

The discussion around co or total management model could be more holistic in its delivery e.g. educative, create local business/community engagement opportunities e.g. composting, recycling, and or could be co-located near other ventures, such as the firewood depot, so that there was a presence to ‘man the transfer station’. One of the stakeholders posed the question “Could corrections become involved in manning transfer stations with Periodic Detention (PD) people?”

**Domestic Refuse Collection Service**

The report will now discuss the potential negative and positive impacts that domestic refuse collection service may have on wellbeing

*Level of Service – The Council will provide a domestic refuse collection service*

<table>
<thead>
<tr>
<th>Option</th>
<th>Option Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Status Quo</td>
<td>Fully user pays refuse collection. Customers have the option of using the Council Contractor's collection service, using a different supplier or taking their own refuse to the landfill.</td>
</tr>
<tr>
<td>2. Partially subsidised system</td>
<td>Bag rate set at $1.00 (for example) Remainder of costs funded via a uniform charge on rates</td>
</tr>
<tr>
<td>3. Fully subsidised</td>
<td>Full collection service funded through rates.</td>
</tr>
</tbody>
</table>

Health Impact Assessment on the draft Wairoa District Council Waste Management Strategy

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We have also included a fourth option of co-management by the community as discussed above.

**Option 1-Status Quo – Full User Pays**
The current status quo is full user pays which the stakeholders at the appraisal hui confirmed has lead to positive waste management behaviours (i.e. recycling, minimisation, composting) occurring in the community as outlined in the positive pathways. This leads to the reduction of litter, people feeling good about their behaviours and local composting.

The literature review looked at the “Pay As You Throw” schemes which has some similarities with the status quo of full user pays. This operates in 4000 USA communities and in Europe and the UK.

*This waste minimisation strategy starts with the householder and is not a result of a campaign or initiative but an extrinsic motivator- the cost of collection and disposal with an intended approach that it is equitable. The fee directly relates to the quantity of waste generated for disposal just like the householder pays for other utilities such as electricity or gas. Setting the trigger level for the incentive (price to throw) is tricky. If it is too high then it may encourage negative behaviour ( putting rubbish in others bins, using recycling bins for non recycled material, burning waste or fly dumping)*

It is interesting to note that the Pay as You Throw scheme is linked into a waste minimisation strategy. The literature review also considered the factors which influence environmental behaviour:

- *Economic needs are put first. “The motivation to undertake environmental behaviours only occurs when basic economic and survival needs were met” (Margal, 1197, p 2).*
Regulated environmental programmes are more successful than voluntary programmes. They have active reinforcement, increased education, financial incentives and social incentives. An economic incentive encourages law abiding behaviours (Everett and Peirce, 1993 and Folz and Hazlett. 1991) in (Timlett 2007)

Cost in time/energy to sort and deliver to kerbside are perceived to be barriers by populations

Another barrier is the perception that separating, handling and storing waste is dirty or unhygienic and therefore inconvenient. (Price, 2001)

Availability of storage containers and space for storage containers within the home/flat, and for recycling this includes space to store recyclables between collections

Available infrastructure for all to participate and have access to environmental protection services (Berger, 1997)


Several pathways lead to the reduction of litter which can then lead to better use of council money as it has less fly dumping etc to clean up. The literature review reported on data from the UK which indicated that the cost of fly tipping could be £100 million per year if costs to local authorities, environmental agency, private landowners and enforcement agencies were all included.

The reduction of litter will also have the following positive effects on waste management behaviours:

- Reduce the vermin/cats and pests present
- Reduce the visual pollution
- Reduce the transmission of disease
- Reduce contamination of waterways
- Increased community pride
• Protect kai gathering areas

This in turn leads to an enhancement in wairua (spirit) and whanau ora. Rau Hoskins commented recently in an article:

_A Maori sense of place can be seen to be connected to both ‘rangatiratanga’ (the ability to exercise the stewardship of resources) and ‘kaitiakitanga’ (the ability to exercise the stewardship of resources). When one’s control over the environment is progressively eroded, so in turn is one’s ability to act as kaitiaki for that environment. So one’s connection to place becomes confined to an academic or at best spiritual level. The newly coined term ‘mana whenua’ has been developed and is used widely to account for a Maori relationship with the environment which is no longer under their direct control – a tenuous shadow or a relationship where the substance of control resides elsewhere, with local, regional and central government or private landowners._

The stakeholders at the appraisal hui also confirmed that the “full user pays option” increases the expense for households and this reduces the income available for other household necessities and services. Reduction in income has the potential to reduced standards of living and decreased access to services and subsequent decrease in whanau ora and negative health and wellbeing. There is well established evidence of the relationship between income and health. In general, lower incomes are associated with high morbidity and mortality for many illnesses and injuries. [Hauora]

With the status quo- full user pays and partial subsidy there is also a perception of paying twice (ie in rates and for the service) as described by some of the appraisal hui stakeholders. The literature review also identified a barrier in a Pay as You Throw” scheme as being “paying for a previously free service”. One of the stakeholders commented that farmers would only really support full user pays
for domestic refuse under the present system as subsidising would lead to increased rural rates.

The appraisal hui also identified that with the “full user pays option” less waste is collected (and the waste collection trucks work quicker). This is supported by the literature review of a Canadian Study which through modelling discovered –

…if bag cost exceeded a cost of $2.20 people would seek alternatives: to take garbage to land fill or seek alternatives, waste reduction, recycling or illegal dumping. People did not want to enlist in commercial services that charged a higher rate.

With a faster collection service, earlier pick up of refuse bags was highlighted by the stakeholders and this caused problems for some people e.g. elderly who were not able to get the refuse out in time. Putting out the refuse the night before was not an option as it would be interfered with by animals etc. The pathway then goes onto explore the concept that the collection service was not being used and this would result in littering occurring. The impacts of this are the opposite to that described under the reduction of litter and would cause a decrease in whanau ora and negative health and wellbeing.

The full user pays scheme has also caused rural collection to occur less frequently in Wairoa and this has caused the efficiency of collection to be reduced. The reason for this reduction in waste was not fully explored with the stakeholders at the hui but the literature review found that

“there are varying reports about the impact the frequency of collection has on recycling, many stating recycling performances improves when frequency increases while Everett and Pierce reported that collection frequency appeared to have no effects on citizen participation or programme success”
One of the perceptions from the hui was that by having the efficiency of collection reduced people take waste to the landfill because they perceive it is cheaper. This causes an increase in transport costs to the households involved. There were several anecdotal situations given of people travelling vast distances just to “dump” their rubbish.

Another effect from the efficiency of collection being reduced was the potential service failure or significant cost per bag increases. This may lead to littering increasing as people might not be able to pay the full user rates.

**Option 2- Partially Subsidised Refuse Collection Service**

The evidence for this type of subsidy is similar but not as strong as that for the full user pays scheme. There is also an increase in positive waste management behaviours which would lead to a reduction in litter. The literature review commented that:

…variable fees alone may not achieve waste reduction. Variable fees are only part of a waste disposal policy that must be tailored with other tools and the needs of a community (Salkie).

Partial subsides make it more affordable for households with a no/low bag purchase price and less driving to the landfill. This was substantiated by the appraisal stakeholders and they indicated that there would be less fly dumping and with one of the reasons being it is more affordable at a $1 per bag. This would lead to a reduction in littering.

By having the income available for other uses there would be a reversal of the negative pathway which was described above in the statua quo - full user pays i.e. it would decrease the expense for households and this would increase the income available for other household necessities and services etc. This would have a positive effect on Whanau Ora.
The hui stakeholders also indicated that by having the partial/full subsidy people would continue to use the waste collection service. This means it would be more economically viable to continue (it could also be a more efficient service) and hence jobs would be maintained which would continue the to income for those employees and therefore positive health outcomes.

**Option 3 - Fully Subsidised Refuse Collection Service**
These positive pathways are the same as those for the partial subsidy and strengthened in relation to it being more affordable for households.

