Assessment of potential reduction in waste emissions by 2030

Summary
Waste emissions in New Zealand are primarily methane caused by anaerobic degradation of biodegradable waste disposed in landfills and other dumps (e.g. on farms). These emissions can be reduced by reducing the quantity of biodegradable waste created and disposed of (including through increased recycling and composting), and increasing the capture of methane at landfill sites and through use of biodigesters, particularly on farms.

Total emissions for the sector in 2013 were estimated at 5.3 MtCO2-e. New Zealand's waste emissions per capita are the second highest in the developed world and more than double the average. Several other countries (Austria, Belgium, Germany, Netherlands, Sweden and UK) have successfully reduced their waste emissions by more than 50 percent since 1990. Based on this, it should be achievable to reduce New Zealand's waste emissions by 40-70 percent by 2030. This would deliver a reduction of 3.7 Mt to 1.6 MtCO2-e.

1. Breakdown of current emissions
Estimates of emissions from waste are subject to reasonably high uncertainties, on the order of ±40%.

This is partly explained by the updated Global Warming Potential values (increasing from 21 to 25 for methane) but also indicates a significant upwards revision of the underlying gas emissions.

2015 GHG Inventory (1990-2013)
Total waste emissions are estimated at 5.1 MtCO2-e in 2013. This is approximately the same as in 1990, although emissions increased to a peak of ~5.4 MtCO2-e in 2005 before declining at roughly 1% per annum.

Waste emissions are primarily from methane (96.4 percent) followed by nitrous oxide (3.5 percent) and CO2 (0.04 percent). CO2 emissions from waste of biogenic origin are not reported.

Estimated emissions in 2013 break down as follows:

<table>
<thead>
<tr>
<th></th>
<th>Solid waste disposal</th>
<th>Incineration</th>
<th>Wastewater</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions (kt CO2-e)</td>
<td>4,600.3</td>
<td>3.1</td>
<td>450.5</td>
<td>5,054.0</td>
</tr>
<tr>
<td>Percentage of total</td>
<td>91%</td>
<td>0.06%</td>
<td>8.9%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1: Waste emissions by category.

The Common Reporting Format tables accompanying the 2015 GHG Inventory allow us to see a further breakdown of emissions from solid waste disposal, shown in Table 2.
2. Mitigation options

Methane emissions from solid waste can be reduced by reducing the quantity of biodegradable waste created and disposed of in landfills or unmanaged dumps (including through increased recycling and composting), and increasing the proportion of methane capture.

According to the UNFCCC GHG database, New Zealand has the second highest waste emissions per capita of developed countries, behind only Cyprus (see Figure 1). New Zealand’s level is more than double the developed country average; simply reducing to this level would be a 56 percent cut. Note that this data predates the 2015 Greenhouse Gas inventory, which has seen New Zealand’s methane emissions from solid waste disposal revised up by about 24 percent from the previous estimate used here (from the 2014 GHG inventory).

The UK Committee on Climate Change reports that the UK has reduced waste emissions by 67 percent since 1990. Emissions were approximately flat to 1999, meaning this reduction has occurred over a period of roughly 15 years. This is almost entirely due to reduced methane emissions from landfill sites. Biodegradable waste sent to landfill was reduced by 70 percent since 1990, and the overall methane capture rate at landfills is estimated to have increased from 1 percent in 1990 to 61 percent today. By comparison New Zealand’s overall methane capture rate (across all landfills) is estimated at ~40 percent, up from ~10 percent in 1990.

We could not find any data on quantities of biodegradable waste landfilled in New Zealand. These figures suggest considerable potential to further reduce emissions through reducing biodegradable waste to municipal landfills (e.g. through food waste collection in urban areas) and by improving overall methane capture rates through new system installations and improved practices.

However the bigger problem, shown in Table 2, is smaller, unmanaged waste disposal sites, which contribute 55 percent of total methane emissions from solid waste. Farm dumps are estimated to make up around 60 percent of this. Such sites have apparently been regulated out of existence in the UK as all waste disposal on land must be run as a properly managed landfill requiring a permit or license. They remain unregulated in New Zealand, and are not covered by either the waste levy or the Emissions Trading Scheme.

By bringing unmanaged waste facilities and farm dumps under regulation, and/or offering education and incentive-based schemes, methane emissions could be reduced through:

- Reducing dumping of biodegradable waste (such as green waste) in favour of composting;
- Diverting biodegradable waste to larger-scale facilities with methane capture systems (e.g. through rural waste collection subsidised by waste levy revenue);
- Uptake of anaerobic biodigesters (e.g. on farms), producing and capturing methane, which can then be used as a renewable energy source on-site.
3. Achievable reductions

Given New Zealand’s per capita waste emissions far exceed the current developed country average, and based on reductions achieved over the last two decades in several countries, it seems achievable to reduce waste emissions by around 40-70 percent from current levels by 2030.

![Waste emissions per capita in 2012 (tonnes CO2e)](image)

Figure 1

1 MFE (2015), Greenhouse Gas Inventory 1990-2013, p. 293.
2 Note that the 2015 Common Reporting Format tables were not published until late-July. In other sectors we have relied on the 2014 CRF tables, but here we have updated the analysis because the waste sector showed a significant revision from the previous year. Other sectors were largely unchanged.
3 Composting food and organic waste does not produce significant methane as it is an aerobic process rather than anaerobic
4 http://unfccc.int/di/FlexibleQueries/Event.do
6 Note that this is higher than the reduction reported in the UNFCCC GHG database (54%).
8 New Zealand’s Sixth National Communication, p. 119.
9 Emissions from farm dumps are reported separately from other unmanaged landfill sites in the Common Reporting Format tables for the Greenhouse Gas Inventory 1990-2012 (produced in 2014).
11 http://www.fwi.co.uk/news/farm-dumps-to-be-run-as-landfill.htm