Removing the Roadblocks to the Beneficial Use of Organic Waste

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1 Introduction

Organic wastes make up a significant portion of the waste steam and make a significant contribution to the environmental effects associated with waste disposal. This paper outlines some key issues relating to organic wastes, consider some potential solutions, and propose roles for key stakeholders.

2 Background

2.1 What is organic waste

There are many types of waste that comprise 'organic' waste. The common definition, based on that used in the Solid Waste Analysis Protocol(MfE, 2002), includes garden waste, kitchen scraps and commercial organic wastes such as paunch grass and food processing waste. Other wastes that may biodegrade in a landfill environment include paper/cardboard and untreated wood.

Biodegradable waste is made up of garden waste, food / putrescible waste, biosolids, waste paper/cardboard and wood waste. The following sections outline the characteristics of each waste stream and issues as they apply to collection, diversion and processing.

2.1.1 Garden waste

Garden waste is made up of lawn clippings, hedge clippings and other waste vegetation such as prunings and weeds. Garden waste makes up a significant portion of the municipal waste stream (up to 40% in some areas) and due to it's often bulky nature can use a large amount of landfill space. In general garden waste is more suited to composting rather than anaerobic digestion.

Commercial composting is an effective diversion route for garden waste, however some materials cause problems since they are not destroyed through the composting process, examples include noxious weeds and the herbicide Clopyralid.

2.1.2 Food / putrescible waste

Food / putrescible waste makes up between 15 and 50% of domestic waste and are also a significant waste stream from the commercial sector (restaurants and food retailers. These wastes are characterised by a high nitrogen and moisture content and can become odorous as they start to biodegrade. Examples include food processing wastewater treatment sludges, paunch grass and food scraps.

Composting (including vermi-composting) and anaerobic digestion are options for processing but in all cases careful control of odour is required.

2.1.3 Biosolids

Biosolids are stabilised sewage sludge and are becoming an increasingly significant waste in terms of quantity as local authorities increasingly utilise secondary treatment at plants throughout New Zealand. Biosolids are similar to food/putrescible wastes in that they will tend to have high nitrogen content and high moisture content and are potentially odorous prior to processing. Depending on the catchment of the wastewater treatment plant there may be issues with organic and heavy metal contamination, many wastewater treatment plant operators manage this issue through implementation of an effective trade waste by-law.

Many biosolids are anaerobically digested with the solid residue landfilled. Composting or direct land application are options for diversion currently utilised in New Zealand.

2.1.4 Waste paper/cardboard

Waste paper and cardboard make up between 15 and 25 % of landfilled waste in New Zealand. While some of this material could be recycled, contaminated paper/cardboard is not suitable for this diversion route. Paper/cardboard is generally very dry and would need to be combined with a biodegradable waste with high moisture content for successful composting or digestion.

2.1.5 Wood waste

Wood waste makes up around 10 % of landfilled waste in New Zealand and is also a significant contributor to 'Construction and Demolition' fill sites and dedicated fill sites at wood processing sites around New Zealand. Wood waste includes sawdust, bark, forest residue and waste timber from construction and demolition activities.

