



Climate change and the Climate Change Act

GHG Inventory training (Session 3)

July 2026



WELCOME!

Agenda

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Introduction to today's session

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Top-down and bottom-up estimates

3

Waste sector emissions

4

Further notes on waste reporting

5

Homework

6

Next session and way forward

1

Introduction to the
session



What we covered in the last session

In the last session we covered:

- Stationary energy and agriculture homework
- Data sources and the downscaling tool
- Introduced energy supply
- Introduced the training platform (<https://ukpact.lateral.co.za>)

Does anyone have any queries on any of the information covered so far?



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Today's session

Today we will introduce:

- The concept of top-down and bottom-up emission estimations
- Waste sector emissions
 - Identify data requirements
 - Introduce waste sector in the developing municipal GHG inventory tool
 - Discuss bottom-up data collection
 - Look at the SAWIC website
 - Provide waste sector homework
- Way forward

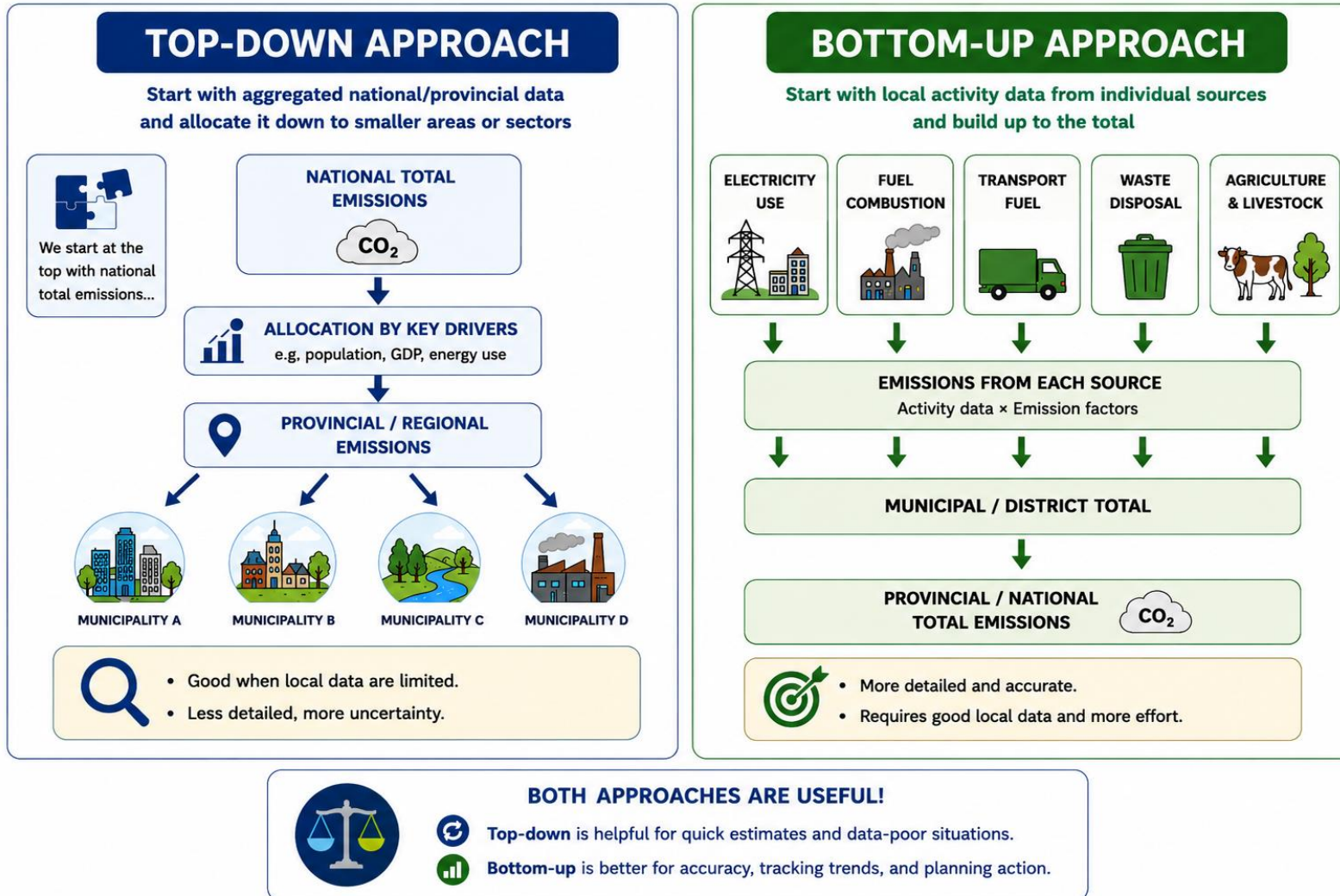


2

Top-down and bottom-
up emission estimations



Top-down and bottom-up emission estimations



Which approach have we been discussing so far in the previous sessions?



3

Waste sector
emissions



What waste management activities give rise to emissions?



Solid waste disposal in landfills or dump sites (unmanaged site, managed dump, landfill)



Composting and anaerobic digestion (known as biological treatment)