There is concern by the hui stakeholders that there would be no incentive to engage with waste minimisation behaviour. This would increase the amount of waste going to the landfill. The hui stakeholders also indicated that they believe the full subsidy scheme could be abused by “outsiders” to the district which would lead to community anger and hence a negative impact on whanau ora.

**Co-Management by the Community**
This scheme links into positive waste management behaviours as discussed above and the stakeholders at the hui felt it would have a strong positive impact on whanau ora. This has been discussed previously under the education section.

It was noted by the stakeholders that it would not be an option for all communities and would only work in communities which would be “organised” to deal with the issues. One of the constraints that were discussed was that often the leaders in the community were over-committed and that this needed to be taken into account when considering this option.

The hui stakeholders also indicated that if co-management by the community occurred it would have potential to create jobs in the community (need pathway
for this) and increase income etc, however it could cause job losses from the current contractor and hence loss of income and the subsequent effects as outlined in the negative health and wellbeing pathway.

There is strong evidence from the literature review that co-management from the community is likely to be effective. For example:

- Social aspects of kerbside recycling create a visual prompt for people to participate, just like the neighbours do (Berger, 1977)

- Face to face contact with residents increases recycling rates and range of materials collected. It is particularly useful for hard to populations (Tinlett 2007). Volunteer youth advisors have been used elsewhere (Grodzinska, 2005). Such campaigns must be supported with recycling infrastructure and communication material.

- Delivered written person feedback in positive language e.g. e.g. “Thanks for taking part and we’ve noticed that today you’ve included xxxxx” reduces recycling contamination and increases participation. It is best undertaken on the same day as collection (by the same provider).

- Local people known to households, who can personalise the message delivered to local households works well. (Meneses and Palacio 2007)

- Where rural collection of waste is uneconomic, a reduction in frequency from fortnightly to monthly for recycled paper showed little reduction in tonnage collected, but provided a sustainable service (Tucker et al 2000).
Limitations

The following limitations for this Health Impact Assessment are noted by the team when preparing this report:

Timeframes
We had limited timeframes in which to undertake the workshops and complete the report in a timely manner so it would be beneficial to the decision makers. Due to this constraint we were not able to do indepth consultation with the farming community and areas in the district where tourists impact on waste management activities.

Scope
The scope of the HIA is outlined above in the section entitled HIA process and does not include waste water or chemical contamination/disposal from the rural community.


Recommendations

The Waste Management Plan has a number of principal objectives. The HIA supports these objectives:

a) Zero waste to landfill by 2015

b) To ensure that waste is handled in appropriate and environmentally sound ways [consistent with all consent requirements]

c) To ensure that individuals within the community understand the options and choices they can make for the disposal of waste

d) Council and community work together to minimise waste and create a clean environment.

The two principal objectives that directly relevant to waste minimisation require a comprehensive approach to be achieved. The Waste Management Plan requires more emphasis on minimisation within the programs/options presented. At present the main approach suggested for minimisation is via user-pays refuse collection, which must be seen as one approach. Other options which support these principal objectives are detailed below, and could be a driving force to complement current minimisation practice.

The following recommendations also address the principal objectives that aim to 'engage communities in the options and choices for their waste disposal'; and support the principal objective for 'appropriate and environmentally sound ways to manage waste':

1. The HIA focussed on rural communities, and it was clear from rural stakeholders (and the literature evidence base) that joint council-community management options are a promising approach to minimise waste, reduce fly-tipping, promote recycling and composting and for collection of domestic refuse. Stakeholders believed such approaches
could work in Waikaremoana, Mahia and Rauponga. Wairoa township would maintain a Council-led service.

2. The HIA does not support disinvestment from education initiatives, and this was backed up by all stakeholders and the literature evidence base. Investigating different ways to educate each community in waste minimisation via education and co-management arrangements is a promising approach. With no additional funding, greater outcomes could be achieved across a broader section of the community by taking into account the following:
   - Use local community members as champions and organisers
   - Personalise the benefits – describe how waste minimisation is important for people, not just the environment
   - Move away from exhortation (i.e I know best) and blame.
   - Move from head focused to heart focused
   - Focus on strong, visual images
   - Focus on positivity and optimism
   - Create a sense of “every little counts” and do not chastise people for the occasional mistake
   - Recognise that different people have different values and motivators - target messages accordingly
   - Associate waste minimisation with other important issues (e.g. safe communities, ethical or economical living).

3. Work in partnership with the Health Promotion workers at the Hawke’s Bay DHB on how to implement community education programmes (as that is a particular skill set of theirs)

4. The school based waste education programmes that are adopted by schools should include a whole-school approach (similar to Health-Promoting Schools), which takes into consideration: curriculum, learning &
teaching; school organisation, ethos & environment; and its community
links, relationships and partnerships. The actions flowing from these
school-based programmes should align directly with Wairoa District
Council’s Waste Management Plan priorities. The Hawke’s Bay DHB
Health-Promoting schools Advisor for the district is available to work in
partnership with the Wairoa District Council to achieve this outcome.

5. Full subsidy domestic refuse collection works against the waste
minimisation principal objectives of the Waste Management Plan. Full user
pays stimulates positive waste minimisation behaviours but leads to issues
of fly-dumping by a small component of the community and resentment
about ‘paying twice’. Partial subsidy is a middle ground which is suitable
for Wairoa township, providing some incentive for positive behaviours,
equalising the burden of expenditure across all socio-economic
households in the district, and potentially reducing fly-tipping.
References


Appendix One - Waste Management Literature review
Literature Review of Waste Management for the Health Impact Assessment of Wairoa District Council’s Waste Management Plan

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For

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&
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Executive Summary

Safe disposal of all waste is important for health, well being and environmental sustainability.

This review of literature addresses the following questions:
- What interventions are effective in changing waste behaviour?
- What domestic refuse collections are effective in changing waste behaviours?
- What is the relationship between waste and health?

Interventions that address waste reduction are more effective in total waste management than recycling alone. While recycling is important it is only one part of total waste management. Perhaps the most important contribution recycling makes is that it is often the starting point for people to go on to adopt other more effective waste management and waste reduction behaviours. People generally “feel good” about participating in recycling and it requires few real lifestyle changes. Waste reduction requires a much greater commitment and effort from citizens.

Interventions that address the full combination of factors involved in waste behaviour are more likely to succeed. It is essential that barriers to participation are minimised, particularly for those in low socio-economic groups. Providing accessible infrastructure for waste disposal, management and recycling is vital. The infrastructure must be easy for people to get to, both for urban and rural dwellers, it should be in areas where people will feel safe and the cost must not be prohibitive. High cost options discourage use and encourage illegal dumping.

Regulated interventions which are well monitored are more successful than voluntary interventions. However there is still value in offering voluntary interventions if regulated options are not possible or until regulation can be introduced.

In a hierarchy of options for waste management reducing waste takes priority, followed by re-using, recycling, recovery, treatment and, lastly, disposal.

A variety of school-based interventions have been found to be useful in raising awareness and increasing knowledge about waste reduction and management. Some of these have resulted in positive behaviour change. Interventions that involved intergenerational input from youth seem to have worked well and have generally been considered worthwhile. School children have been able to influence the behaviour of their families.

Managing domestic refuse is an important part of waste management. Facilities to deal with domestic refuse must remain accessible to all community members and especially those with the least resources. Domestic refuse collection services are important and the most effective way to encourage participation in managing waste.

Kerbside collections act as a visual prompt and a social pressure to recycle. Research has found kerbside recyclables collection to be more effective than drop-off sites. Rural communities need modified collection services to make them economic.
How often recycling collections are made depends on the community. Some literature suggested less frequent collection services can be more effective.

The demographics of the local community influences the type of interventions required, a one-size-fits-all is unlikely to be successful.

To achieve long term success, waste education requires consistent messages and regular updating to keep messages fresh and relevant to each particular community.

