Module 3: Estimating Baseline Solid Waste GHG and SLCP Emissions

Global Methane Initiative

Click to Start

About Module 3

This module covers how to use the Global Methane Initiative's (GMI) Solid Waste Emissions Estimation Tool (SWEET) to estimate greenhouse gases (GHG) and short-lived climate pollutants (SLCP) from a baseline scenario.

SWEET
SOLID WASTE EMISSIONS ESTIMATION TOOL

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How to Navigate

1. Use the “**Back**” and “**Next**” buttons to navigate between slides
2. Use the **menu** at the top of the screen to move between sections
3. Click “**Home**” to go back to the About page

Module Overview

Select a topic to visit that section of the module. Select “Next” to continue.

Instructions

STEP 1: Download SWEET

STEP 2: Enter Data

STEP 3: Results

Insights:

- **Common Applications of the Emissions Baseline of Solid Waste Management (SWM)**
- **Common User Issues and Challenges**

Key Resources

Instructions

- **STEP 1**: DOWNLOAD SWEET.
- **STEP 2**: ENTER DATA. Follow the steps in this training to enter the climate, waste generation, collection, treatment and disposal data provided for a fictional city, "Sample City." SWEET will calculate emissions based on the data.
- **STEP 3.** REVIEW RESULTS.

STEP 1: Download SWEET

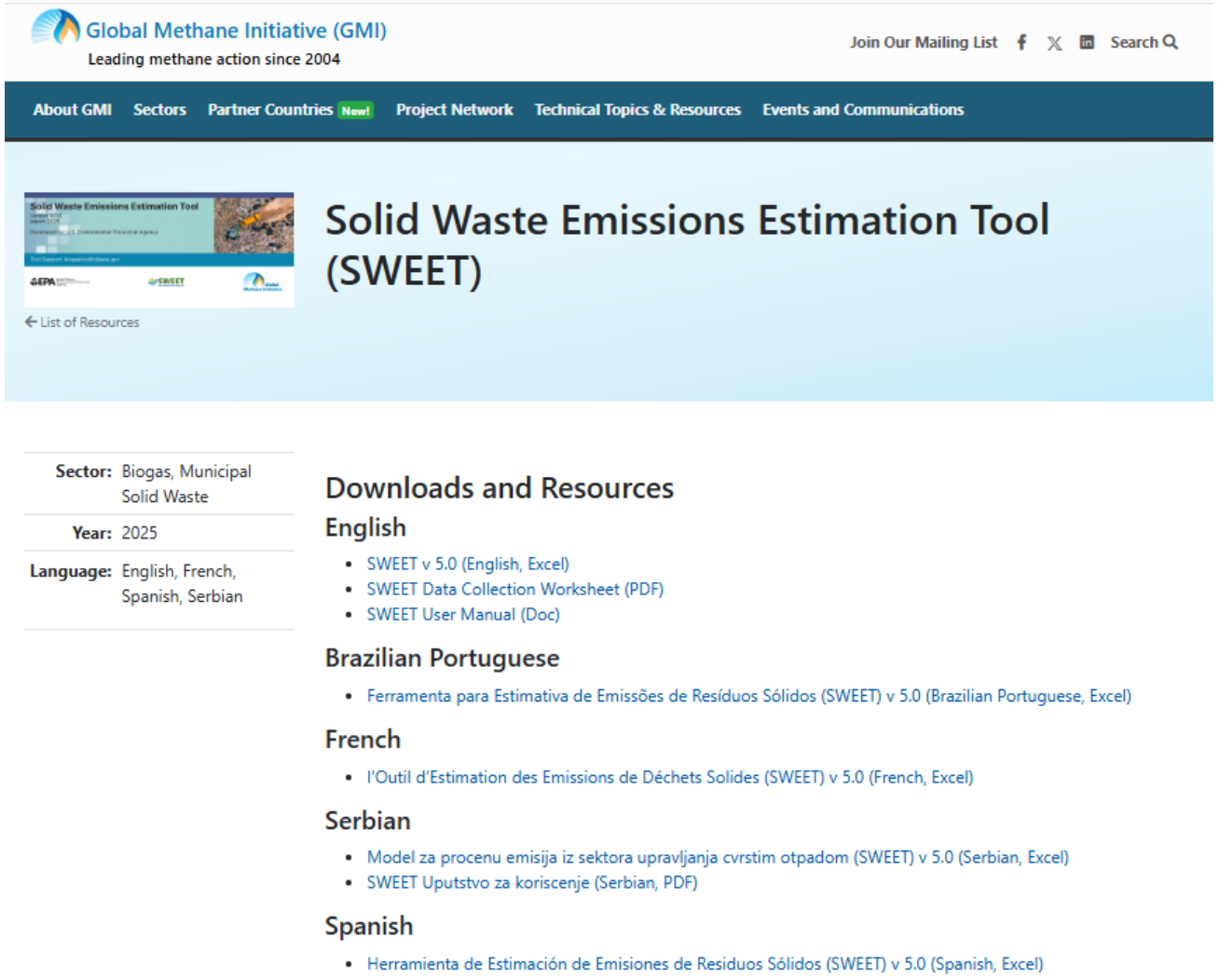
Download the tool by going to www.globalmethane.org/SWEET or clicking the button below.