Incineration and open burning of waste



Wastewater treatment and discharge

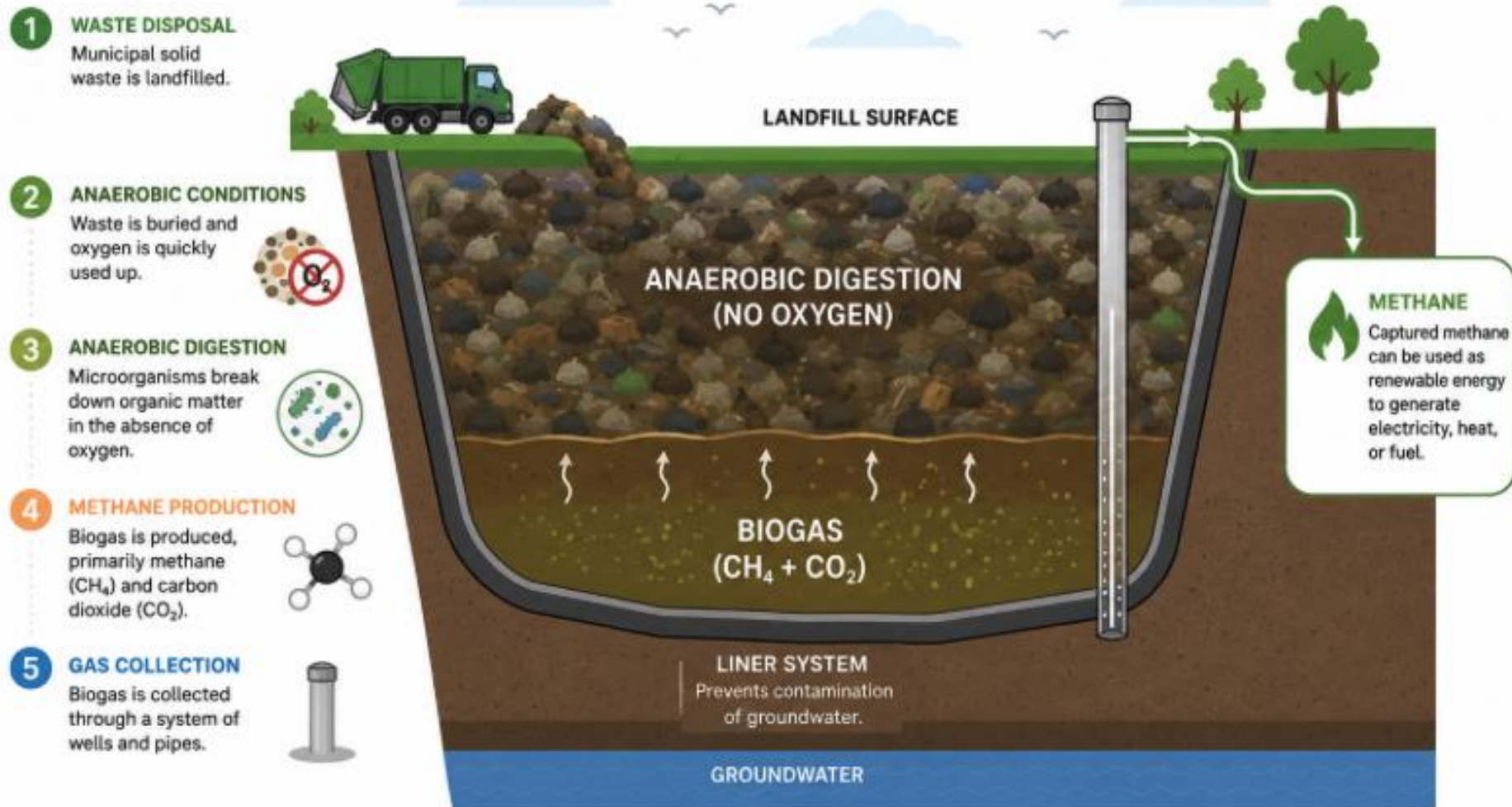


Gases: CO₂, CH₄, and N₂O

Solid waste



Anaerobic Digestion Produces Methane in a Municipal Solid Waste Landfill



Solid waste types

Municipal solid waste (MSW):

Food, gardens and parks, paper and cardboard, wood, textiles, nappies, rubber and leather, plastics, metal, glass, other.

Wastewater Treatment Sludge

Industrial waste

Other waste: Clinical and hazardous waste

Factors determining emissions from solid waste

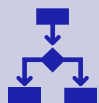
Disposal in landfills:

- Total waste disposed (tonnes)
- Degradable organic carbon (DOC) in the waste → methane generation

Incineration/ burning:

- Total waste burned (tonnes)
- Fossil carbon in the waste

Emissions from landfill



Continues for decades (or centuries) after disposal



Waste disposed in one year gives emissions in that year and in future years.



Methane from a landfill in one year includes emissions from waste disposed that year, and waste from previous years.



GPC provides two methods for estimating methane emissions from solid waste: FOD and methane commitment

EMISSION ESTIMATION

Type of site	Waste disposed <i>(This is the amount of solid waste that is generated and disposed of in your jurisdiction.)</i>		Municipal Solid Waste (MSW) composition <i>(This is the percentage of the total municipal solid waste that is allocated to each of these waste types indicated below. If this data is not available default values for South Africa (shown in the grey row below the heading) can be used.)</i>								Check <i>(This sum column should be 100 otherwise the composition data must be adjusted)</i>	Fraction of methane recovered at landfill <i>(If there is no data leave it blank)</i>	Degradable organic carbon (DOC)	Emissions (t CO ₂ eq) <i>(Emissions will be estimated automatically so no input is required)</i>
	Value <i>(Please enter the amount of waste that is disposed.)</i>	Units	Food	Garden waste/ plant debris	Paper	Wood	Textiles	Nappies	Rubber and leather	Plastic/ other inert waste				CH ₄