Communication can be effective in increasing awareness but does not guarantee behaviour change. Generally other activities which support the desired behaviours are also necessary eg easy and/or improved access to recycling and appropriate disposal methods.

A collaborative approach to community waste issues is likely to be the most powerful way to demonstrate desired waste behaviours and local community events and festivals are a useful way of getting the message to large numbers of people.

The links between health and waste are not clear. Expert opinion suggests there are likely to be some negative health effects on populations living near waste disposal sites but methods for measuring exposure and isolating effects from other confounding factors have not been developed. The studies which have been done lack rigorous method and have generally not been able to accurately measure exposure or risk. The range of different waste materials and the variety ways in which waste is handled and stored also makes research difficult.

However an absence of evidence does not mean absence of effect and given that there are obvious plausible risks associated with waste eg toxic leachates in water supplies from landfills, it is important a precautionary approach is used. There are obvious points in the waste chain where careful management can protect the environment and consequent the health of citizens.

There are a number of regional and national waste management strategies existing in New Zealand which would assist Wairoa in the development of its waste strategy.
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References
1. Introduction

Safe disposal of all waste is important for our health and well being and environmental sustainability. How we safely dispose of all waste is therefore a matter of importance to all New Zealanders.

The health impact assessment considers how three proposed options in the drafted Wairoa District Council’s waste management plan might impact either positively or negatively on the health and wellbeing of people in Wairoa District. It also aims to gather evidence about the proposed change, and make constructive recommendations about how the draft strategy and rules and any future programme may be improved.

1.1 Aims of the literature review

This literature review aims to identify:

- Interventions (particularly education interventions) that are effective in changing behaviours regarding waste such as waste minimisation or recycling.
- Effective domestic refuse collections that are effective in changing behaviours such as waste minimisation or recycling.
- The relationship between waste and health.

1.2 Waste definition

For the purpose of this report waste will be defined as:

Waste – generally start with the notion of 'discarding' or 'disposing'—'any material, solid, liquid or gas, that is unwanted and/ or unvalued, and discarded or discharged by its owner’ or can extend to – reuse, recovery and recycling. This definition recognises that what one person or organisation regards as waste can be a useful resource when used again for a beneficial purpose’


2. Methods

This review aimed to investigate the following three questions:

- What interventions are effective in changing waste behaviours?
- What domestic refuse collections are effective in changing waste behaviours?
- What is the relationship between waste and health?

2.1 Search Strategy

A mixed method approach was used in this review. Initially three databases were searched Scopus, EBSCO and Web of Science. The following key words were included in the search.

Recycling
Waste
Waste reduction
Refuse
Rubbish
Rubbish minimisation
Recycling minimisation
Behaviour
Behaviour change
Education
Attitudes
Refuse collection
57 papers were identified for further reading of abstracts. 22 papers were obtained, read and analysed for possible inclusion. All of the papers described studies outside of New Zealand therefore the second step was to search Google for relevant for New Zealand reports and case studies that could utilise existing national policies, programmes and infrastructure which might be more relevant to Wairoa. A further 3 New Zealand papers were identified from the Google search and included in the analysis. A number of key people were contacted and a snow ball method was used to identify local case studies and networks. Both quantitative and qualitative evidence was included in the review. A lot of the New Zealand literature relating to waste programmes is descriptive, anecdotal and was not peer reviewed.

Sources:
Websites searched:
- Sustainable Household Programme http://www.sustainablehouseholds.org.nz
- EnviroSchools - http://www.enviroschools.org.nz
- Grass roots recycling network- http://www.grrn.org

Key people contacted:
Clair Mortimer – Landcare NZ, formerly at Auckland Regional Council (ARC)
Lyndsey Dupreez - Auckland City Council
WasteWise - Danielle Kennedy
Auckland Regional Council - Hillary Childow
Paul Prendergast - Ministry of Health: Public Health Engineer
Ngarimu Blair- Orakei Marae - Ngati Whatua o Orakei
3. Findings

3.1 Interventions that are effective in changing behaviours regarding waste
Most of the literature is from the United Kingdom, United States and European countries. There were more studies on recycling than other behaviours such as reducing and reusing waste, and there were many studies on education-based waste reduction interventions. Some of the literature was peer reviewed while a lot of the New Zealand literature is descriptive, anecdotal and was not peer reviewed.

3.1.1 Factors that change waste behaviours
Education based interventions alone cannot change waste behaviour. Environmental behavioural factors must be considered and incorporated into education programmes to improve the likelihood of behaviour change. A number of researchers (Berger 1997; Margai 1997; Price 2001; Timlett 2007; Tucker et al 2000) outlined factors that influence environmental behaviour. These factors are summarised below.

- Economic needs are a priority for households – ‘motivation for environmental behaviours only [happens] when basic economic and survival needs were met’ (Margai, 1997:2)
- Regulated environmental programmes were more successful than voluntary programmes and active reinforcement, increased education, financial incentives encourage law abiding behaviours (Everett & Pierce 1993; Folz and Hazlett 1991 cited in Timlett 2007).
- Perceived inconvenience eg. sorting and delivering to kerbside is costly in time and energy.
- Perception that separating, handling and storing waste is dirty or unhygienic (Price, 2001).
- Availability of storage containers and space for storage containers within the dwelling (home/flat) including space to store recyclables between collections.
- Available infrastructure for everyone in the community to participate and have access to safe waste disposal services.
- Age, dwelling ownership rates, household size (Margai 1997), education levels and affluence are predictors of recycling behaviour (Perrin & Barton 2001).

3.1.2 Waste reduction a priority over recycling
Waste reduction is a more effective total waste management solution than recycling. The New Zealand Waste Strategy (2002) refers to the waste hierarchy noting that the most preferred waste options are reducing waste, followed by re-using, recycling, recovery, treatment and, lastly, disposal.

More research was found on recycling than other aspects of waste management. However encouraging waste reduction in the community is more effective than managing waste once it has been created. Price (2001) viewed recycling as a simple solution to waste generation and a means of avoiding disposal while minimising lifestyle change. Timlett (2007) reported recycling is perceived to be a good thing to do but notes that recycling rates are often exaggerated and not realised when collections are actually monitored.
Waste reduction is different from recycling, it is more comprehensive and requires more emphasis within total waste management programmes. Findings from Margai’s (1997)
waste reduction behaviour study in a low socio-economic area in urban New York found there were no improvements in waste prevention but there were improvements in recycling participation and improvements in total daily recyclables.

Berger (1997) found that those who recycle are more likely to engage in other environmental behaviours even if the behaviour requires a greater personal effort. Berger also poses that though kerbside recycling is a cost to municipalities, it could be the first step in developing an environmentally responsible society where individuals may sensitize other people to adopt other pro-environmental behaviours (such as using reusable shopping bags). A policy implication of this is recyclers can be segmented as an audience to engage with other pro-environmental behaviours.

The findings strongly signal that waste reduction is a more effective total waste management solution than recycling and should be strongly emphasised in the Wairoa waste strategy.

3.1.3 Communication
Communication is a common tool used to change behaviour. Tucker (2000), Martinez (1998) and Timlett (2007) support communication as an effective intervention for improving recycling rates. Communication that provides instructional information showed a positive correlation between recognition of instructional information and higher levels of recycling.

Recycling messages should:
- Personalise benefits that are important for people not just the environment
- Move away from exhortation (i.e. I know best) and blame
- Focus on strong, visual images
- Focus on positivity and optimism
- Create a sense that ‘every little bit counts’ - do not chastise people for the occasional mistake
- Recognise that different people place different values on waste management and have different motivators’ - target messages accordingly
- Stop pretending the environment is the only thing that matters to people. Instead, associate waste management with the other causes (e.g. safe communities, ethical or economical living) (Hounsham 2006 cited in Timlett 2007)

Martinez (1998) reported that communication messages must be appropriate to the local community, considering e.g. education levels, socio-economic status. A one size fits all’ approach is unlikely to be successful.

