Waste composition and landfill gas at non-municipal (class 2-4) landfills

Overview

- Introduction and Purpose
- Class 2 waste composition
- Class 3/4 waste composition
- Landfill gas monitoring
- Key findings
- Next steps

Our Team

Dr Dan Harvey

Dr Ivan Chirino-Valle

Waste data, evidence and emissions reduction team

Rod Lidgard

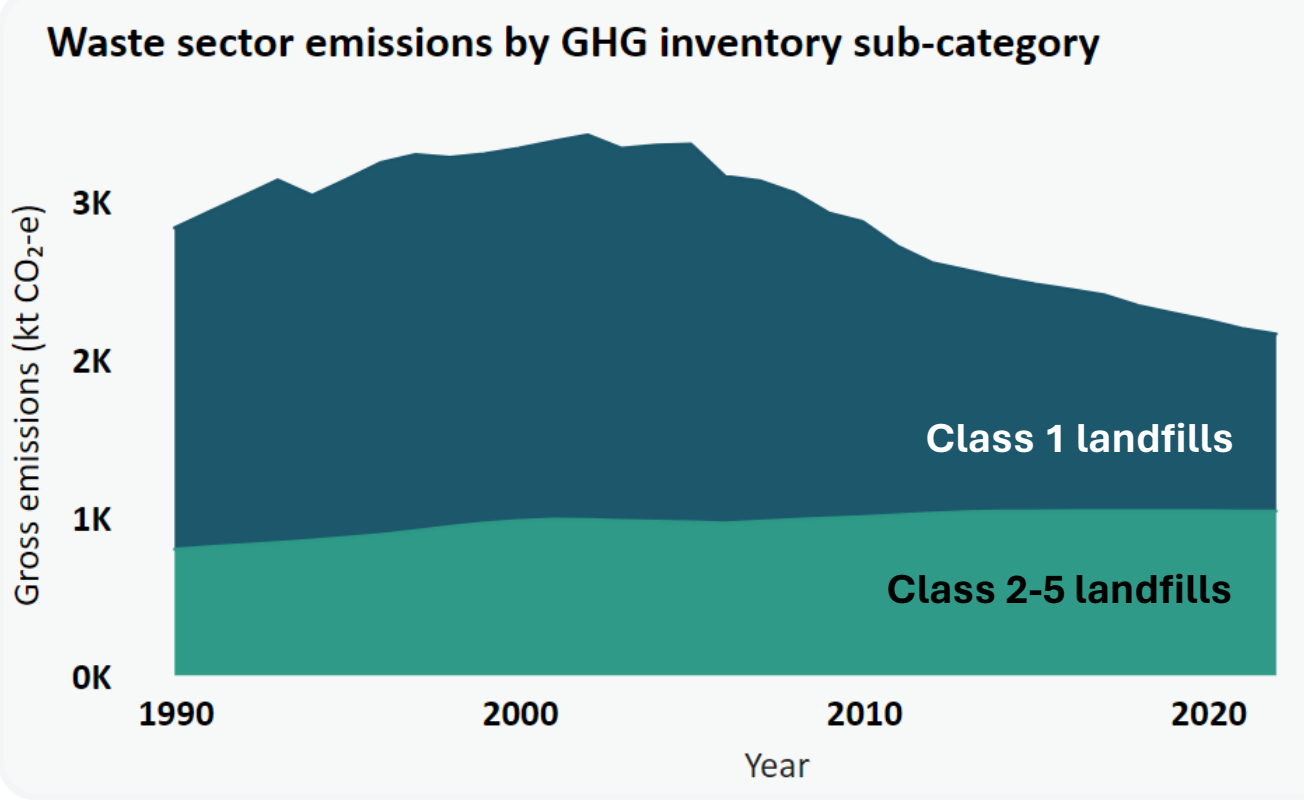
James Conway

Jordan Vaughn

Contaminated Land and Solid Waste team specialists

And a very special thanks to the contributing landfills and site teams who have allowed us to access their sites and collect this information...

Purpose / Objective



ERP action 15.6.2

Improve information on greenhouse gas emissions from waste disposal

ERP action 15.5.2

Undertake feasibility studies to determine whether additional LFG capture requirements or organic material bans should be implemented at non-municipal (Classes 2 to 5) landfills.