			20	0	10	6	3	9	0	52	100			

Solid waste disposal - Municipal solid waste

Managed		tonnes									0			
Managed (semi-aerobic)		tonnes									0			
Unmanaged (≥5m)		tonnes									0			
Unmanaged (<5m)		tonnes									0			
Uncategorised		tonnes									0			
#LS #02/07/2026 #Pmeth Should we au #LS #01/07/20 #LS #01/07/2026 #Pmeth Need to maybe think about these categories and how they relate to what is collected on SAWIC ter													Total emissions (t CO ₂ eq)	0.00

Solid waste disposal - Industrial waste

Managed		tonnes				
Managed (semi-aerobic)		tonnes				
Unmanaged (≥5m)		tonnes				
Unmanaged (<5m)		tonnes				
Uncategorised		tonnes				
				Total emissions (t CO2eq)		0.00
#LS #01/07/20 #LS #01/07/2026 #Pmeth Need to maybe think about these categories and how they relate to what is collected on SAWIC ter						

Bottom-up activity data – Homework Exercise

- Go to <https://sawic.dffe.gov.za/SAWIC/sawissearchregistrations>, search for disposal sites in your municipality
- Contact waste department and see if there are any missing
- Go to <https://sawic.dffe.gov.za/SAWIC/sawisstatisticsreport>, search for statistics on general and hazardous waste disposal in your municipality
- Contact all site owners and ask for:
 - Waste disposed in a year in each landfill
 - By type of waste if they have it
 - Type of landfill site (as different landfills have different EF) – managed, unmanaged, open dumping
- Cross check totals with SAWIC
- If there is a gap/difference, try and identify which sites don't collect data - these might be the ones contributing to the difference:
 - Communicate with these site managers to collect the data for filling in the SAWIC Excel spreadsheet
 - Use the spreadsheet to calculate waste disposed per year per landfill type
- Add up total waste disposed in municipality and per type of disposal site
- *Prepare a few slides for next session to demonstrate your progress*

What data do site managers need to calculate total waste disposed?