It is important to note there is debate about, and limited research into, the effectiveness of communication campaigns used in isolation since most communication campaigns have been associated with infrastructure developments.

The Big Clean Up campaign: The Big Clean Up, run in 2003 as part of the New Zealand Waste Strategy, was a pilot social marketing campaign that had a communication component. One aspect of the programme was an advertising campaign that used television advertising and media. The campaign was supported by a website and 0800 number. The aims were:
- To encourage territorial authorities and other waste related organisations to work collaboratively regarding environmental issues.
- To encourage environmental behavioural change (including waste reduction)

The results showed that territorial authorities could effectively work collaboratively on waste and environmental issues. The Big Clean Up campaign was reported to be a success as it:
- ‘Created a lot of noise for a relatively small amount of money’ (Mortimer, 2009).
- Drove 30,000 people to seek further advice about waste reduction or report environmental incidents to a website and/or an 0800 number within a six week period
- Created a mandate for policy change

The research that followed the campaign was particularly useful in identifying gaps in people’s knowledge in order to identify the issues that needed follow-up.

The slide below indicates that the campaign did change behaviour.

![But behavioural change?](image)

12% increase – washing cars on lawn/car wash
12% increase will wash paint brushes inside sink
40% increase in pollution hotline calls

(Frame and Mortimer, n.d:slide 49)

3.1.4 Educational programmes for waste behaviour
There has been considerable research into designing waste education programmes. Many environmental education programmes have failed because they focussed on what the organisation wanted to say rather than how to make the content suit the audience’s learning process (Anderson 1995 cited in Meneses 2006). The following programmes and models are examples of effective education based initiatives.
**Information processing:** In this model, programmes need to encourage an educational approach to using habitual and low commitment behaviour eg. separating recyclables in a community rubbish bin. It aims to change ‘know, feel, do’ to ‘know, do, feel’ so that people exhibit positive waste behaviour even if they do not feel like it. Know (about the ecological impact), do (carry out the recycling), feel (having an emotional response only AFTER carrying out the desired behaviour. Classic learning theory in recycling programmes has focused on the do at the end. Results from this study showed this alternative approach to be efficient and effective as it took into account recycling as a norm, was proactive and facilitated by the local authorities (Meneses 2006). This model is suited to the consolidation of routine activity without the need to change attitudes.

**Door stepping:** A face-to-face approach that has been used effectively in the USA and UK in urban and semi-rural settings (Timlett, 2007). It has been effective in engaging residents with the services (i.e. gets people to participate in using the waste/recycling infrastructure), increasing the range of materials recycled and improving the quality of recyclable materials. It is most suitable for populations where previous methods have failed, e.g. hard to reach communities, because this approach would be too costly to use to target everyone. In studies where trained youth volunteers from local schools conducted the face-to-face contact sessions, intergenerational communication and influence were identified as strengths. The study found this method enhanced waste management knowledge of the young people and their families (Grodzinska- Jurezak et al, 2005).

Door stepping campaigns need to be supported with communication materials and need to be targeted to areas where there is sufficient waste infrastructure. While this approach seems to be effective in changing behaviour in the short-term, there is limited research on its sustained effect and on the cost analysis of the relatively new door stepping method. Door stepping is influenced by seasonal variation and it is possible household waste rates drop in winter as resident's burn paper and cardboard in wood burners.

**Delivering written personal feedback:** This intervention is used in a number of countries including the United Kingdom and USA. It is based on the premise that the majority of people get waste disposal wrong because they do not understand how to do it properly. Therefore specific instructions are given on how to rectify the situation using positive encouraging messages. Timlett (2007) identified this as highly effective and the most cost effective intervention in reducing contamination (contamination refers to non targeted materials in recycling). Studies by Perrin and Barton (2001) and Timlett (2007) found waste participation rates increased by 48% and 50% respectively when this approach was used. They found written feedback was best delivered at the point of service i.e. on the day of collection.

A study by Staats (2004) extended the feedback concept by using social pressure to encourage neighbourhoods to participate. For example, feedback such as ‘participation in your neighbourhood is worse than x neighbourhood’ or ‘x neighbourhood was better than z neighbourhood’ was used to change behaviour. However, some researchers have questioned whether or not written personal feedback is effective in the long-term maintenance of desired behaviour.
**Waste audit:** This New Zealand case study was based on empirical evidence from an Auckland based marae (Orakei Marae - Ngati Whatua o Orakei). It demonstrates the actions taken following a waste audit.

A local territorial authority waste officer worked with trustees of the marae and conducted a waste audit, separating waste into ‘waste that could be recycled’, ‘waste that could be composted’ and ‘other waste’. Information from the waste audit was presented to the marae committee and a decision was made to improve waste management and adopt a zero waste policy. One of the major catalysts was that waste was being transported out of Auckland into another iwi’s land in the Waikato at Hampton Downs landfill. ‘This was a cause of embarrassment for the people of Orakei Marae’ (Blair, 2009).

Since the waste audit, composting and bokashi¹ units have been introduced and follow-up site visits and support from local territorial eco advisors started. Orakei staff are now familiar with the system and it has become a norm. Kitchen gardens have been established and members are re-learning traditional gardening skills.

Although having the waste minimisation policy is a criteria for hiring the marae facilities, the current area for improvement is ensuring groups hiring the marae are able to implement the waste minimisation policy. Marae staff are familiar with procedures such as separating compostable waste and recyclables but those new to the marae may not be. There has been a huge shift in waste behaviour for the better but there is still room for improvement.

**Holistic community approach:** The Eco Team Programme (ETP) is a holistic community approach used in Holland (Staats et al. 2004) that was used over three year period and looked at environmental issues including waste. This approach used a holistic, social community approach to look at over 100 interrelated environmental behaviours. It aimed to increase response rates and particularly increase duration and maintenance of pro-environmental change.

The ETP targeted voluntary individual adoption of pro-environmental behaviour in the household using the following threefold approach:

1. Group setting (participants are usually known to each other) for environmental discussion
2. Information for discussion on six themes. Each theme was discussed over a four week period and information regarding all aspects of the themes (facts, ways to minimise impacts, steps to change behaviour) contained in a workbook.
3. Periodic feedback about waste volumes or energy use was given.

Waste was the first theme discussed. The self-reported results for a few of the behaviours studied in detail were validated by physical measures e.g reduction in solid waste or volume gas, electricity used. The study found half of the participants (n= 150) changed half of the 38 household behaviours examined, with corresponding reductions on the four physical measures of resource used. The improvements were maintained or improved two years after completion of the programme. It was found that strong social influence from the ETP team changed their behaviours. ETP was strongly based on

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¹ A small sealed composting unit suitable for indoor use that has sawdust with bacteria in it to aid composting.
Lewin’s (1947) findings that the social influence should be considered in educational programs. Lewin (1947) was a prominent psychologist who described the strong effects of participation in group discussions.

**School based education:** According to Ballantyne et al (2001) the following factors are known to be effective within the field of environmental education:
- Provide an enjoyable experience for the students
- Connect with the age and interests of the group
- Provide adequate support for learning
- Liaise with student parents
- Emotionally engage students in environmental issues

Ballantyne also discussed the benefits of intergenerational communication when youth are involved in environmental community programmes. With intergenerational contact there is the potential to change household environmental behaviour and as well as community behaviours. Intergenerational communication is supported by a Polish study (Grodzinska- Jurczak et al 2003); 70% of parents reported discussing waste issues with their children while 34% of students had made suggestions to their parents on how to improve their waste management practices.

Rickinson (2001) reported there is evidence that certain programmes can result in learning outcomes (changes in students’ environmental knowledge and/or attitudes), and, in a few cases, behaviour change. The long-term durability of the impacts from these programmes is not fully known as measurement were only taken for relatively short periods of time after the programmes had taken place.

The following two New Zealand school based programmes are examples of successful grass root programmes (anecdotal evidence only) as there are no formal published evaluations to date.

