# Waste to Energy – Implications for Aotearoa

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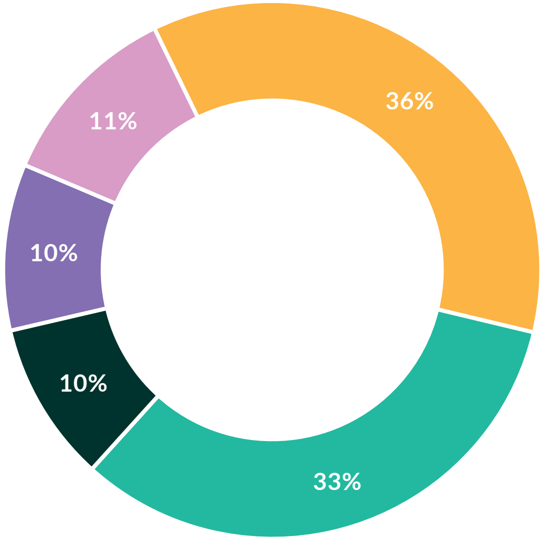
# Eunomia's Diverse, Global Clients

## National, Regional Government

Ministry of Environment & Energy
Department of Energy & Climate Change
Seal of the Governor of the State of California
Finnish Government
Department for Environment Food & Rural Affairs
Norwegian Environment Agency
Llywodraeth Cymru Welsh Government
Hong Kong
The Scottish Government
Department of Ecology State of Washington
RPRA Resource Productivity & Recovery Authority
UK Research and Innovation

## Supranational Government

OECD
JRC European Commission
European Environment Agency
eurostat
UNEP
European Commission
European Medicines Agency Science Medicines Health




## Non-Governmental Organisations

wrap
reloop
C40 Cities
WWF
Alliance to End Plastic Waste
Commission for Environmental Cooperation
CHEMTrust
Zero Waste Scotland
EEB European Environmental Bureau
Greenpeace
Changing Markets Foundation
ClientEarth
RCA Recycling Council of Alberta
Zero Waste Europe

## Local Government

Eurocities
New York City Department of Sanitation
King County Council
Hoboken
Yukon
Manchester City Council
Calgary
SWA Sacramento Regional Solid Waste Authority
Islington
Exeter City Council
Camden
Oslo
City of Westminster
Greater London Authority
The Royal Borough of Kensington and Chelsea

## Private Sector

Nike
TOMRA
FIFA
Consumer Brands Association
Deloitte.
Danone
M&S
Itochu
Europen
Tesco
Red Bull
P&G
Uniqlo
Eastman
Ball
Apple
suez
Coca-Cola
Aldi Süd
L'ORÉAL
PepsiCo
BASF We create chemistry
Nestlé
Macquarie

# Outline

- What is Waste to Energy?
- Characteristics of different WtE technologies
- Key assumptions/context
- Carbon performance
- Other key findings
- Recommendations

| Technologies | Waste inputs |
| --- | --- |
| | **Residual/Source-segregated?** |
| Incineration with energy recovery | Residual waste |
| Pyrolysis/gasification (advanced thermal treatment) | Residual waste but prepared fuels only; some source-segregated wastes |
| Co-incineration (cement kilns) | Residual waste (prepared fuels only), source-segregated wastes |
| Refuse-derived fuels | Residual waste |
| Anaerobic digestion | Potentially residual waste (as part of MBT systems) but mainly for source-segregated wastes |

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# WtE Technologies

Mass-burn incineration – controlled burning of mixed waste in oxygen with energy recovery
Produce heat which is fed through boiler to create electricity or CHP (requires heat out-take)
Many examples globally, 25 to 600 ktpa, 30% efficiency, residue ash and air quality potential issues
E.G 350 ktpa NZ$430M, NZ$70/tonne

ATT – pyrolysis, gasification – controlled oxidation/degradation with high temp, low O2.
Produces gas and/or chemicals, tars, other by-products - WtE option is heat and electricity
Waste must be processed prior, or source-segregation
Limited international track record, commercial/operational viability questionable – key area currently is 'chemical recycling' for plastic waste

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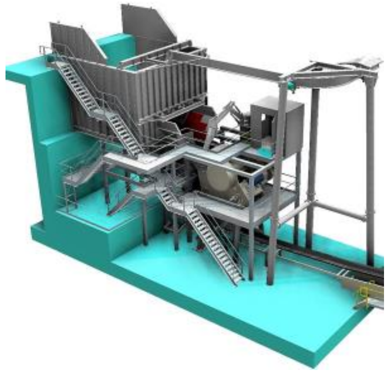
# WtE Technologies