Name of Landfill: <i>Landfill Name</i>
ID: <i>Municipal Vehicles (large trucks)</i>
Date: <i>29 February 2024</i>

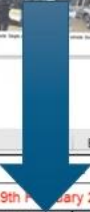
These forms can be modified to better suite the operating conditions at the waste facility

Vehicle Number	Vehicle Type	Vehicle capacity in m ³	Number of loads				Type of waste
V21	Compactor	19	1				Compacted domestic
V22	Compactor	19	0,5				Domestic uncompacted
V105	Tipper truck	15	1	1			Building rubble
V105	Bakkie	1	1				Garden waste



Waste categorisation	Waste type	Density kg/m ³
Domestic waste	Domestic waste compacted in REL	500
	Domestic uncompacted	200
	Mix domestic/garden (more domestic than garden)	200
	Mix domestic/building rubble (more domestic than building)	250
	Commercial/Industrial - packaging (paper & plastics)	200
Commercial/Industrial	Commercial/Industrial - timber/metal	150
	Tyres	150
	Building rubble/concrete/sand/fiber glass/bricks/ceramics	750
Inert Waste (Contruccion waste)	Building rubble/industrial mix (more building than packaging)	350
	Building/garden mix (more building than garden)	250
	Garden waste	200
Garden waste	Loose grass/small branches	200
	Large logs	400
	Garden/building mix (more garden than building)	250
Perishable waste	Food waste/animcal fodder	840

100% of the respondents were female, and 90% were aged 18 years or older. The majority of the respondents were students (60%), followed by employees (20%), and the remaining 20% were categorized as "other." The majority of the respondents were from the United States (60%), followed by Canada (20%), and the remaining 20% were from other countries.



100

Notes

- The spreadsheet doesn't distinguish between waste types which you need for calculating emissions so keep these separate in your calculations, hence the need to obtain from site operator. Otherwise use defaults
- Video: Go to <https://sawic.dffe.gov.za/SAWIC/home>, choose SAWIS implementation from the side menu, SAWIS Training and Implementation at the bottom, and SAWIS Tonnage Estimation Training
- Spreadsheet: Go to <https://sawic.dffe.gov.za/SAWIC/home>, choose SAWIS implementation from the side menu, Waste Information System Guidelines, Landfill monthly data capture form

Biological treatment of solid
waste: Composting and
Anaerobic Digestion

Incineration

Open burning



What is biological treatment?



Composting and anaerobic digestion of organic waste (food, garden and park, sludge, other organic waste).



Reduces overall waste volume for final disposal (in landfill or incineration) and reduces the toxicity of the waste.



Report on CH₄, N₂O and non-biogenic CO₂

Data sources

- Composting: As per municipal solid waste
- Anaerobic digestion: Individual sites

Incineration and open burning



Incineration is a controlled, industrial process, often with energy recovery



Open burning is an uncontrolled, often illicit process with different emissions



Each have different emission factors and are reported separately (CH₄, N₂O and non-biogenic CO₂)

Data source

- Incineration: Information to be collected from individual sites
- Open burning: difficult to estimate

