How far can you transport food waste from an emissions perspective?

There is a wide range of emissions factors and variables to consider for disposal, alternative processing options, and transport when considering the business case for kerbside organics, which is why we recommend the development of a spreadsheet calculator to support a business case approach for each region/district. Relevant to kerbside organics, these factors include:

- Default EF for food to landfill (with landfill gas capture) 0.299
- EF for waste to compost 0.172
- EF for food waste to anaerobic digestion 0.02
- Short haul transport
- Long haul transport

Running the calculations using these factors and assuming a typical scenario for 1 tonne of food waste disposed of at a typical class 1 facility with 68% landfill gas capture, to generate the equivalent emissions through diversion and using short haul vehicles (higher emissions) you would need to drive the organic waste:

- 1,102 km (like driving from Dunedin to Christchurch) to a composting plant
- 1,492 km (further than Auckland to Wellington) to an anaerobic digestion plant

before generating greater emissions than landfilling.[1]

If more efficient long-haul vehicles are used, the travel distances increase to:

- 4,094 km for composting, and
- 5,542 km for anaerobic digestion

Assuming a typical scenario for 1 tonne of food waste disposed of at a typical Class 1 facility with landfill gas capture of 90%, a short haul vehicle could drive 41 km to a composting plant and 431 km to an anaerobic digestion plant before generating greater emissions than landfilling.

If more efficient long-haul vehicles are used, the travel distances increase to:

- 153 km for composting, and
- 1,600 km for anaerobic digestion

[1] as calculated based on parameters from the 2020 measuring emissions guide and the 2021 greenhouse gas inventory. The calculations themselves refer to the following sources:
2020 MEG which can be cited as follows:
Ministry for the Environment. 2020. Measuring Emissions: A Guide for Organisations. 2020 Detailed Guide. Wellington: Ministry for the Environment.
(Note, the detailed guide is the only one that contains all values used but the spreadsheet refers to both the summary and the detailed guide)
Parameters for managed landfills in the 2021 inventory:
Ministry for the Environment. 2021. New Zealand's Greenhouse Gas Inventory 1990–2019. Wellington: Ministry for the Environment

These calculations include both the transport and processing emissions from AD and composting methods, and do not include transport emissions to the landfill i.e. a conservative estimate.

Source document:

Landfill v Transport Emissions - 2020 MEG vs 2021 inventory.xlsx

Note from Chris Bean who did the calculations:

"I have included the original 2020 MEG data, plus a new version with updated inventory calculations (note, the transport emission factor is still based on 2020 MEG). Note: it's worth mentioning that the MEG won't be updated for a while, so technically the calculations based on the 2020 MEG are still valid too, even if the results are different using 2021 inventory methodology.

Other overseas estimates

Composting massively reduces greenhouse gas emissions compared to landfill - 45% gas capture
MRA Consulting Group / July 11, 2018
By Mike Ritchie, (MRA Consulting Group)

At a recent meeting with Local Government Mayors and CEO's, a claim was made that transporting organics by truck to a distant compost facility (in this case 150km away) would emit more greenhouse gases than landfilling it locally. Thinking that the carbon forcing factor of methane from landfill (25 times CO2) would render that claim incorrect, I thought I should go back and check the maths.

In short, a truck filled with 25 tonnes of Food and Garden Organics (FOGO) can be driven 13,100km to a composting facility before it emits the same amount of greenhouse gases as that same truckload put in a landfill with 45% gas capture (typical of whole of life gas capture).

Or put another way, you could circumnavigate Australia (14,500km) with FOGO compared to a standard landfill with gas capture.

If the landfill had no gas capture, you could drive that truck 20,900km before the CO2-e emissions from the truck were equal to the landfill's emissions. To put that in context, you could drive from Sydney to Perth and back 5 times before you generated the same amount of emissions.
How stark is that?