**EnviroSchools:** is a whole-school approach that has been operating nationally in New Zealand from 2001. The programme is based on Environmental Educational Theory and is part of the Ministry of Education's Environmental Education Guidelines. A regional coordinator supports the programme within regional council boundaries.

Class learning and action is organised around the following five themes:
1. Living Landscapes
2. Ecological Buildings
3. Healthy Water
4. Precious Energy
5. Zero Waste

The diagram below shows the action learning process outlined above:
Some of the relevant self-reported benefits of Enviroschools are summarised below:

Educational benefits
- An integrated approach means the curriculum is richer and more interesting for students. The action oriented approach and real life projects engage and motivate a diverse range of students.
- Students learn essential life skills. The projects undertaken by Enviroschools provide students with opportunities to learn about problem solving, decision-making, how to take action and how to make change happen.

Environmental benefits
- Significant reductions in energy and water use, and waste to landfill are being achieved by Enviroschools.
- Action projects undertaken by schools are resulting in enhanced biodiversity and protected healthy waterways.
- Most Enviroschools tackle projects to improve their school's physical surroundings e.g. gardens, murals, and sculptures. As a result, schools have found students had a greater sense of place and appreciation of their school and local area.
- Enviroschools found that environmentally friendly practices 'go home' with students and change parents' behaviour as well.

Social and community benefits
- The Enviroschools approach improves relationships between staff and students. It involves all staff and students taking collective and individual responsibility for the school.
- Schools report positive learning environments as a result of reduced bullying and anti-social behaviour.
- The programme provides a focal point for greater community involvement with their local school.

Economic benefits
- Financial savings for schools from more efficient practices such as reducing the amount of waste that is sent to landfill.
- Enviroschools provides a focal point for links between schools and businesses e.g. working on a joint environmental project.

**WasteWise**: This is a national programme that works with schools and is supported by the Ministry for the Environment. It is designed to create an awareness of waste and help schools improve their knowledge and understanding of ways they can reduce their own general waste, particularly disposing of their own organic waste (organics accounting for approximately 80% of total waste in schools). The programme offers regional contacts to help with bin set up, training for teachers, manuals and classroom activities.

**Sustainable Household Programme**: This education and action programme has been developed across New Zealand since 2001 by the local and regional Councils listed below. It was led by Marlborough District with involvement from environment centers,
high schools, and other adult education providers. Originally named Sustainable Households, it was assisted for its first three years by the Ministry for the Environment's Sustainable Management Fund (Projects 7067 & 6153). The now re-named Sustainable Living Programme has attracted many additional Council subscribers. For 2007-9 the partner councils have sought close links with Ministry for the Environment initiatives on household Sustainability, and secured funding to help develop these further, working alongside the Sustainability Trust. Hawkes Bay Region is a member of this trust. (www.sustainablehouseholds.org.nz)

3.1.5 Other programmes

Zero Waste: This is a global philosophy and a design principle for the 21st Century. It includes 'recycling' but goes beyond recycling by taking a 'whole system' approach to the vast flow of resources and waste through human society. It aims to:

- Redesign the current, one-way industrial system into a circular system modelled on Nature's successful strategies
- Challenge badly designed business systems and maximise human and physical resource use
- Address increasing waste of human resources and erosion of democracy through job creation and civic participation
- Help communities achieve a local economy that operates efficiently, sustains good jobs, and provides a measure of self-sufficiency
- Eliminate waste rather than manage waste

(http://www.grrn.org/zerowaste/zerowaste)

New Zealand is working towards Zero Waste at various levels:

- Central Government: Zero waste and Sustainable New Zealand is part of the New Zealand Waste Strategy (2002) which includes the recent Waste Minimisation Act (2008). These policies encourage waste minimisation and a decrease in waste disposal in order to protect the environment from harm and provide environmental, social, economic and cultural benefits.
- Local Government: councils have signed up to waste minimisation targets and are offering Zero Waste education programmes.
- Community: there is a Zero Waste New Zealand Trust.

Create Your Own Eden: This is a partnership across New Zealand local authorities to encourage households to increase composting using three methods

1) Traditional composting using a heap or bin
2) Vermiculture or worm farming
3) Bokashi.

The website (www.createyourowneden.org.nz) provides detailed information including step-by-step guides, frequently asked questions plus the ability to enrol in a practical workshop.

Community rewards: A pilot study in Portsmouth (United Kingdom) used one or a combination of the following techniques to enhance recycling participation rates.

- League tables for communities with prizes
- Rewards for increasing recycling performance paid back to the community to spend on specified projects or improvements.
- Recycling champions
- Charitable donations
Rewards to local schools

All of the schemes demonstrated positive behaviour change. However, there was uncertainty as to whether the behaviour change was due to the introduction of the scheme and associated infrastructure, or whether it was due to seasonal variations. It was also unclear which elements were the most effective ie, communication, feedback, financial reward or the work of a local outreach worker. It was found cash rewards only worked in achieving behaviour change to a limited extent as they needed to be of significant value to a household. A prize draw was found to be ineffective though there was limited communication about that particular scheme (Defra 2006 cited in Timlett, 2007)
3.2 Effective Domestic Refuse Collections in changing behaviour

3.2.1 Availability of recycling
There was consensus from researchers (Margai (1997), Price (2001), Timlett (2007) of the importance of an accessible recycling infrastructure in waste reduction. Berger (1997) stated safe waste infrastructures should be available for all citizens to use. Berger’s Canadian study of 43,000 households found those who recycled were also more likely to engage in other environmental behaviours even if the behaviour required a greater personal effort. Berger also suggested that although kerb recycling is a cost to municipalities it is helpful in developing an environmentally responsible society as it helps individuals to adopt other pro-environmental behaviours (such as carrying a re-useable shopping bag). Berger said that the provision of environmental protection services safe waste disposal should be similar to the need to provide health and education services. (Berger 1997)

Access to kerbside recycling
Access to kerbside recycling is the key factor influencing whether or not a household recycles its waste regardless of whether that household has a pro-recycling attitude or not. Access to a kerbside recycling service acts as a trigger to promote recycling behaviour. (Barr and Gilg, 2005 cited in Timlett, 2007). Berger (1997) stated that the size of residence area, type of dwelling, education and income are important determinants which affect whether or not people access recycling facilities. However, Berger questioned the relationship between socioeconomic status and recycling usage as socioeconomic status seemed to determine access.

Most studies were undertaken in high socioeconomic areas but a study by Margai (1997) which captured environmental behaviours in a low income urban area in New York found improved recycling participation rates, and an increased total volume of recyclables, following an outreach programme which improved physical access to recycling.

Social Aspects of Kerb Recycling
Research has indicated that the social visibility of recycling may create a context in which recycling is the norm. Kerb recycling can be a visual prompt to participation. Tucker (2000 et al) described “social recyclers” as those stimulated by the desire to be seen to participate in the same way as the neighbours do.

3.2.2 Frequency of recycling
There are mixed reports on the impact the frequency of collection has on recycling volume and rates. Many reports stated recycling performance improved when frequency of collection increased. The collection frequency varied. In some communities recyclables and general waste are collected on the same day, while others had separate days for recyclables and general waste. Some collected recyclables more often than general waste to encourage recycling rates. Collection frequency appeared to have no effect on citizen participation or programme success. (Everett & Pierce, 1993 cited in Timlett, 2007).

Reducing frequency of kerbside collection in a rural area
A study in Fylde Lancashire (population 20,000) by Tucker et al (2000) reduced the frequency of recycled paper collection from fortnightly to monthly. One of the reasons for this was that non-economic volumes of paper were being collected by the rural villages that made up 40% of contractors circuit. The intention was that if rural households collected paper for a month the volume would increase to make it more economic.

Computer modelling was used to predict recycling performance indicators and was verified by observed changes.