Data requirements

	A	B	C	D	E	F	G	H	I	
19	Type of site or waste	Waste treated or burned <i>(This is the amount of solid waste that is composted, digested, burnt or incinerated within the municipal boundary)</i>		Tonnes of CH4 recovered <i>(If there is no data leave it blank)</i>	Type of incineration <i>(Please select from the drop-down list provided)</i>	Emissions (t CO2eq) <i>(Emissions will be estimated automatically so no input is required)</i>			Total emissions per category	
20		Value <i>(Please enter the amount of waste composted, digested, burned or incinerated)</i>	Units			CO2	CH4	N2O	(t CO2eq)	
21	Biological treatment of solid waste									
22	Composting		tonnes				0.00	0.00		
23	Anaerobic digestion at biogas facility		tonnes				0.00	NA		
24					Total emissions (t CO2eq)	0.00	0.00	0.00	0.00	
25	Open burning									
26	Municipal waste		tonnes				0.00	0.00		
27	Industrial waste		tonnes				0.00	0.00		
28	Hazardous waste		tonnes				NA	NA		
29	Clinical waste		tonnes				NA	NA		
30	Wastewater treatment sewage sludge		tonnes				NA	NA		
31					Total emissions (t CO2eq)	0.00	0.00	0.00	0.00	
32	Incineration									
33	Municipal waste		tonnes							
34	Industrial waste		tonnes							
35	Hazardous waste		tonnes				NA	NA		
36	Clinical waste		tonnes				NA	NA		
37	Wastewater treatment sewage sludge		tonnes				NA	0.00		
38					Total emissions (t CO2eq)	0.00	0.00	0.00	0.00	

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Waste - BTOBI
Wastewater treatment
Background calculations
Livestock
Land - Managed soils
Livestock Manure Management
Co ... + :