ERP = Emissions Reduction Plan

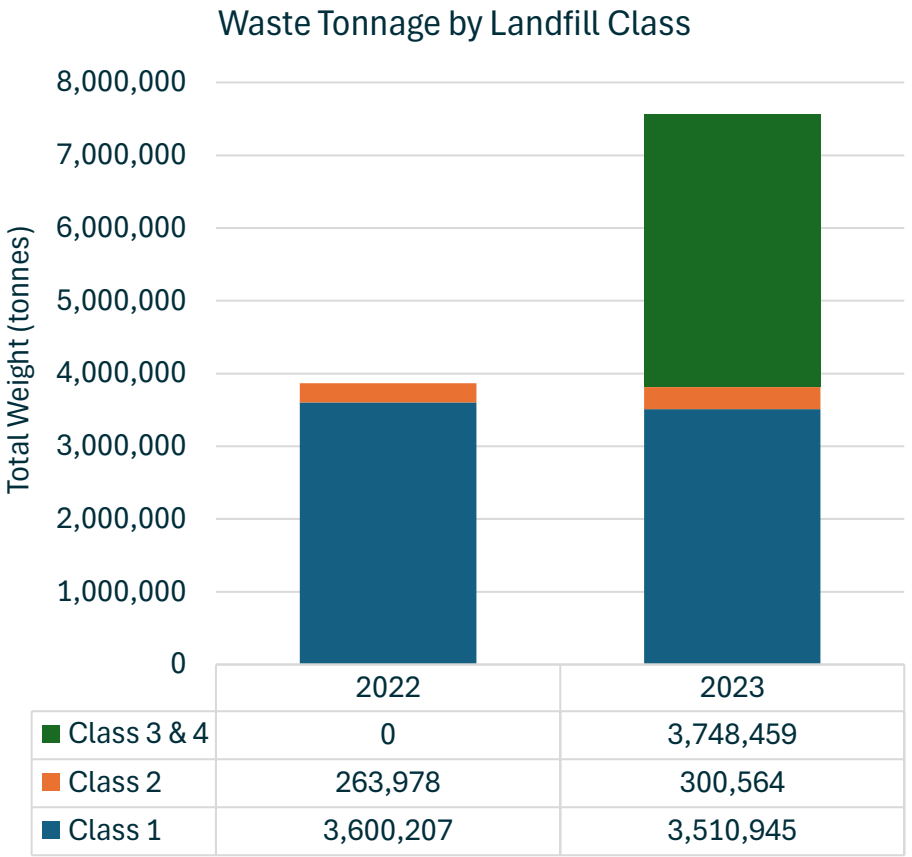
Purpose / Objective

The investigation involved:

- A review of existing composition data for class 2 landfills
- An assessment of technologies available in NZ to measure landfill gas
- Three site assessments of waste composition and landfill gas at class 2 landfills
- Seven site assessments of landfill gas at class 3-4 landfills (waste composition at five sites)
- Final report pending

Class 2 Waste Composition – Desktop Review

- Review indicated a high proportion (potentially up to 44%) of material being disposed of to Class 2 landfills is biodegradable, including: paper, ‘putrescibles’, nappies and sanitary materials, textiles and timber.
- Recent data for fill facilities has been made available on the Ministry’s new public dashboard
  - Class 2 facilities began reporting in Jan 2022.
  - Class 3 & 4 facilities in Jan 2023.



	2022	2023
Class 3 & 4	0	3,748,459
Class 2	263,978	300,564
Class 1	3,600,207	3,510,945