- 82% of residents maintained their same recycling behaviour despite the change in frequency.
- 18% changed their behaviour as a result of kerbside frequency.
- Half of the 18% converted to using drop off stations that were nearby i.e supermarkets
- Though 5% dropped out of recycling there were 3% new recruits so overall a loss of only 2%
- a 60% saving in costs making the contractors circuit economically viable and tonnage targets were still met.
- 40% fuel saving for the contractor.

An interesting finding was that there was a perception among citizens that a month’s accumulation was worth collecting and made a difference whereas a fortnight was previously thought to be insufficient for a fortnightly collection. Citizens had a choice of using a regular sized bag for paper collection or obtaining a larger one, if they needed it, at no extra cost.

**Fly Tipping**

There is debate on the strength of evidence on fly tipping (dumping waste illegally). According to WHO (2007) many reports are anecdotal. However in 2004 England and Wales the Department of Environment, Food and Rural Affairs (DEFRA) developed a reporting tool ‘Flycapture’ to create an evidence base to inform future policy making and provide local authorities with management tools to enable a problem solving approach. In 2005-2006, Flycapture data reported:

- The cost of fly tipping could be £100 million per year if costs to local authorities, the environment agency, private landowners and enforcement agencies were all included.
- Local authorities dealt with over one million incidences of illegal dumping
- Most incidences were on high-ways or council land
- 51% of fly tips were of bin bags or household waste
- Other major types of fly tips were from construction, demolition or trade waste.
- 86% of fly tipping took place in urban areas where 63% of the population reside
- More than half of fly tipping took place in the most deprived areas.

A good practice guide for local authorities developed by the UCL Jill Dando Institute of Crime Science in 2006 included the following six point framework to address actions that would target flying tipping in specific communities. The framework was founded on a problem-solving approach.
1. Make it easier to behave within the law by increasing accessibility to, and convenience of, legal dumping sites.
2. Reduce access to popular dumping sites by improved fencing, bollards etc
3. Increase the perceived risk of getting caught – CCTV or dummy CCTV, signs stating this area under surveillance.
4. Reduce the rewards. A major motive for fly tipping is avoidance of the associated costs. Offer free/subsidized bulky waste collection and good waste disposal bonds as part of consents to encourage trade, builders and contractors to dispose of waste legally.
5. Reduce provocations eg reduce distances to waste sites, reduce minimum charges, extend opening hours and explain waste disposal schemes - why they are necessary, how they work and the types of waste accepted.
6. Remove excuses - make residents and businesses aware of their responsibilities through effective education about fly tipping issues and effective advertising and marketing of waste disposal services.

The Review of England’s Waste Strategy (2007) noted there was a potential for fly tipping to increase as the cost of legitimate forms of waste management became more complex and more expensive. A multi-faceted approach made up of increased resources, harsher penalties for offenders (conviction rates were low through court system), better liaison among enforcement agencies and a campaign of information and education on illegal activity was recommended. Other suggestions included removing the motivation to commit fly tipping as referred to in framework above.

**Porirua Fly Tipping** White & Pritchett (2006) looked at fly tipping in Porirua, New Zealand. A survey of stakeholders was carried out, followed by pilot which trialed a number of different activities, some of which were part of Creekfest (a health and cultural festival held in Cannons Creek community).

A community based social marketing (CBSM) approach developed by Doug McKenzie-Mohr was used and included communication, removal of barriers, prompts, development of social norms, incentives and commitment. This approach moved away from traditional punitive measures as used in the New Zealand Litter Act (1979). The results of the survey and the pilot found that the CBSM focused on individual behavior change rather than communal behavior change which is cultural norm for the Maori and Pacific families living in the pilot area. The authors suggested a capacity building community development approach might be more appropriate. However there were some interesting lessons learned that could be used to inform decision making in Wairoa.

As background to the Porirua study, the Porirua City Council (PCC) is a signatory to the Zero Waste to Landfill by 2015 and as part of this introduced a Zero Waste Coordinator in 2000. In 2000 PCC introduced user pays rubbish bags ($1.15 per bag at time of report if brought from the council) and in 2002 introduced kerbside recycling. The area’s most vulnerable to fly tipping were at communal recycling centres which were closed before the White and Pritchett study started. The reasons for the closures included the cost of maintenance, inappropriate locations and they lacked the appropriate consents.

The aims of the White and Pritchard study were to understand:
• why people in eastern Porirua (an area of high deprivation) did not use PCC waste services properly
• what was happening to people’s rubbish after the recycling centres had closed
• what could be done about the problem of fly tipping.

Survey results

1. Fly tipping was a joint responsibility for the council and residents and should not be condoned. Most residents believed rubbish dumped on the street was either picked up by the council or a concerned resident or in the case of small pieces rubbish – it just blew away. Most residents saw fly tipping as a problem. Twenty out of the 28 people surveyed had not resorted to fly tipping.

2. Overall there was a good understanding of the difference between rubbish and recycling however comments were made that in Pacific Island languages there is little distinction between rubbish and recycling.

3. There was good understanding of the council rubbish and recycling collections and most found them convenient and easy to use. There were mixed responses to the expense of council rubbish bags, tip fees and the centralised recycling station “Trash Palace”. Some people opted for a private rubbish contractor as they perceived it as cheaper and easier. Strong winds tipping over recycling bins meant some residents preferred wheelie bins for recycling. Some residents were frustrated there was no longer an inorganic rubbish collection day though this had been replaced by a twice yearly collection service offered by Trash Palace. For some residents meeting basic household/family financial needs meant rubbish collection and reduction were not a priority.

4. Causes of fly tipping from this study were identified as:
   • Cultural and social attitudes – laziness and general apathy towards rubbish. Supported by Anderson’s (2003) study of fly tipping in Western Australia.
   • Lack of convenient waste disposal options- especially green waste
   • Transient populations as found in Victoria Litter Action Alliance in the City of Greater Dandenong (2005)
   • Rubbish Attracts rubbish. Supported by Brisbane City Council (2004) and Anderson (2003).
   • Holidays- more fly tipping occurs over Christmas, when unwanted presents and the packaging from excess food and drink are dumped.

To minimize fly tipping the following activities were trialed:

**Street make over’s**- highlighting the services of Trash Palace and helping households get rid of rubbish legitimately so they did not have to illegally dump it. Placing skips in street (on a designated day) and having a time for Trash Palace to come and collect goods for re-use. Flyers were also handed out demonstrating use of CBSM tools: communication and removal of barriers.

**A mural competition** (Canvas Battle) for the three local secondary schools to visually depict how cultures in the past had less waste and how they dealt with it. This was part of Creekfest. The aim was to increase awareness among youth.
How to make your own worm farm demonstration which included an opportunity for children to paint one at Creekfest.

Running a recycling programme at Creekfest to attempt to normalise recycling. A local sports team were contracted to act as recycling crew for the day.

Lessons learned:
- Use PCC recycling bins for visual consistency. PCC bins were unavailable and other bins with recycling symbol signage were used but they were too small.
- The recycling crew could not approach people to separate recyclables from rubbish at bins as crowds were too big.
- Stall holders were informed of recycling arrangement but did not comply with request to sort waste.
- The amount of rubbish strewn across the grounds was an indication that many people who attended Creekfest did not dispose of think about responsible rubbish disposal and were unlikely to consider sorting and recycling it.
- A more visible presence at events with PCC recycling wheelie bins and a recycling cage might help to normalise recycling.

At the suggestion of residents working with local schools was seen as a way to reach children and their families on general rubbish issues and disposal of waste. A range of activities were also used engage the students and their families.

A Community Mulching Day was held as an alternative way to get rid of green waste as the area had limited green waste options. Heavy rain on the day resulted in no interest. It was also noted that many of the houses in the identified district were rented (48% are HNZC owned) and that few households had gardens.

Families were given composting and recycling bins. Verbal instructions explained how these methods could reduce waste going into rubbish bags, help the environment and lower household’s costs. Follow up visits to the households were made to reinforce the message a week later.