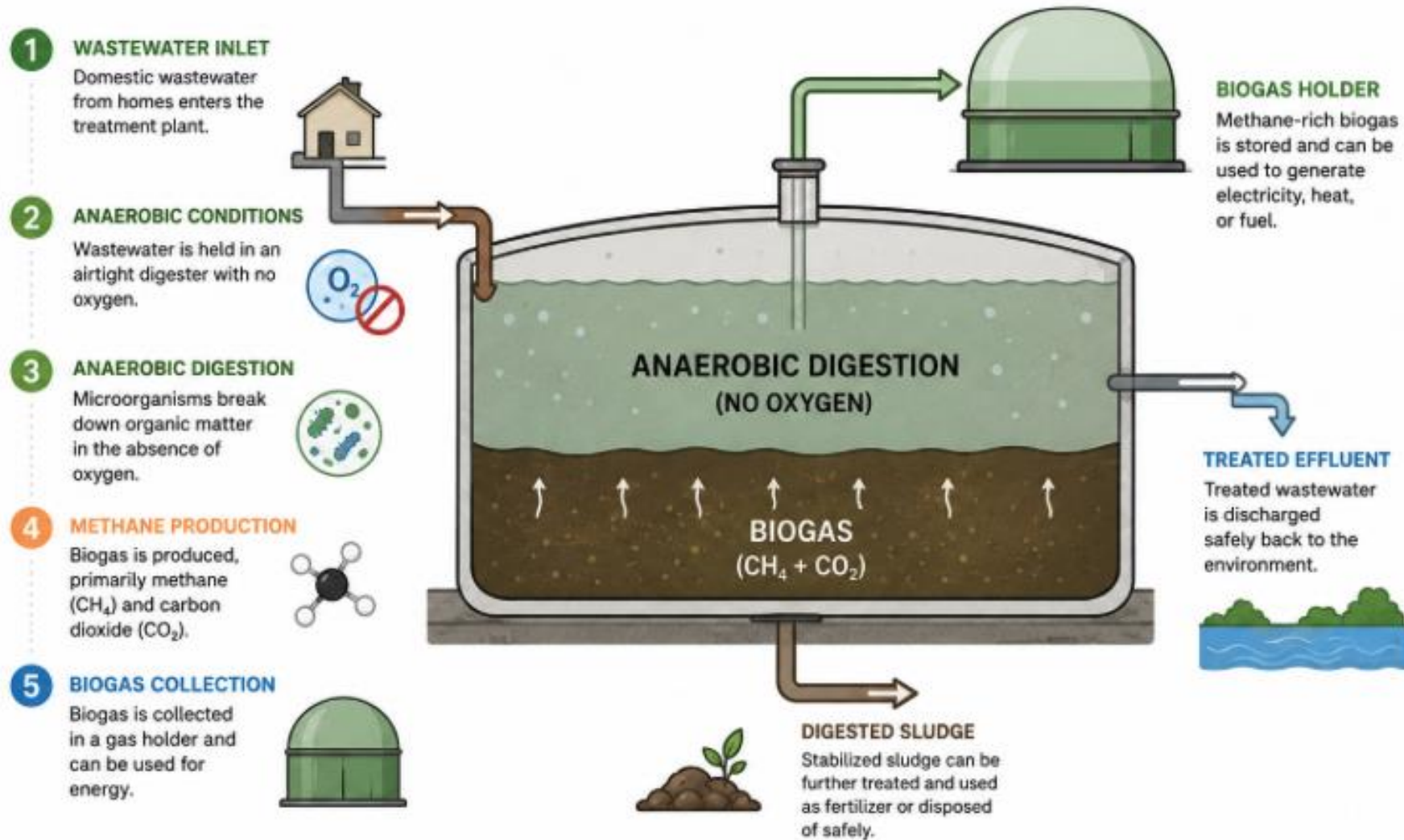
Ready

 Accessibility: Investigate

Wastewater treatment



Anaerobic Digestion Produces Methane in Domestic Wastewater Treatment



Introduction

- Municipal wastewater can be treated aerobically or anaerobically
 - Anaerobic → methane (CH_4) produced
 - Aerobic → CO_2 (considered biogenic)
 - Both treatments also generate nitrous oxide (N_2O) through nitrification and denitrification of sewage nitrogen

Data for wastewater emissions calculations

- Quantity of wastewater
- How it is treated
- Source, organic and nitrogen content:
 - Based on
 - Population and composition (domestic)
 - Industrial sectors (industrial wastewater)



Domestic wastewater treatment data requirements

EMISSION ESTIMATION														
Type of site	Degree of utilisation <i>(This is the fraction of treatment/disharge pathway for each category. Default values are provided in te grey rows if no data is available.)</i>										Check <i>(This sum column should be 100 otherwise the composition data must be adjusted)</i>	Organic component removed as sludge in inventory year (kg BOD)	Amount of CH4 recovered in the inventory year (kg CH4)	
	Sea, river, lake discharge	Stagnant sewer	Flowing sewer	Aerobic treatment plant (well managed)	Aerobic treatment plant (not well managed)	Anaerobic digester, reactor or deep lagoon	Anaerobic shallow lagoon	Septic system	Latrine (rural)	Latrine (urban low income)				
	Rural													
	Urban low income													
Urban high income														
Domestic wastewater														
Rural											0			
Urban low income											0			
Urban high income											0			

1	General input		
2			
3	Jurisdiction (Please enter the jurisdiction for which the inventory is being completed)	Bushbuckridge	
4	Inventory year (Please select the year from the drop-down list)	2025	
5	Global warming potential (GWP) (The default GWPs are AR5, but should you wish to change this please select an alternate from the drop-down list)	AR5	
6	Population (Please enter the population of the jurisdiction)		
7	Rural population percentage (Please enter the percentage of the population that is in the rural bracket)		
8	Urban low income percentage (Please enter the percentage of the population that is in the urban low income bracket)		
9	Urban high income percentage (Please enter the percentage of the population that is in the urban high income bracket)		
10			

Wastewater: Homework

- Homework exercise:
 - Speak to wastewater treatment departments
 - Find out what percentage of domestic wastewater is treated in different ways
 - Present this next session