Class 2 Waste Composition – Consent Conditions

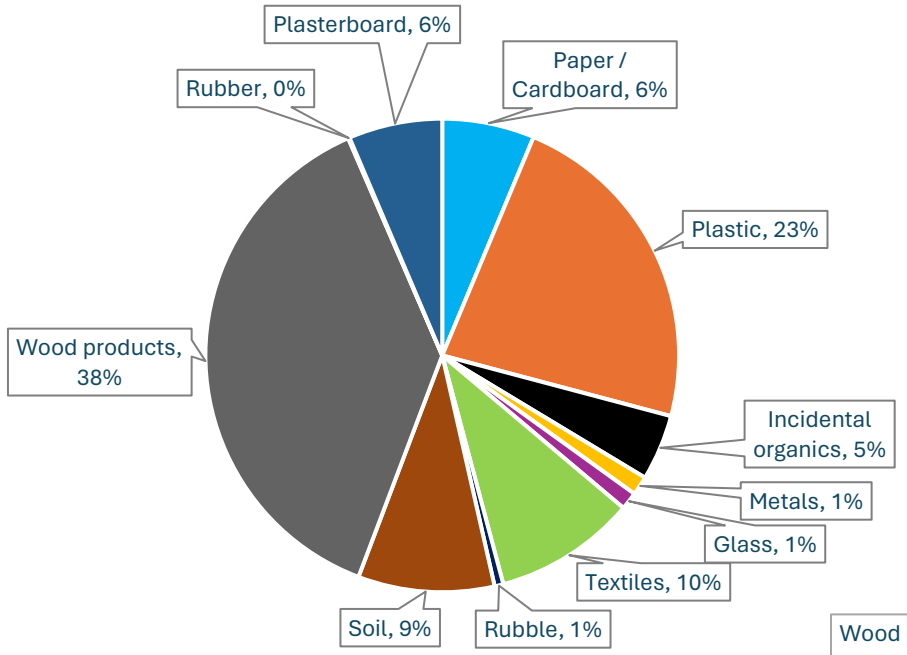
- Tāmaki Makaurau | Auckland
  - No information on Class 2 landfills. The Auckland Unitary Plan (AUP) has consenting triggers for cleanfills, managed fills and landfills, not landfill classes. The waste acceptance criteria for a Class 2 landfill is more than the AUP allows as managed fill, therefore a Class 2 facility would require consent as a landfill (same category as Class 1 facility).
- Te Whanganui a Tara | Greater Wellington
  - *'The total quantity of organic materials shall not exceed 5% by weight of the landfill materials as a whole'.*
  - *'No more than 5% processed timber (both treated and untreated) shall be disposed of at the landfill'.*
- Waitaha | Canterbury
  - Environment Canterbury does not classify sites under the current Class 1 – 5 system.
  - Up to 6x 'C&D waste' and 'open' sites – 2x which also accept 'building materials and timber'.
- Ōtākou | Otago / Ōtepoti | Dunedin
  - *'Vegetation as a minor (<5%) component mixed with other wastes'.*

Class 2-4 Waste Composition - Custom SWAP

- The *Solid Waste Analysis Protocol* (SWAP) provides a standardised method for gathering information on the composition of solid waste streams.
- The original SWAP was developed for Class 1 facilities: some categories are general – i.e. ‘rubble’ includes materials such as soil, concrete, plasterboard, ceramics and asphalt.
- Amendments were made for more accurate recording of these materials and anything with emissions potential.
- Important to ensure the custom categories remain compatible with existing SWAP categories.

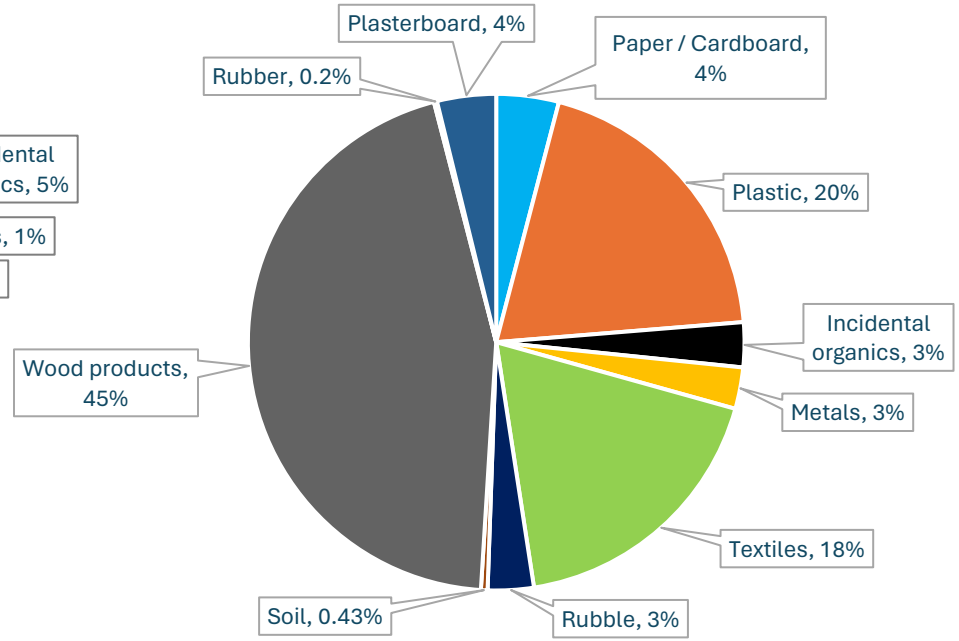
Class 2 Waste Composition - SWAP Results