Select the version of SWEET to download. As of 2025, SWEET is available in English, Brazilian Portuguese, French, Serbian, and Spanish.

Microsoft Excel must be installed to proceed.

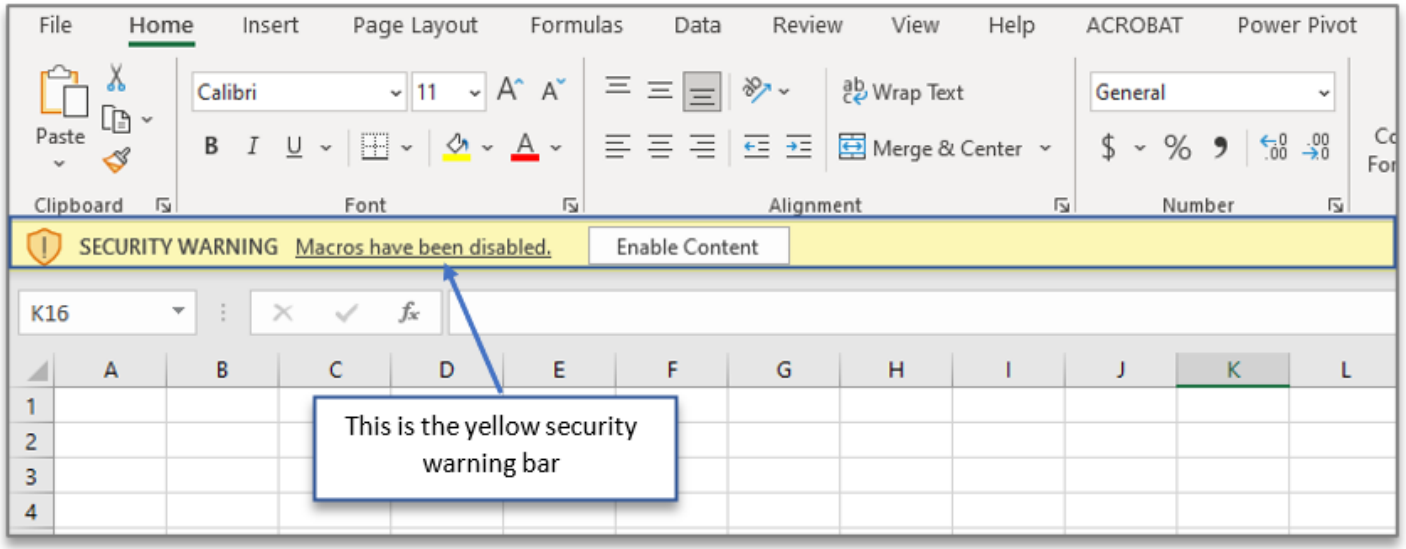
Download **SWEET**

Read the **User Manual**



Reminder: Enable Macros

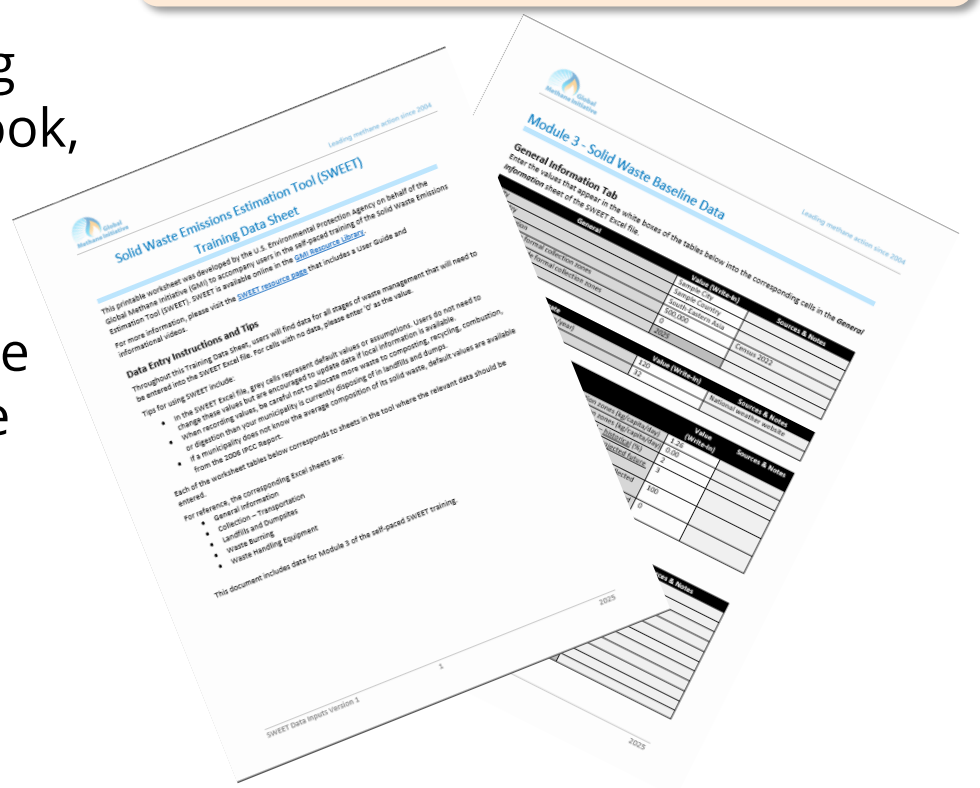
When you open the tool, you will be prompted by Excel to **enable the tool's macros**. You **must enable macros** for the tool to function correctly. You will either be prompted with a pop-up upon opening the tool, or a yellow warning bar will appear at the top of the program asking you to "Enable Content." If you did not choose to enable macros, close the tool and reopen it, and you will have the option again to enable macros.



STEP 2: Enter Data

Download the SWEET Training Data Sheet

- The necessary input data provided in the following slides has the same look of the cells in the workbook, so it is easy to follow along.
- The data is also available in an accompanying document "SWEET Training Data Sheet" that can be downloaded from the training webpage. Using the data sheet is optional.
- The data that will be used in this training will be provided in the following slides and needs to be entered in the blue tabs of the tool, shown below.



Screenshot of Excel tabs in SWEET

Reminder: Cell Colors

- Enter data for your city's current waste management situation and alternative scenarios into all **blue** ( ) cells.
- You can also enter data in **green** ( ) cells, which are not required but appear as options when you enter certain information into blue cells on the Landfills and Dumpsites tabs.
- **Yellow** ( ) cells are default values that are automatically provided. You can change these values if you have local data available.
- The light **grey** ( ) cells, except for those in columns labeled "source" or "notes," contain calculated values that cannot be edited.

Tips

Many of the **blue** and **green** cells contain helpful hints and definitions that will appear when you click on them.

You can reset any user-entered data to original default values by clicking on the "**Reset Default Values**" buttons provided on each data input page.

Data Sets for Each Worksheet

The following slides include:

- Screenshots of the data entry portions of the worksheet in each of the tabs of SWEET.
- General guidance for each worksheet.
- The data that should be entered in the **BLUE** cells of each worksheet.
- Tips to keep in mind when entering your own data into this worksheet

When users are entering their **own data** in the blue cells and specific information is unavailable, the user should consider using proxy data (e.g., national or regional statistics). It's important to document the source of this data or note any assumptions made. If no data is available, then enter 0 or a small value such as 0.000001.