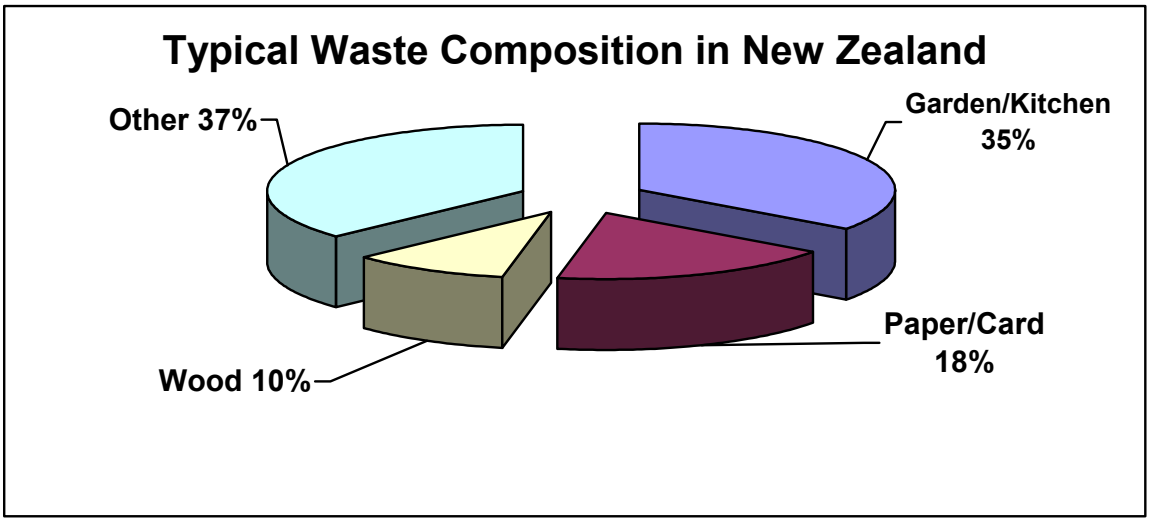
Untreated wood waste can be chipped and used as a mulch, for composting and as a fuel source for industrial heat /power generation (known as Bioenergy). Issues include differentiating between treated and untreated timber and transport/separation logistics.

2.2 Quantity

We can estimate the quantity of organic or biodegradable waste based on a range of data including Waste Analysis Protocol (WAP) and Solid Waste Analysis Protocol (SWAP) surveys, the 2002 Landfill Review and Audit and data from the Waste Data Pilot project in the Waikato and Bay of Plenty. On this basis the composition of waste disposed of to landfill is estimated to be:

Garden, kitchen and biosolids:	35 % of waste stream, (45% of domestic)
Paper/Cardboard:	15-20%
Wood waste:	10% of waste stream

Figure 1 – Typical Waste Composition in New Zealand



3 Impacts

3.1 Leachate

Leachate is generated in a landfill as water percolates through the refuse and contains a mix of chemical and biological contaminants. The movement of leachate through refuse aids biological degradation and leaches contaminants such as heavy metals and volatile organics from the waste material. The slightly acid nature of leachate (due to weak acid products of the anaerobic biodegradation process) aids in leaching contaminants from the refuse. In the absence of organic waste, leachate will be predominantly water and suspended solids (c.f. Dissolved contaminants), treatment would be vastly simpler and potential impacts significantly reduced.

3.2 Landfill gas

Landfill gas is generated during anaerobic biodegradation of organic waste and is predominantly Carbon dioxide CO_2 and methane CH_4. Whilst methane is odourless, trace components have a characteristic odour. Methane has the potential to build up in confined spaces to explosive concentrations.

3.3 Landfill Capacity

As noted above these wastes makes up over 30% of the total waste stream and close to 50% of the domestic waste stream by weight (45% and 60% respectively when paper and wood are included. Clearly these waste streams represent a significant opportunity for a reduction in the quantity of waste going to landfill through established alternatives such as composting. Even where the market for compost is poor, the disposal of compost to public spaces, as a mulch or to enhance soil characteristics, is preferable to disposal of the organics to landfill where they contribute to our greenhouse gas emissions in contravention of our responsibilities under the Kyoto Protocol.

3.4 Transport costs

Where waste producers are facing significant transport distances, the percentage contribution from organic waste by weight, means that effective diversion has the potential to result in significant savings on transport costs.

4 Issues for Diversion of Organic Waste in NZ

4.1 Clopyralid

Clopyralid is a broadleaf herbicide used both commercially and in domestic gardens in New Zealand. It persists through `best practice` composting and is highly toxic to several plants, most notably in this context, tomatoes. The composting industry has been working with the producers/importers of Clopyralid and ERMA to identify options for improved controls to minimise or remove the risks to the composting industry. The Ministry for the Environment has helped to fund this work and is actively seeking to support the industry in identifying and removing barriers.