Anaerobic digestion – organic waste breaks down anaerobically creating methane (biogas) and digestate

Digestate can be applied to land, or composted (to minimis
'free' nitrogen)

Many AD plants globally, can be location sensitive if heat an
CO2 are to be used

E.G: 45 ktpa plant, NZ$25M



RDF/SRF – MBT or MRFs process mixed waste to produce a feed stock for a range of facilities including co-incineration

Can replace fossil fuels e.g. coal for process heat

Some materials removed for recycling (metals, perhaps plastic)

Widely used in Europe, poor performance in UK

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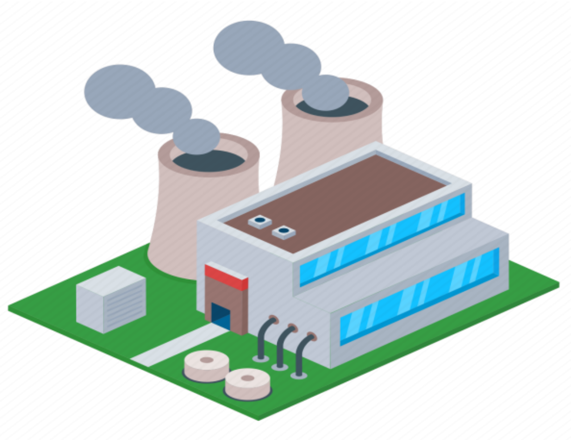
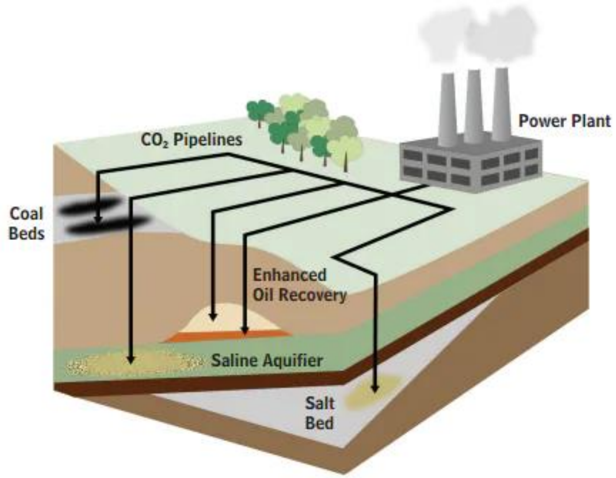
# WtE Technologies



Co-incineration – e.g. replacing coal fuel at cement kilns with high-NCV wastes e.g. timber, tyres
Significant GHG benefits through replacing fossil fuel use
Potentially 90% efficiency, economics relies on fuel costs

CCUS – capture CO2 that would otherwise be released for permanent storage and/or future use
Used effectively elsewhere – three significant facilities in Europe
Financial feasibility limited at smaller scales, storage ability limited here except Taranaki