Consult the SWEET User Manual for additional guidance.

General Information Tab – Data Set (1 of 9)

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Tab Guidance

- Enter the information found in the “General Information” portion of the SWEET training data sheet in the General Information Tab of the workbook.

- Users **must** enter data in every cell that is shaded **BLUE**.
  - If specific data is not available, users should consider finding proxy data (e.g., national or regional data). User should make a note of the information source, or any assumptions made.
  - If no data is found or applicable, then enter 0 or a small value such as 0.000001.

- If a cell in the "Review" section turns red, it is likely that one or more inputs in a blue cell is incorrect.

General Information Tab – Data Set (2 of 9)

The type of information the user will enter in the "***General Information***" Tab, as shown in the next slides, includes:

General Table

- **City and Country:** Name of the city and country.
- **Global Region:** The specific region where the city is located.
- **Population:** Population figures both within and outside formal collection zones.
- **Climate:** The city's climate characteristics.

Waste Generation & Collection Rates Table

- **Waste Generation:** Data on waste generation *inside and outside formal collection zones*, including per capita figures, percentages, and total waste generated.
- **Collection Rates:** Information on the total waste collected and the average annual percentage growth rate in the quantity of waste collected.

Inside formal collection zones refers to areas within the city where waste collection services are provided by the municipality or a licensed private company.
Outside formal collection zones refers to areas where there are no licensed waste collection services.

General Information Tab – Data Set (3 of 9)

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Enter the details from the blue boxes below into the *General Information* Tab of the workbook.

General		Sources & Notes
City	Sample City	
Country	Sample Country	
Global Region	South-Eastern Asia	
Population in formal collection zones	500,000	Census 2022
Population outside formal collection zones	0	
Current Year	2025	

In this cell, the user will select a value from a drop-down list

Use the cells in the Sources & Notes column of this Tab to document where all data came from and/or any assumptions made

Climate		Sources & Notes
Average annual precipitation (mm/year)	120	National weather website
Mean annual temperature (°C)	32.0	

General Information Tab – Data Set (4 of 9)

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Enter the details from the blue boxes below into the *General Information* Tab of the workbook.

Waste Generation & Collection Rates		Sources & Notes
Per capita waste generation rate inside formal collection zones (kg/capita/day)	1.26	
Per capita waste generation rate outside formal collection zones (kg/capita/day)	0.00	
Average annual % growth rate in quantity of waste collected – historical	2%	
Average annual % growth rate in quantity of waste collected - projected future	3%	
Percentage of waste generated inside formal collection zones that is collected	100%	
Percentage of waste generated outside formal collection zones that is collected	0%	
Total waste collected annually inside formal collection zones (metric tons)		Calculated based on waste collection rate
Total waste generated annually inside formal collection zones (metric tons)		Calculated based on waste generation rate

Values in gold boxes are default values.

- The "%" symbol will automatically appear in cells requiring a percentage.
- The tool will automatically round up or down these values.

General Information Tab – Data Set (5 of 9)

Additional information that will be entered in the "***General Information***" Tab.

Average Waste Composition of Collected Table

- Enter the city's waste composition data in terms of percentage breakdown, not metric tons, of waste collected.
- The fractions listed represent the most common *types of municipal solid waste*.

Outcome of Waste Diverted from Landfill/Dumpsite

- This table captures details on waste diverted to composting, anaerobic digestion, waste combustion, and recycling. Information includes:
  - The year diversion of waste efforts began
  - Metric tons of waste delivered to each facility annually
  - The composition of waste targeted for diversion from disposal

- Organic waste: Food, wood, and green waste (i.e., yard waste)
- Paper and cardboard
- Textiles
- Plastics
- Metals
- Glass
- Tires
- Other

General Information Tab – Data Set (6 of 9)

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Average Composition of Collected Waste	Percent	Metric Tons	Sources & Notes
Food Waste	52.0 %		
Green	12.0 %		
Wood	2.0 %		
Paper/Cardboard	12.0 %		
Textiles	0.4 %		
Plastic	10.6 %		
Metal	5.0 %		
Glass	4.0 %		
Tires	0.0 %		
Other	2.0 %		
Total	100.00%		

Does the composition of waste equal 100%?