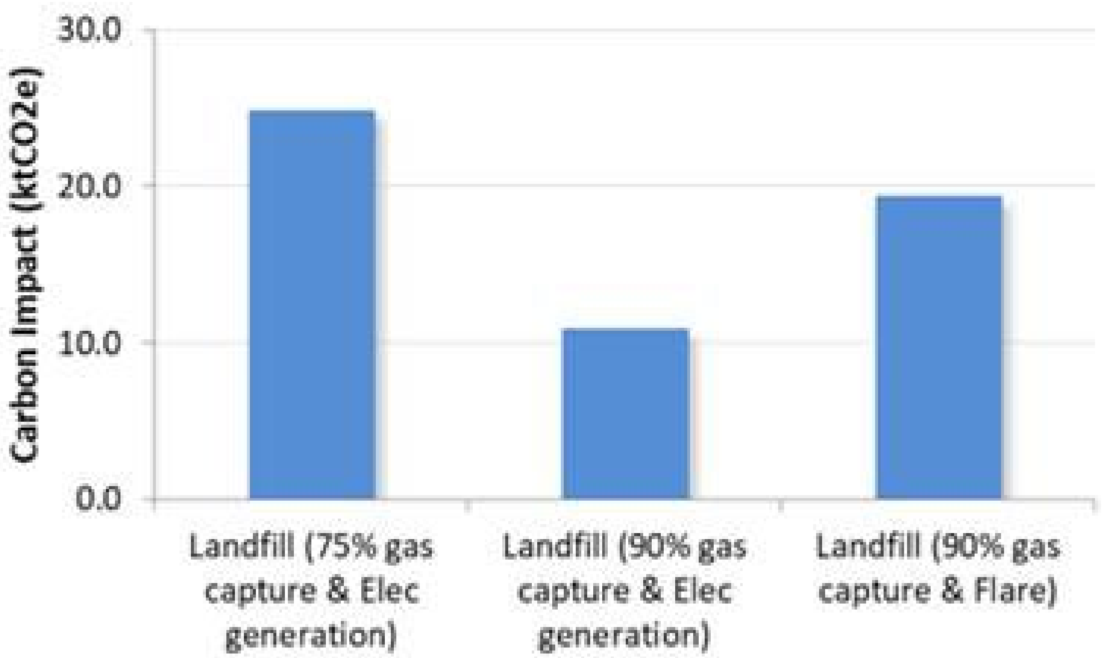
To FOGO or not to FOGO WasteMINZ Webinar 2019

By Andy Street (Director, SLR Consulting Limited)

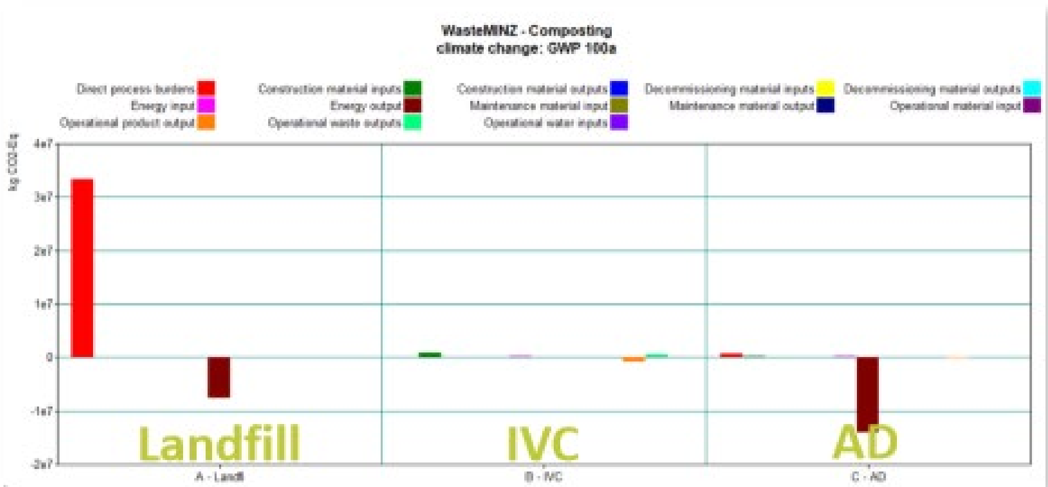
What's the carbon performance in comparison to a landfill that has a unique emission factor of only 0.1, ie very effective gas recovery/destruction?