4.2 Perception

There is a perception that compost or other products containing biosolids are not 'safe'. This is generally based on concerns about heavy metal and organic contaminants and has been studied in detail both in New Zealand and internationally.

To build on the information already available The Ministry for the Environment is half way through a two year research project aimed at identifying key contaminants in sewage and recommending appropriate ways to manage the risks associated with these contaminants. The project is titled "Removing the Roadblocks to the Beneficial Use of Sewage Effluent and Biosolids" and is being undertaken with input from a steering group comprising representatives from the Ministry of Health, the Ministry of Agriculture and Forestry, researchers and environmental groups.

The New Zealand Water and Wastes Association published the Guideline for the Safe Application of Biosolids to Land in August 2003. This document includes recommended maximum levels for contaminants (pathogens, metals and other contaminants) and pathogen reduction regimes for several grades of biosolids. The guideline also proposes a permitted activity rule for inclusion in regional plans covering the use of the highest grade (lowest level of contaminants and most stringent pathogen reduction regime) of biosolids.

4.3 Landfill Disposal Charges

While landfill disposal charges have increased significantly throughout New Zealand in recent times, in many cases there is a perception that landfill disposal is the simplest option for organic waste, particularly when the cost of separating organic waste at source is taken into account. Disposal charges in New Zealand range from $0 (at many rural transfer stations and skip sites) to over $100 per tonne (generally at urban transfer stations). Rates for commercial waste quantities are generally in the range $25 - $50 per tonne at the landfill gate.

Commercial composting operations need recover the cost of collection, processing and marketing their product through a combination on 'tipping' fees and the proceeds from the sale of compost. Where the landfill fees are low, the up-front fee that the composting operation can charge is likely to be limited and the economics may become marginal.

4.4 Separation of Organic Waste

While in some cases rates for green waste disposal via composting are often significantly less than for landfill disposal, unless there is a reduction in general waste disposal costs (i.e. a shift to a smaller bin or less regular pick-up) it may be hard to justify separation on an economic basis. Separation, even at sites where composting is a well established commercial operation and a differential price exists for green waste, the separation of green waste from other general refuse is difficult to achieve. Separation and collection of food/putrescible wastes also pose a challenge with respect to minimising odour while contamination with non biodegradable contaminants is an issue with all organic waste diversion options.

5 International initiatives

5.1 European Union Landfill directive

Under the European Union Landfill Directive (99/31/EC) introduced in 1999 EU member states are required to "reduce biodegradable waste going to landfill to 75% of 1995 figures by 2010 and to 35% by 2020" (including paper, card, food, garden waste and organic textiles). The directive has driven the development of a range of technologies to reduce the impacts of biodegradable waste disposal through pre-processing and/or diversion. Examples of initiatives put in place throughout Europe include

- composting of garden and food waste
- treatment of waste prior to landfilling
- diversion of biodegradable wastes to incineration or other waste to energy technologies.

5.2 Renewable energy

With the impending implementation of the Kyoto Protocol in many parts of the world there is increasing interest in reducing the emission of greenhouse gases associated with waste disposal and in replacing fossil fuels with renewable energy sources. Energy is being recovered from organic waste through anaerobic digestion (producing methane), incineration and pyrolysis/gasification.

Examples of renewable energy generation from organic wastes are presented in Table 1.