These cells will automatically fill with calculated values for metric tons bases on the entered waste composition data.

General Information Tab - Checkpoint

Instructions: Ensure all cells say "NO" before proceeding. If any are red and say "YES," please fill in the missing inputs in the appropriate data box above.

REVIEW - Key Inputs Check Box	
Required Inputs	**Missing Input?**
General	YES
Climate	NO
Waste Generation & Collection	NO

If there's a "YES" in any of the rows, the user will need to go back to the respective section to assess what input/data is missing.

Instructions: Ensure all cells say "NO" before proceeding. If any are red and say "YES," please fill in the missing inputs in the appropriate data box above.

REVIEW - Key Inputs Check Box	
Required Inputs	**Missing Input?**
General	NO
Climate	NO
Waste Generation & Collection	NO

After the missing data is entered, all the rows should say "NO" in the "Missing Input?" column.

General Information Tab – Data Set (7 of 9)

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Waste Flow – Business as Usual (BAU)					
Outcome of Waste Diverted from Landfill/Dumpsite	**Composting**	**Anaerobic Digestion**	**Waste Combustion***	**Recycling**	**Sources & Notes**
Diversion Scenario Start Year	2020			2020	
Metric Tons of Waste Delivered To Diversion Facility Per Year	15,000			5,000	
% of Total Collected Waste Delivered to Facility	7.0%	0.0%	0.0%	2.3%	
% of Total Collected Waste Diverted from Landfill or Dumpsite (after accounting for materials diverted/rejected from facility)	6.1%	0.0%	0.0%	2.1%	
Reject Rate for Waste Combustion Materials	-	-	10%		
Composition of Waste Targeted for Diversion from Disposal					
Food Waste	50 %		0%		
Green	30 %		0%		
Wood	2 %		0%	0 %	
Paper/Cardboard	18 %		0%	15 %	
Textiles	-	-	0%	0 %	
Plastic	-	-	0%	40 %	
Metal	-	-	0%	40 %	
Glass	-	-	0%	5 %	
Tires	-	-	0%	0 %	
Other	-	-	0%	0 %	
Total (should add to 100%)	100%	0%	0%	100%	
Does the composition of waste equal 100%?					

General Information Tab – Data Set (8 of 9)

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To run the business as usual (BAU) analysis, select "NO" for each alternative scenario.

Alternative Scenario Selection	Alternative Scenario 1	Alternative Scenario 2	Alternative Scenario 3	Alternative Scenario 4
(select one)	No	No	No	No
Alternative Scenario Start Year				

General Information Tab – Data Set (9 of 9)

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Tips to keep in mind when entering custom data into this worksheet:

- For every data point entered, the user should make a note of the information source, or any assumptions made. The tool provides space to make annotations under the "**Sources & Notes**" column.
- When entering values, the user should be careful to not allocate more waste to composting, recycling, combustion, or digestion than the municipality is currently disposing in landfills and dumps (there is an error check at the bottom of the sheet that will inform the user if they have made this error).
- If the average solid waste composition of the municipality is not known, default values are available from the 2006 IPCC Report.
- The user needs to ensure all values within each waste type for individual alternative scenarios sum to 100%.

Collection Transportation Tab – Data Set (1 of 3)

SWEET
SOLID WASTE EMISSIONS ESTIMATION TOOL

Tab Guidance

- Users **must** enter data in cells is shaded **BLUE**.
  - If specific data is not available, users should consider finding proxy data (e.g., national or regional data). User should make a note of the information source, or any assumptions made.
  - If no data is found or applicable, then enter 0 or a small value such as 0.000001.
- If a cell in the "Review" section turns red, it is likely that one or more input values in a blue cell is incorrect.
- The data entered in this tab is for the number of vehicles used in primary collection in addition to secondary collection fleet vehicles.
  - Fleet vehicles are disaggregated into heavy-duty and light-duty trucks and by fuel type – diesel, gasoline, and natural gas.