Landfill B
2023 SWAP Results



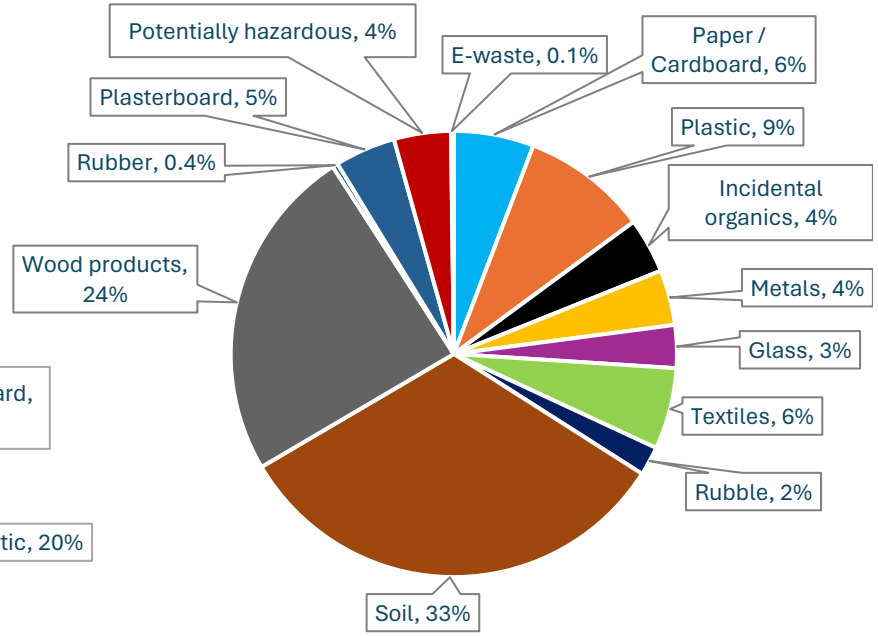
Sum of categories containing potentially degradable organic material = 58 % (w/w)

Landfill B
2024 SWAP Results



Potentially degradable organic material = 70 % (w/w)