Industrial wastewater treatment data requirements

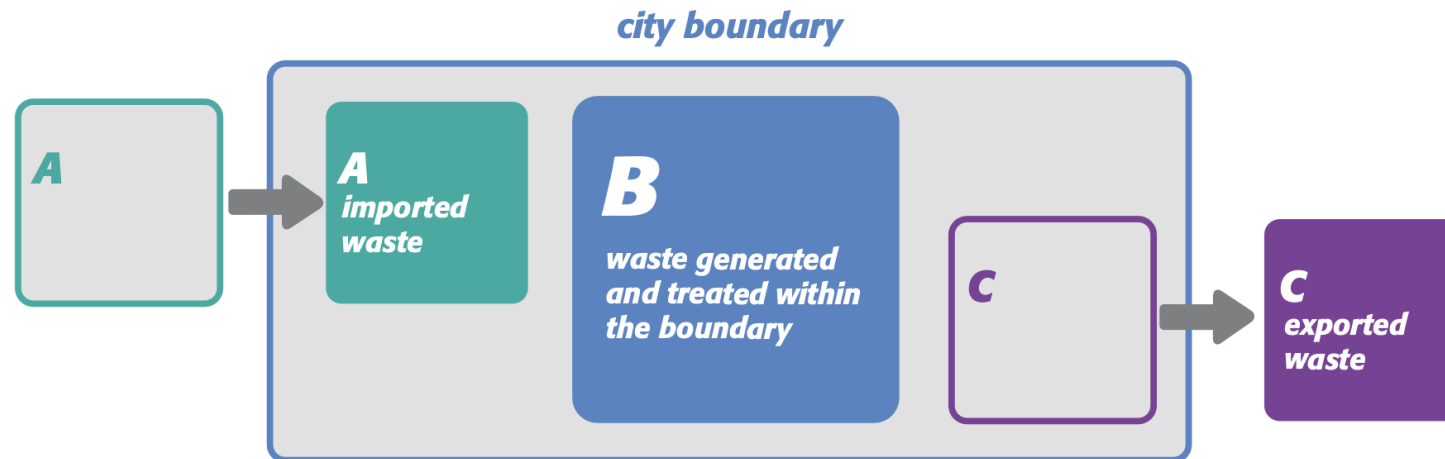
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
29	Type of industry	Total industrial product produced in inventory year				Wastewater generated				Organic component removed as sludge in inventory year (kg COD)	Amount of CH4 recovered in the inventory year (kg CH4)	Waste treatment type <i>(Please select from the drop-down list provided)</i>					Emissions (t CO2eq) <i>(Emissions will be estimated automatically so no input is required)</i>		Total emissions (t CO2eq)		Data source reference for industrial wastewater treatment data <i>(Please write down where the industrial wastewater data was obtained from, incorporating as much detail as possible (e.g. report name, links, table or page numbers))</i>
30		(t/yr)			(m3/t product)			CH4									N2O				
31	Industrial wastewater																				
32	Alcohol Refining																	NA			
33	Starch Production										Sea, river, lake discharge							NA			
34	Beer and Malt										Aerobic treatment plant (well managed)							NA			
35	Vegetable Oils										Aerobic treatment plant (not well managed)							NA			
36	Dairy Products										Anaerobic reactor							NA			
37	Fish Processing										Anaerobic shallow lagoon							NA			
38	Vegetables Fruits and Jui										Anaerobic deep lagoon							NA			
39	Meat and Poultry																	NA			
40	Organic Chemicals																	NA			
41	Petroleum Refining																	NA			
42	Plastic and Resins																	NA			
43	Soap and Detergents																	NA			
44	Pulp and Paper																	NA			
45	Sugar																	NA			
46	Wine and vinegar																	NA			
47												Total emissions (t CO2eq)		0.00		NA		0.00			
48																					