Collection Transportation Tab – Data Set (2 of 3)

Number of Trucks in Operation	Business-As-Usual	Sources & Notes
Heavy-Duty Trucks		
Number of heavy-duty diesel trucks in operation each year	140	
Number of heavy-duty gasoline trucks in operation each year	0	
Number of heavy-duty natural gas trucks in operation each year	0	
Light-Duty Trucks	**Business-As-Usual**	
Number of light-duty diesel trucks in operation each year	0	
Number of light-duty gasoline trucks in operation each year	0	
Number of light-duty natural gas trucks in operation each year	0	

Collection Transportation Tab – Data Set (3 of 3)

Tips to keep in mind when entering custom data into this worksheet:

- **Activity Data**
  - If the user knows the average number of kilometers traveled by heavy-duty or light-duty trucks each year, they can update the default value provided in yellow ( ) cells.
  - Similarly, if the user has more data on the number of hours trucks spend idling, they can update the default values.
  - If local kilometers traveled and hours idling data is unavailable, the user can use the default values in SWEET.
- **Emissions Factors**
  - The user can alter emissions factors in yellow cells ( ) if they have local data.

Landfills and Dumpsites – Data Set (1 of 4)

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Tab Guidance

- Please see *Table 1. Characteristics of Solid Waste Disposal Site Types* of the *SWEET User Manual* for **definitions of a dumpsite, controlled dumpsite, and a landfill.**
- Landfills and dumpsites are often the most significant source of methane emissions in the waste sector, so it is important that data entered into this tab be as accurate as possible.
- This tab allows the user to enter data about up to four landfills and/or dumpsites that any city currently operates or plans to operate.
- Users **must** enter data in every cell that is shaded **BLUE**.
  - If specific data is not available, users should consider finding proxy data (e.g., national or regional data). User should make a note of the information source, or any assumptions made.
  - If no data is found or applicable, then enter 0 or a small value such as 0.000001.

Landfills and Dumpsites – Data Set (2 of 4)

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How many landfills and dumpsites would you like to analyze?
2

Detailed Disposal Site(s) Information	Business-As-Usual	Sources & Notes
Landfill/Dumpsite #1 (Please enter the oldest landfill information here)		
Name	LF 1	
Site opening year (no later than 2000)	1995	
Site closure year (actual or projected)	2035	
Annual disposal: most recent year data or estimate (metric tons)	230,000	
Landfill or dumpsite?	Landfill	
Year of dumpsite upgrade to controlled dumpsite, or controlled dumpsite upgrade to landfill?		
Average waste depth (m)	10	
Existing or planned active gas extraction and flaring or utilization system?	No	
Active gas extraction and flaring or utilization system start-up year?		
Existing or planned gas-to-energy project? (landfills only, not dumpsites)		
Actual (or assumed future actual) methane recovery (m^3 CH_4/year)		
Year of actual methane recovery data		
Site-specific collection efficiency starting in year with recovery data (%)	0%	

In this cell, the user selects a value from a drop-down list

Landfills and Dumpsites – Data Set (3 of 4)

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SOLID WASTE EMISSIONS ESTIMATION TOOL

How many landfills and dumpsites would you like to analyze?
2

Detailed Disposal Site(s) Information	Business-As-Usual	Sources & Notes
Landfill/Dumpsite #2		
Name	Future LF	
Site opening year (no later than 2000)	2035	
Site closure year (actual or projected)	2100	
Annual disposal: most recent year data or estimate (metric tons)	493,000	
Landfill or dumpsite?	Landfill	
Year of dumpsite upgrade to controlled dumpsite, or controlled dumpsite upgrade to landfill?		
Average waste depth (m)	15	
Existing or planned active gas extraction and flaring or utilization system?	No	
Active gas extraction and flaring or utilization system start-up year?		
Existing or planned gas-to-energy project? (landfills only, not dumpsites)		
Actual (or assumed future actual) methane recovery (m^3 CH_4/year)		
Year of actual methane recovery data		
Site-specific collection efficiency starting in year with recovery data (%)	0%	

In this cell, the user will select a value from a drop-down list

Landfills and Dumpsites– Data Set (4 of 4)

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Tips to keep in mind when entering custom data into this worksheet:

- While many disposal sites receive waste from multiple cities, the user's inputs of waste received at the disposal site should only reflect the **waste produced by the city being modeled**.
- **At least one disposal site must be operating in any given year for each scenario**. If a city plans to close a disposal site in 2023, for example, it should add a new disposal site starting in 2024, even if the specifics of the future site are uncertain.
- Information for the oldest landfill or dumpsite must be entered under *Landfill/Dumpsite #1.*
- If a site is older than 1960, the user has to enter '1960' as the site opening year.