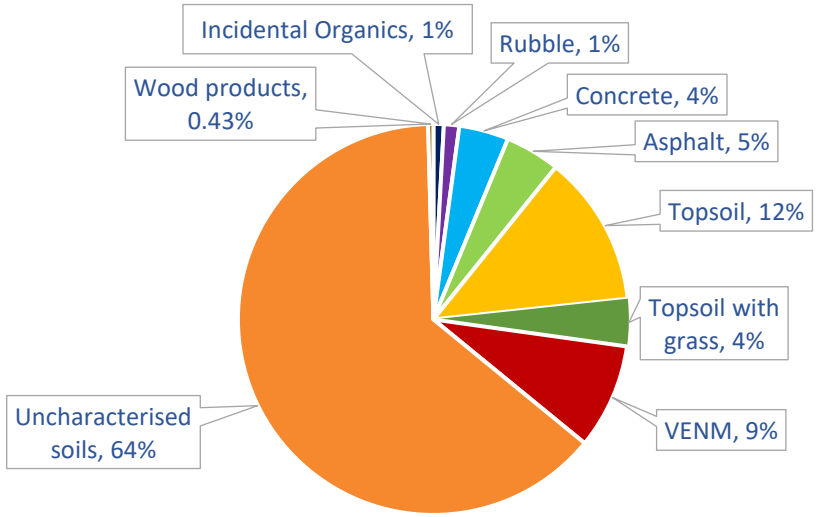
Landfill A



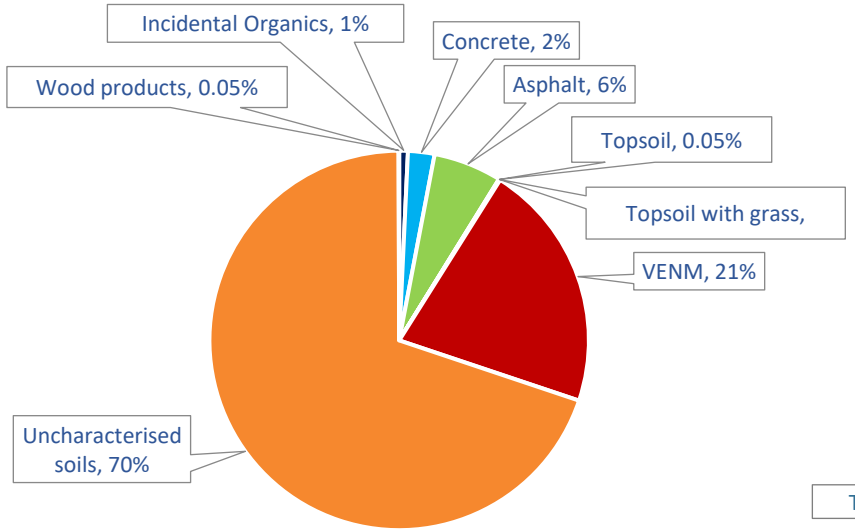
Potentially degradable organic material = 40 % (w/w)

Most recent national estimate for organic materials at Class 1 landfills is 43%

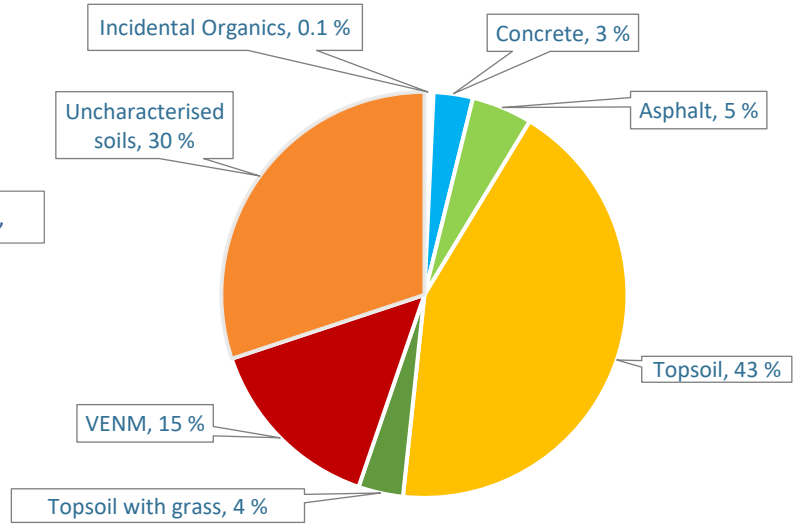
Class 3-4 Waste Composition - SWAP Results



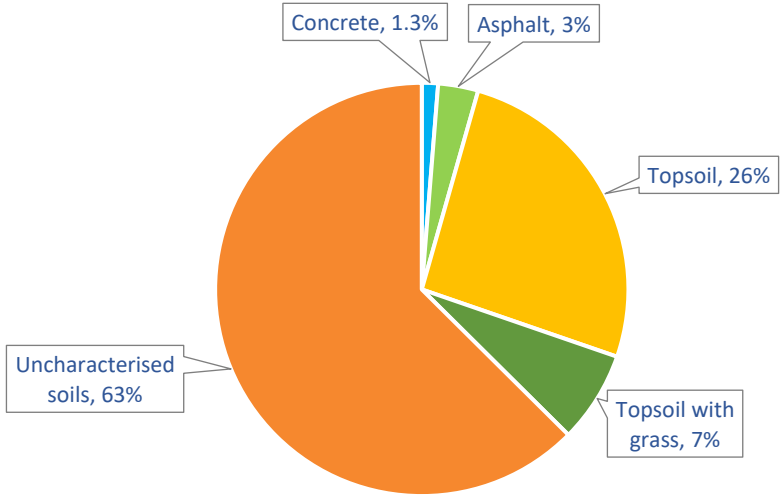
Organics ~ 5.5 % (w/w)