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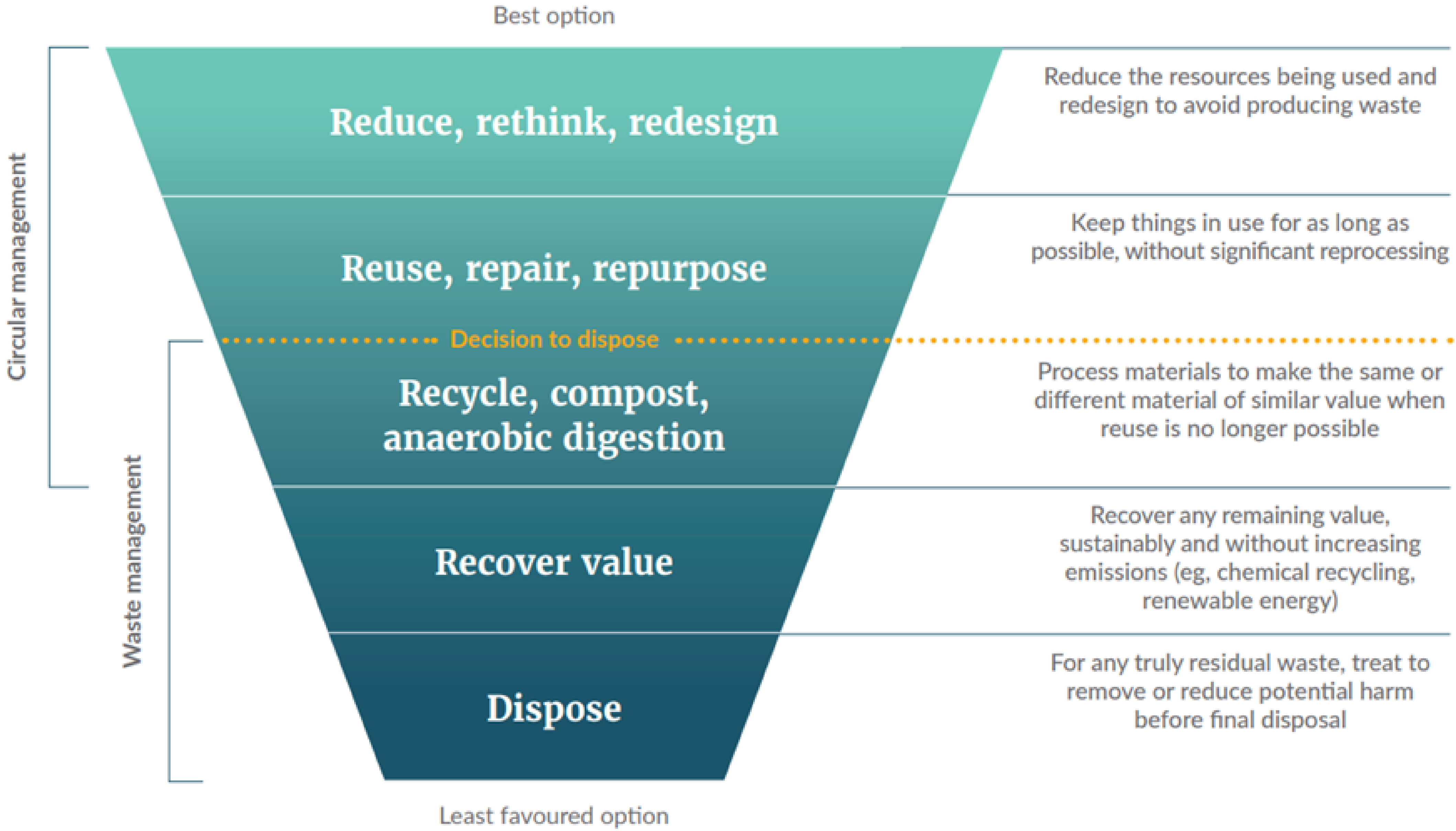
# Aotearoa New Zealand Context

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# Key assumptions/context

- The energy mix used reflected that of Aotearoa New Zealand – with 80% or higher renewable production of electricity
- **Composition 1** reflects the intent of Te rautaki para | New Zealand Waste Strategy, and the emissions reduction plan – with a large proportion of organic waste separated for beneficial use, leaving a high proportion of **fossil carbon** in residual waste
- **Composition 2** represents an input that focuses on household and mixed construction waste streams, but less ICI waste – resulting in a waste stream relatively high in **biogenic carbon**

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# Scenarios Modelled

- Option 1: Landfill 100% residual (status quo)
- Option 2: All residual goes to incineration with energy recovery
- Option 3: Assumes 75% of food scraps is processed through AD, with the remainder residual waste landfilled
- Option 4: Assumes 75% of food scraps is processed through AD, with the remainder residual waste incinerated with energy recovery