4

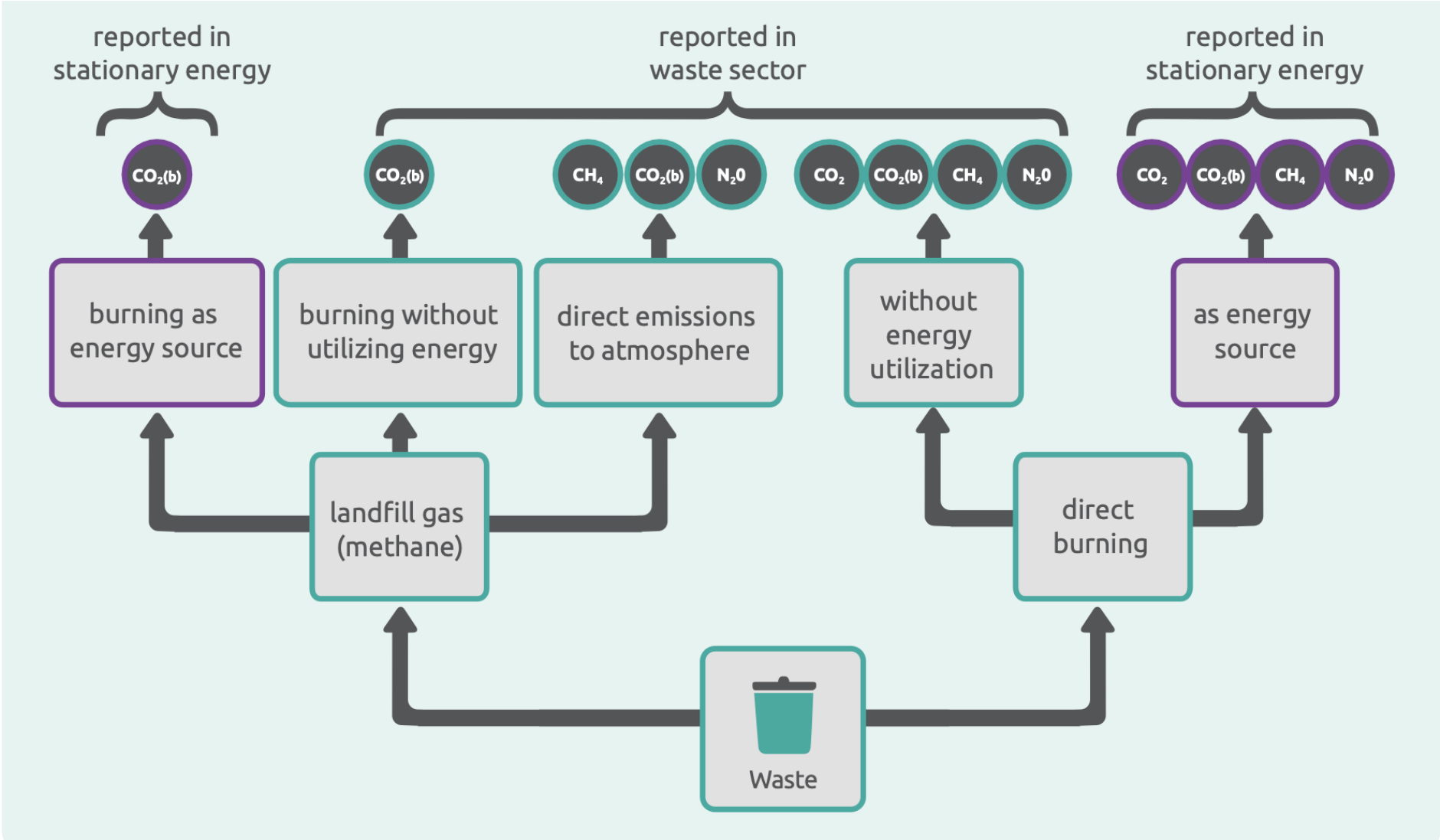
Further notes on
solid waste reporting

Where do emissions get reported?

- Scope 1: Emissions from A+B
 - All emissions generated within the municipality
 - Only GHG emissions from waste generated by municipality shall be reported under BASIC/BASIC+ (B+C).
 - GHG emissions from imported waste (A) shall be reported as scope 1, but not added to BASIC/BASIC+ totals
 - Scope 3: Emissions from C
- > This gives challenges around accounting



Where do you report what?



5

Homework



Homework

- Homework is as discussed on the various slides:
 - Municipal waste
 - Biological treatment
 - Incineration
 - Wastewater
- Remember to prepare slides/spreadsheets to present to the group
- You can also think about possible sources of energy and livestock data for next session
- All slides and presentations will be available on the training platform.



6

Next session and
way forward



Next session and way forward

- Next session (session 4) will focus on:
 - Bottom-up data requirements for:
 - Agriculture
 - Introduction to Land sector
 - Aims to be in the last week of July (27-31)
- Plan going forward:
 - Mid-July – session/discussion with provincial champions and inventory compilers
 - Middle of August (17-21) – session 5
 - 31 August to 2 September – in-person training on tools and compiling inventories
 - Sessions will then continue after in-person training.



Introduction of “Open door” hours

- These are sessions where Luanne will be available online to answer any questions or queries regarding anything discussed in these sessions or GHG inventories in general:
 - Maybe you have collected some data and are not sure what to do with it
 - Perhaps you did the homework and were having difficulties or want to check your answers
 - You may just have a general inventory question
- No formal presentations will be prepared or given during these sessions:
 - They are purely for answering your questions, so you only need to join the session if you have something you want to discuss
- Scheduled on the following days (meeting links to be sent to everyone):
 - Thurs 16th July (2pm-3pm)
 - Wed 22nd July (10am – 11am)





THANK
YOU



Stay in touch:



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