### 3.2.4 Economic Instruments

**Personal incentive** There is debate over the effectiveness of personal incentives, defined as offering a financial reward for household’s waste performance. Timlett (2007) argued it is difficult to isolate the impact of the incentive as it is likely to be a consequence of communication, engagement and other feedback methods. Cash rewards needed to be of significant value to a household to be effective and must be balanced against cost effectiveness and environmental gains. (DEFRA, 2005)

Personal incentives may not be effective in persuading the final 20% of households to adopt certain waste behaviours (assuming the 80/20 rule) so other engagement methods and some kind of compulsion maybe required to reach the final 20%. Timlett (2007) reported personal incentives were effective when a single message was communicated and where participation rates were already high.

**Pay As You Throw (PAYT):** This waste minimisation strategy was reported by Price (2001). The scheme was based on a fee relative to the amount of waste generated by the household for disposal in the same way householders pay for other utilities such as electricity or gas. Setting the price to throw can be difficult. Too high a fee can
encourage negative behaviour (putting rubbish in others bins, using recycling bins for non recycled material, burning waste or fly dumping), too low a fee discourages waste reduction. Price (2001) noted the scheme can encourage individuals to change attitudes to waste prevention but economic justification and rationale must be explained to householders. Price discussed the importance of local approaches to sustainable waste management that work towards national targets. Direct charging is not a short term solution but is intended to complement recycling strategies by extrinsically encouraging participation and initiation of further waste minimisation.

Charging for waste disposal is used in the USA, Europe and only in some communities in the UK. It is routine practice in New Zealand and is aligned with Towards Zero Waste and solid waste management and minimisation work. The barriers and problems associated with the scheme have been identified as:
- Paying for a previously free service
- Increased fly dumping
- Local community characteristics influence effectiveness e.g social, cultural, economic and physical variations.
- It is a prerequisite that adequate facilities are in place to divert waste appropriately.

Successful indicators for PAYT include:
- A reduction in the amount of waste requiring collection from households
- An increase in recycling. Reduction of waste at the source could be 14-27% and recycling rates can be improved by 32%-52%. (Hui (1999) cited Price, 2001)

3.2.5 Collection of household organic waste

Kerbside organic collection is widespread in the USA, Australia and Europe. The main driver in Europe is that green waste and food scraps are banned in landfills. Increasingly waste collection in Europe uses breathable and compostable bags with ventilated kitchen bins versus newspaper lining and air tight bins. Research by Christchurch City Council (2006) identified the barriers to home composting as:
- Convenience- people find it too hard and too time consuming and /or it is easier to dispose of material into rubbish collecting systems.
- Limited space for a compost bin or unable to use the compost produced.
- Knowledge- people don’t know how to compost effectively or with confidence and failure discourages further involvement.

An investigation of the viability of a household organic collection was carried out in Christchurch, New Zealand. (Christchurch City Council, 2006) The household organic waste trial was done in Spreydon and Dallington.

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2 The median income of people in Spreydon is $17,200, compared with $17,600 for Christchurch City and $18,500 for all of New Zealand. (statistics NZ- community profile and 90.7 percent of people in Spreydon said they belong to the European ethnic group, compared with 89.5 percent for Christchurch City and 80.1 percent for all of New Zealand.)
Two collection systems were trialled:

a) breathable and compostable BioFilm bags and ventilated kitchen bins
b) closed kitchen bin where food scraps were wrapped in newspaper.

The results showed that when the full costs associated with the disposal of organic waste in Christchurch were considered the scheme was financially viable and good for the environment. Residents were supportive of the service and continued to separate organic waste throughout the year. Residents preferred to use the BioFilm bags and ventilated system. Savings to the community could include diverting organics waste from the landfill (estimated to be 29,000 tonnes when the study was extrapolated city wide), extending the life of landfill, fewer kilometres travel to landfill and fewer trips to the refuse station (reducing CO\textsuperscript{2} emissions) and the productive use of the compost.

3.2.6 Withdrawal of publicly provided Household Waste and Rubbish Removal

This occurred as a result of strike action over a one month period in Canada. Some interesting waste behavioral changes were reported as a result. (Salkie et al 2001). Citizens surveyed said they:

- stockpiled waste
- used the 3 temporary depots within the city for disposable nappies and wet kitchen waste
- independently took waste to the landfill (fees were waived at the city landfill for part of the strike but fees remained at the rural landfill)
- dumped waste illegally in roadside bins, restaurant or construction bins.
- modified behaviour to reduce total waste production
- half respondents thought they modified their behaviour or changed actions in some way to reduce their total waste production. However estimated impact on flows to the landfill were quite small with volume decreasing by 1% during strike and 0.1% after the strike
- paid someone else to take their waste away

The experience showed that economic incentives needed to be large enough to change behaviour for instance joining a commercial scheme at $5 per load vs $2.20 rate charged by the city. Modelling was used to discover if the cost of $2.20 was exceeded to remove waste if people would be willing to take garbage to a landfill or seek alternatives such as waste reduction, recycling or illegal dumping. People did not want to enlist in

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3 The median income of people in Dallington is $16,800, compared with $17,600 for Christchurch City and $18,500 for all of New Zealand. 93.1 percent of people in Dallington said they belong to the European ethnic group, compared with 89.5 percent for Christchurch City and 80.1 percent for all of New Zealand.
commercial services that charged a higher rate, when costs of waste increased 25% of people reviewed the waste they threw out. If there was an increase in disposal costs - 15% people increased the amount of waste they recycled. This study useful demonstrated that variable fees alone may not achieve waste reduction. Variable fees are only part of a waste disposal policy and must be combined with other tools and the needs of a community. (Salkie, 2001 et al)

3.2.7 A community case study

Orakei Marae - Ngati Whatua o Orakei (NWoO) recycled 79% of total waste either through composting or recycling during a free Waitangi day event that attracted 30,000 people in 2008. This impressive first attempt was part of the Zero Waste strategy employed by (NWoO). The main components of the waste strategy for the event are summarised below:

- Getting buy in from event directors
- Contracting specific waste management advice
- Employing 7 paid staff for the day
- Seeking advice from Xtreme waste and Zero Waste Trust
- Identifying compostable product suppliers for stall holders to use
- Developing a communication package to prepare event visitors to adopt a “pack in, pack out” attitude
- Developing a volunteer engagement strategy.

There were four resource recovery stations (RRS) station around the grounds manned by 50 volunteers throughout the day. Advice was given to event attendees regarding correct waste separation at the RRS and volunteers gathered waste from the RRS ready for correct disposal.

Other recommendations included:
- Appointing a stallholder officer to ensure stallholders used packaging that complied with event policies or face stall shut closure.
- Resource recovery was seen as important but had low status and little financial resource assigned to it. This was why volunteers were necessary, in the future jobs could be created to carry out these duties.

The marae based volunteer training and “impassioning” the night before was key to the success. Whanaungatanga and camaraderie were developed in a short space of time.

3.3 The relationship between health and waste

Waste can pose a significant risk to health and to the environment and the way waste is handled is crucial to sustainability (NZ Waste Strategy, 2002). Relating risk to health with waste disposal is complex as there are a variety different ways humans can be exposed to waste.

The overall approach to reducing health risk to the public from waste focuses on “stopping the linkages” between the waste and health. This may be achieved by controlling the sources, decreasing exposure or removing links. The strength of evidence linking waste risks with health can be variable as often studies have not been able to measure the degree or amount of exposure to potentially harmful
waste and there are so many different types of waste. As scientific methods develop to address these limitations in studies a precautionary approach should use to mitigate against possible health risks.

3.3.1 Health effects from environmental exposure from incinerators and landfills

The World Health Organization (2007) (WHO) reported that there was a lot of suggestive, but not conclusive, evidence of possible adverse health effects which might arise from living near waste treatment plants, landfills, incinerators etc. Reasons for the lack of conclusive evidence include:

- Limitations and uncertainties in science that are mainly from study design and exposure characterisation.
- The wide variety of waste exposures, waste exposure pathways and waste exposure scenarios and most studies lack a direct exposure measurement.
- Confusion because of the mix of waste material in waste sites eg solid urban waste, toxic industrial waste or hospital waste.