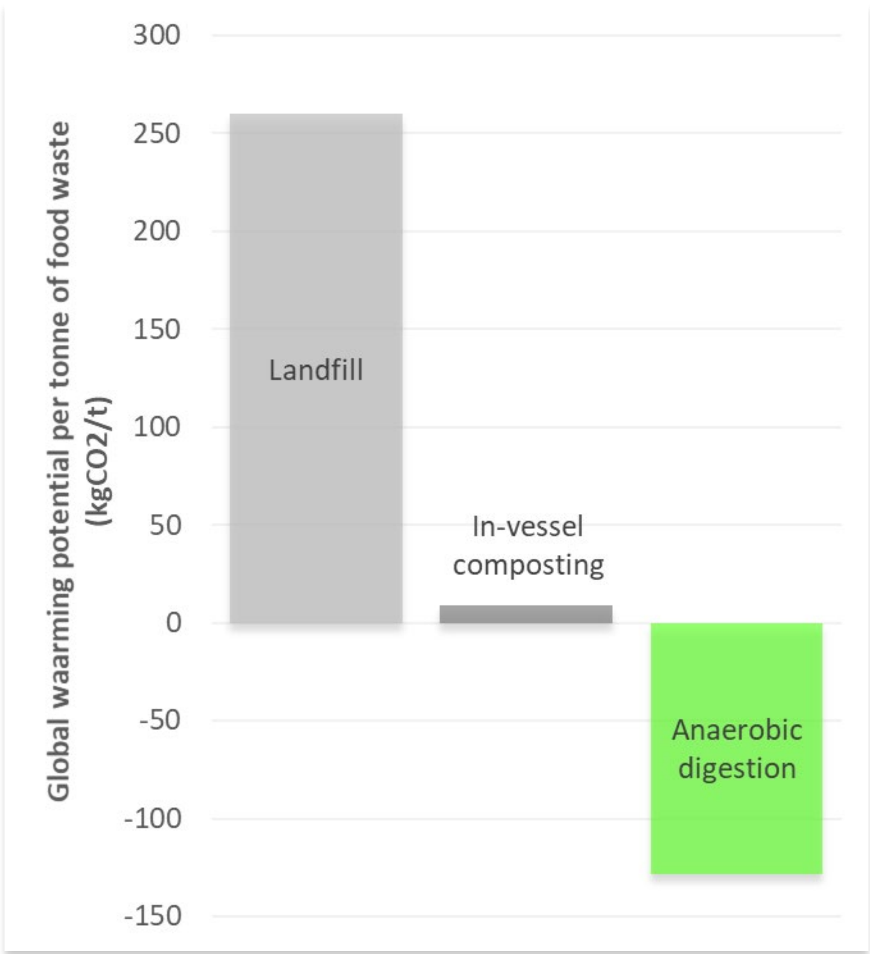
This question comes up regularly in the NZ market, where there is a belief (often shared by the major landfill operators) that the best approach to managing organic waste is to leave it in the residual stream and continue sending it to landfill – on the basis that very efficient gas recovery / destruction / utilisation is a better way of managing it than taking it out of the waste stream and processing it through IVC or AD. This is simply not true, and there is no evidence to support this view.

There are a number of globally accepted carbon models based on the life cycle assessment of waste management options, which provide the basis for comparing the carbon performance of those options. One such model is WRATE. The default gas recovery figure for UK and US landfills – some of the best engineered and operated sites in the globe – is 70-75%. Claiming that NZ landfills can achieve a figure of 90% plus recovery over the life of the site is simply wrong and has no basis in fact. Furthermore though, even if we did assume 90% plus recovery the impact of landfill is still significantly greater that EfW/AD:



- In the below graph: **Red** is direct process emissions and **Brown** is energy output




300
250
200
150
100
50
0
-50
-100
-150
Global waarming potential per tonne of food waste (kgCO2/t)
Landfill
In-vessel composting
Anaerobic digestion