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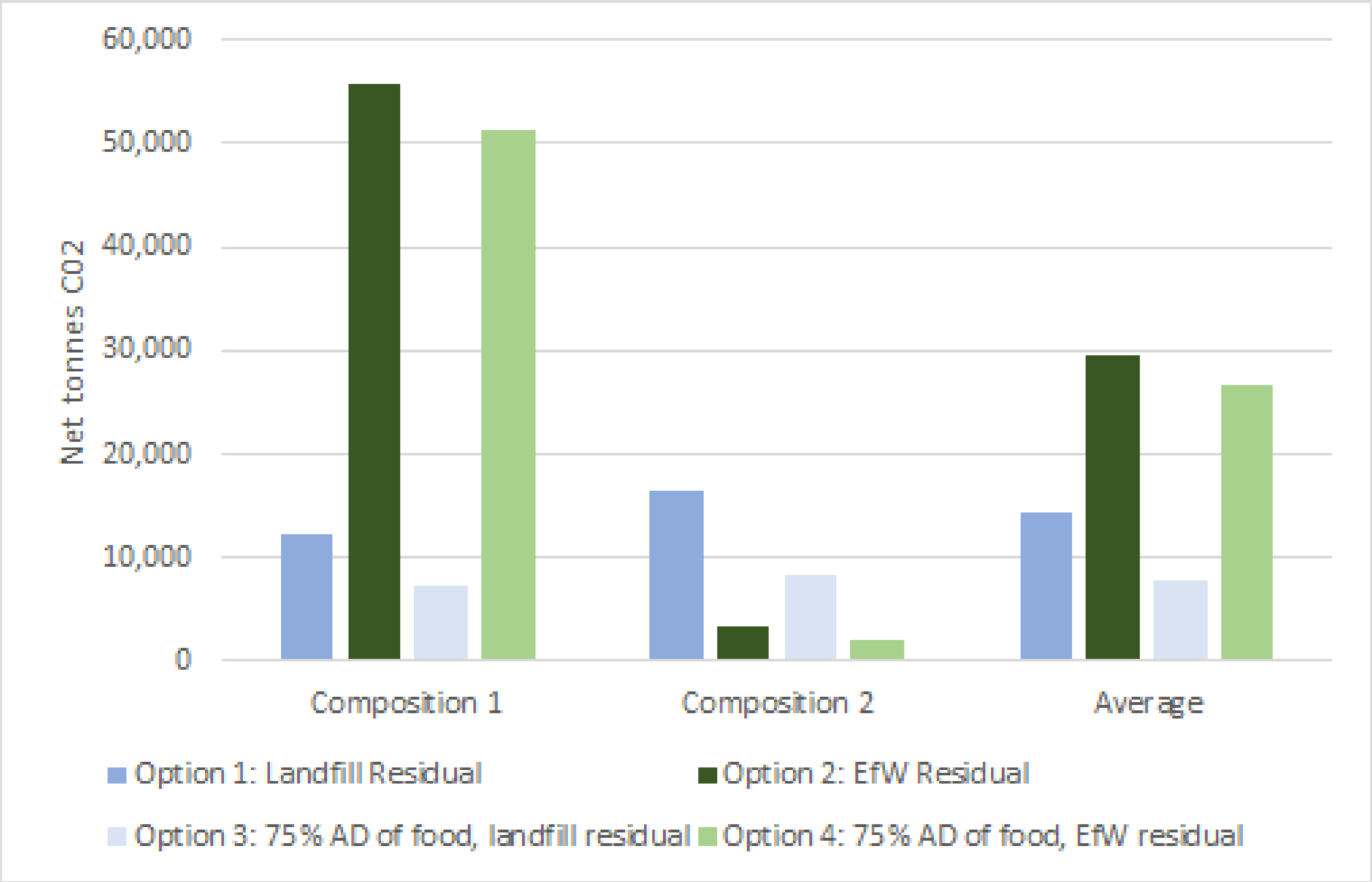
60,000
50,000
40,000
30,000
20,000
10,000
0
Net tonnes C02
Composition 1
Composition 2
Average
Option 1: Landfill Residual
Option 2: EfW Residual
Option 3: 75% AD of food, landfill residual
Option 4: 75% AD of food, EfW residual
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# Other Key Findings

- In every scenario, whether residual waste went to WtE incineration or landfill; modelling showed it is always more beneficial to separate out food scraps for treatment through AD
- WtE incineration is widespread (e.g. Japan 45%) but the UK and EU countries are gradually moving away from it as it impedes circular economy developments and increases carbon emissions

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# Other Key Findings

- In employment terms:
  - ➢ landfills and incinerators generate roughly 1 FTE per 10,000 tonnes of waste treated
  - ➢ Organic waste two to four FTEs
  - ➢ Recycling typically ten times these numbers
- Māori views on WtE are mixed, exacerbated by lack of clarity about the different technologies and the pros/cons

# Recommendations

- Separate food scraps for AD or composting
- Incineration of mixed waste should be avoided unless offsetting fossil fuels and not impeding moves towards circularity
- ATT should be avoided due to technical and commercial risks
- Burning mixed waste only done as co-incineration and as a transitional measure

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# Recommendations

- Landfill continues to be the default disposal method for truly residual waste
- Proactively engage mana whenua

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# Thank You