Despite the methodological limitations the WHO report noted there was some indication that living near a landfill had adverse health effects. The evidence, though stronger for reproductive health effects than for cancers, was not sufficient to establish causality of the association. However, given the large population potentially exposed to landfills in many European countries and the low power of studies investigating the risk, the potential health implications cannot be dismissed.

There is also concern regarding exposure to bioaerosols as a result of composting, however as above research shows there is not enough information available to determine the risk to human health (workers or those living nearby) from bioaerosols coming from composting sites (Environment Agency, 2009).

The evidence of adverse health effects related to landfills and incinerators, although not conclusive, adds to other environmental concerns and is an additional imperative for strategic waste management, a reduction of waste production, re-use and recycling schemes.

Absence of evidence is not evidence of absence of risk. Hence, available information of localised environmental contamination and of increased occurrence of adverse health effects in the vicinity of landfills and incinerators necessitates a precautionary approach with respect both to the instalment of new facilities and the mitigation of exposure to emissions and leachates of existing sites.

3.3.2 Domestic waste risk

According to the DEFRA report in 2004 domestic waste is the main component of municipal solid waste (MSW) and can contain hazardous substances eg pesticides used within the home. If substances are volatile it is likely they will be released in the environment from a landfill. Incineration may destroy some of these substances but combustion can create toxic substances such as sulphur dioxide, oxides of nitrogen, dioxins and furans.
Composting can also generate hazardous substances— for example some microorganisms which flourish are able to release spores with allergenic properties.

Recycling processing is not without risk. The processing uses energy and can result in the combustion and release gases which contaminate the air and the processing can also produce contaminated wash waters.

Material Recycling Factory (MRF) the hazard that probably presents the biggest risks is biological material in particular bio- aerosols they are also significant chemical and physical hazards to the worker in the MRF and those chemical exposure to vapours and suspended particulate matter outside the plant. There are no epidemiological studies of population living near MRF so studies of worker exposures have been considered.

DEFRA (2004) reviewed studies investigating ill-health in people living close to facilities treating or disposing of municipal solid waste (MSW) but found no studies of health effects in people living near materials recycling facilities (MRFs). The authors noted some studies have been carried out on the health of workers at MRFs and concluded there are likely to be health effects on people living near to MRFs, but noted those effects could not be completely ruled out. They also noted limited information on the effects of composting facilities on the health of local residents is available. What was available suggested there might be a link between commercial scale composting facilities and the occurrence of respiratory and irritative symptoms in people living very close to the facilities. They found no published information on the health effects of anaerobic digestion, pyrolysis/gasification or transport of MSW.

The DEFRA authors looked in detail at studies of incineration facilities, and found no consistent or convincing evidence of a link between cancer and incineration and little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributed only a small proportion to local levels of pollutants.

They quoted a study of landfills in the UK that indicated people living within 2 km of an active or disused landfill site may experience slightly higher rates of certain birth defects than people living further away. However the authors noted that the study was not able to state whether the observed increases were due in part or in whole to exposure to emissions from the landfill, or to some other cause or causes. Practical difficulties in the study meant that other causes are likely to be responsible for at least some of the observed increases. A similar study found no evidence that living close to landfill sites increases the chance of getting cancer to a level that can be measured.

3.3.2 Illegal dumping

A WHO (2007) workshop reported a lack of data concerning wastes that are illegally disposed of. Anecdotal evidence indicates illegal disposal of waste is a frequent practice in some areas in Europe. Because a variety of illegal disposal practices exist (burning, dumping, etc…) and because it is very difficult to estimate the amounts of waste that are disposed of illegally, determining emissions and exposure levels is virtually impossible.

3.3.3 Psychological health
The WHO (2007) recognised the importance of possible adverse effects on health due to
nuisance (smell, noise, litter, effect on property values, stress for lack of regulatory
response etc). These are often not included in formal epidemiological analysis but are
relevant to the health of communities.

The WHO report (2007) suggested that the way to ensure the consideration of all
relevant health effects might be through integrated and participatory approaches, such
as health impact assessment (HIA), which includes wide range of disciplines and
includes representation from the affected communities. The WHO report noted that HIA
has been proven to be effective in the development of waste management policies.

3.3.4 Rodents

The literature found on the health impacts of rodents from waste was limited. There was
more information found about rats than there was for other rodents like mice, hedgehogs
etc. Rodents can act as disease vectors between animals and humans (zoonotic
disease) and it is therefore important this public health risk is minimised. If rodent
faeces, urine, remnants of hair and gums or teeth (via biting) enter the body where skin
is broken or through mucus membranes diseases can be transmitted.

The diseases and micro-organisms likely to be distributed by urban rats include
diarrhoeal diseases caused by parasitic worms from trichuris, hymenolepis and listeria
species (Battersby, 2002 cited Drew, 2007). Rodents are also directly or indirectly
responsible for the transmission of diseases such as plague, leptospirosis and

Conditions that provide food and shelter for rodents are likely to become rodent hot
spots such as:
- Areas with wide spread litter, unkempt gardens and neglected or empty buildings
- Areas that provide shelter for rodents- such as broken drains or empty buildings
- Older properties (adapted from Drew, 2007)

Properly controlled and managed solid waste systems need to be in place to avoid
potential difficulties arising from the attractiveness of waste to insects and rodents as a
food source. (Jha et al, 2003 cited in Drew, 2007). Control measures include good
maintenance of urban dwellings and areas to reduce the risk of rat infestations; control of
street litter or litter near waste containers; storage of waste so it is not attractive to
rodents.

3.3.5 Waste electrical and electronic equipment (WEEE)

Ever increasing advances in electrical and electronic equipment technology means an
increasing amount of electrical and electronic waste and a need for safe ways to dispose
or reuse WEEE to protect health and the environment. According to Horne & Gertsakas
(2006) there is good (although not perfect) information about the toxicity of WEEE
components and the likelihood of damage to human health and the environment.
Of the substances reviewed in this study, lead was noted as posing the biggest risk because of the amount of it in WEEE and its toxicity potential. It is well established that lead can cause serious developmental effects on the brains of children. Mercury, cadmium and chromium VI (hexavalent chromium) are also of concern because of their toxicity and leaching potential, and their persistence in the environment.

Brominated Flame Retardents (BFRs) are a complex issue, with proven potential human health effects associated with some compounds, and documented suspicions associated with most current major commercial substances. Similarly, Polyvinyl Chloride is a major concern. It is a contaminant in recycling streams.

The state of knowledge regarding the toxicity of WEEE components is developing, with still some way to go before confident and accurate predictions of effects on humans and the environment for all WEEE substances can be made. While some studies are several years old, they remain relevant until new evidence is developed, and significantly more research is needed into the toxicity potential of WEEE. Until then, a precautionary approach to the disposal of WEEE is necessary. Three well-established principles can be drawn upon to guide policy development in WEEE management:

• **Precautionary principle;** where theory or circumstantial evidence suggests damage potential exists, in the absence of fuller evidence, it is prudent to assume the worst case and legislate accordingly;

• **Prevention is better than cure;** it is cheaper in the long term to prevent risks and impacts from occurring than to concentrate on cleaning up problems later. So, eco-design mechanisms to minimise WEEE generation is a logical approach;

• **Polluter pays principle;** those who create the risks should incorporate the costs of dealing with them into their operating costs, for example, through operating product stewardship programmes.
References


Create Your Own Eden http://www.createyourowneden.org.nz/

Blair, Ngarimu (personal communications, 6 April, 2009) Trustee and Heritage and Resource Manager at Orakei Marae.


Health Impact Assessment on the draft Wairoa District Council Waste Management Strategy 78