Table 1 – Examples of Renewable Energy Projects using Organic Waste

Technology	**Waste**	**Location**	**Products**	
Anaerobic digestion	Food waste (supermarkets	Sydney	Electricity	Fertiliser
Anaerobic digestion	Organic separated from general waste	Sydney (proposed)	Electricity/ Heat	Fertiliser

Pyrolysis	Organic separated from general waste	England (proposed)	Electricity/ Heat	Fertiliser
Pyrolysis	Food processing waste	USA	Oil and Gas	Char
Incineration	Biosolids		Electricity/ Heat	Ash

6 Climate Change Issues

Methane, produced as a result of anaerobic decomposition of organic waste, has a 'global warming potential' 21 times that for CO2. Clearly any reduction in methane emissions associated with landfill disposal has a tangible benefit from a climate change perspective. An additional potential benefit is the use of the methane for energy generation thus offsetting fossil fuel use.

There are several ways to reduce the methane emissions from landfill, these are:

- Landfill gas flaring – active collection of landfill gas, flaring (with or without energy recovery). 50-70% reduction in methane emissions via conversion to CO2.
- Composting – diversion of organic waste from landfill disposal with aerobic composting followed by use as soil amendment/mulch. 100 % reduction in methane emissions.
- Anaerobic digestion – diversion of organic waste from landfill disposal to anaerobic digestion. Energy recovery from gas phase (methane) and use of solid residue as compost/soil amendment.
- Bioenergy – diversion of wood waste to 'bioenergy plant with energy recovery.

Under the current proposals for the Climate Change Policy Package (see www.climatechange.govt.nz for the latest information Climate Change policy in New Zealand), there is provision for initiatives that go beyond 'business as usual' to obtain assistance. This assistance is likely to take the form of tradable carbon credits.

Landfill gas flaring is likely to be considered business as usual for large landfills, while smaller sites face practical and technical issues in seeking to collect and manage landfill gas. Initiatives that mitigate landfill gas emissions from small landfills may attract incentives under the projects mechanism but are likely to struggle to compete with alternatives that can demonstrate a greater environmental benefit per dollar through economies of scale

The diversion of organic waste prior to disposal (to composting or other beneficial use) may also provide tangible benefits from a climate change perspective. Centralised composting of garden waste is likely to be considered 'business as usual', diversion of food waste and other biodegradable material may attract incentives.

7 The Ministry's Role

It is a simple exercise to determine what organic or biodegradable wastes are present in the New Zealand waste stream and to consider the options available for diverting these wastes from landfill disposal. The question for the Ministry for the Environment and the waste management industry as a whole is how to get the best environmental outcome through effective management of organic waste.

The Ministry has a role in specific areas and is most likely to make an effective difference when working in partnership with the industry and the community and putting the case for organic waste management at a central government level.

An example of working with industry is the current initiative to control the use of Clopyralid in domestic gardens. This is to be achieved by introducing additional controls under the HSNO framework as a result of an application for a reassessment to ERMA being led by the New Zealand Business Council for Sustainable Development. Supporters of the application include Living Earth Limited, Auckland City Council, Wellington City Council, Christchurch City Council and the Ministry for the Environment.

The Ministry is also looking to work with industry on developing and documenting best practice for organics diversion. This could take the form of documenting best practice, developing compost quality criteria or assisting with market development for recycled organics products.

The NZWWA Guideline for Safe Application of Biosolids to Land is an example of the Ministry working with the industry in this way. In this case the Ministry assisted with funding through the Sustainable Management Fund and had representation of the project steering group.

8 Conclusions

Organic waste is a significant portion of the total landfilled waste stream and therefore represents a significant opportunity to reduce the total quantity of waste disposed of to landfill.

There are a range of options for diverting organic waste including composting and anaerobic digestion. Key issues covering the feasibility of these options include waste disposal charges and markets for products such as soil amendments and energy.

The way forward for organics diversion in New Zealand involves all stakeholders working in partnership to identify and remove roadblocks to the beneficial use of organic waste. Key stakeholders include organic waste producers, the composting industry, wastewater treatment plant operators, local government and the Ministry for the Environment.

9 References

European Union, Directive 99/31/EC on landfill of waste (The Landfill Directive), 1999.

New Zealand Water and Waste Association, The Guidelines for the Safe Application of Biosolids to Land, 2003.