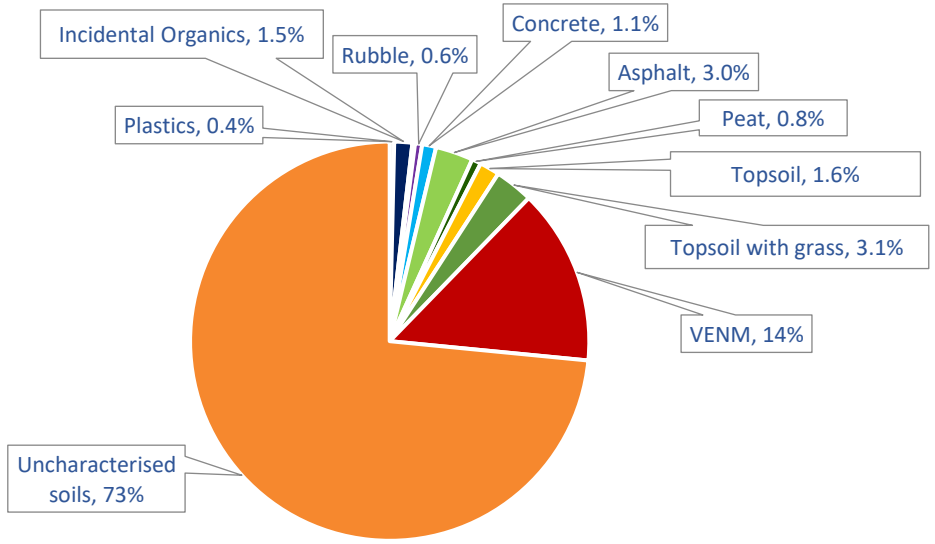
Organics ~ 0.9 % (w/w)



Organics ~ 3.8 % (w/w)



Organics ~ 7 % (w/w)



Organics ~ 5.5 % (w/w)

Landfill Gas Monitoring – Methodology

- Prior to surveying, a comprehensive review of emission detection technologies was undertaken including various technologies available and accessible in Aoteroa NZ (focus on methane only).
- Instantaneous surface monitoring (ISM) using a low-level methane detector (i.e. Eagle 2) was the preferred method.
  - Provides concentration of methane at ppm level.
  - Can be completed over large areas and a wide range of surfaces.
  - Suitable as a screening method (notes presence of methane and rough idea of magnitude/distribution at the time of sampling).
- This is a constantly evolving field with many new tools and applications coming online (e.g., remote sensing, UAVs, etc).

Landfill Gas Monitoring – Summary

- Surface methane detected at all landfills
- Results should be treated as indicative only

Class 2 Sites	No. of survey points	CH_4 range (ppm) Day 1	CH_4 range (ppm) Day 2	Background CH_4 (ppm)
A	48	0 – 25	NA	NA
B (2023)	23	0 *	NA	NA
B (2024)	24	95 – 115	35 – 75	55

Class 3-4 Sites	No. of survey points	CH_4 range (ppm) Day 1	CH_4 range (ppm) Day 2	Background CH_4 (ppm)
A	87	0 – 75	0 – 15	0 – 10
B	154	0 – 220	0 – 45	0
C	33	0 – 55	0 – 30	0 – 15
D	30	0 – 15	0 – 5	0
E	27	0 – 10	0 – 5	0
F	40	0 – 45	0 – 15	0

Key Findings

- Biodegradable waste at class 2 landfills included paper products, textiles, wood and incidental organics. Range of total biodegradable materials by weight 40-70%.
- Biodegradable waste at class 3-4 landfills was mostly incidental greenwaste (e.g grass in topsoil).
- Variation in application of organic material acceptance among councils and operators (ie consents).
- Surface methane detected at all class 2-4 landfills (0-220 ppm across 8 sites).

Next Steps

- More composition and emissions data from Class 2-5 facilities.
- Improved estimates of emissions at non-municipal landfills (e.g. GHG Inventory).
- Updated SWAP protocols for Class 2-5 facilities.

Ngā mihi
Thank you