Waste Burning – Data Set (1 of 3)

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Tab Guidance

- Users **must** enter data in every cell that is shaded **BLUE**.
  - If specific data is not available, users should consider finding proxy data (e.g., national or regional data). User should make a note of the information source, or any assumptions made.
  - If no data is found or applicable, then enter 0 or a small value such as 0.000001.
- This tab collects data about open waste burning, both by residents and at the landfill, in the municipality.
- The tab requests the percentage of waste that is burned.
  - In areas outside the formal collection zones: Open burning of uncollected waste by residents in areas not served the municipality collection service.
  - Inside formal collection zones: Burning of uncollected waste by residents served by the municipality collection service.
  - At the landfill or dumpsite: Waste disposed at landfills or dumpsites that is ultimately burned.

Waste Burning – Data Set (2 of 3)

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Open Burning Rates (I.)	Business-as-Usual	Sources & Notes
Business-as-Usual/Alternative Scenario Start Year	2025	
Percentage of uncollected waste that is burned in the open by residents living outside formal collection zones	0%	
Percentage of uncollected waste that is burned in the open by residents living inside formal collection zones	0%	
Percentage of waste disposed at landfills or dumpsites that is ultimately burned at the landfill or dumpsite	0%	
Percentage of total collected waste that is ultimately burned at landfills/dumpsites	0%	

Waste Burning – Data Set (3 of 3)

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Tips to keep in mind when entering custom data into this worksheet:

- This tab requests data that might not be readily available. If there is open burning place taking place in areas inside or outside the formal collection zones, estimate the percentage of uncollected waste that is burned.
- Likewise, if there is burning of waste at the landfill(s) or dumpsite(s), estimate the percentage of disposed waste that is burned. Waste burning is more common in dumpsites, either as a measure to reduce the volume of waste or as a measure to obtain certain materials (e.g., metals), or both.

Waste Handling Equipment – Data Set (1 of 3)

Tab Guidance

- Users **must** enter data in every cell that is shaded **BLUE**.
  - If specific data is not available, users should consider finding proxy data (e.g., national or regional data). User should make a note of the information source, or any assumptions made.
  - If no data is found or applicable, then enter 0 or a small value such as 0.000001.

- Enter key information about waste handling equipment on this tab. This includes equipment used to handle waste at facilities such as:
  - Landfills and dumpsites
  - Transfer stations
  - Material recovery facilities
  - Composting facilities
  - Other waste management facilities

- Equipment is disaggregated by fuel type – diesel and gasoline.

Waste Handling Equipment – Data Set (2 of 3)

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Number of Pieces of Equipment	Business-As-Usual	Sources & Notes
Diesel Equipment		
Excavators	1	
Graders	1	
Forklifts	1	
Loaders	1	
Bulldozers	1	
Tractors/Backhoes	1	
Other	1	
Gasoline Equipment		
Excavators	0	
Forklifts	0	
Loaders	0	
Tractors/Backhoes	0	
Other	0	

Waste Handling Equipment – Data Set (3 of 3)

Tips to keep in mind when entering custom data into this worksheet:

- Based on the number of waste management facilities, the user may have to create separate a spreadsheet detailing the equipment used at each facility.
- Then, the user can calculate the total quantity of each type of equipment, categorized by the type of fuel used. The information can then be transferred to SWEET.

End of Data Entry

- Congratulations! This slide marks the end of the slides containing data to be entered into the SWEET workbook.
- The following slides illustrate the results of the calculations based on the entered data.

STEP 3: Review Results – Tables

- The emissions calculations in the baseline or business-as-usual (BAU) scenarios are shown in the "Summary-Emissions" tab (see below). This tab displays the calculated emissions resulting from the solid waste activities data entered in the workbook in tables.

Screenshot of Excel tabs in SWEET

- The "Summary–Emissions" tab shows:
  - **Table 1: Total Emissions** (Metric Tons CO_2e)
    - The SWEET workbook will show the total emissions up to the year 2120*.
  - **Table 2: BAU Pollutants by Sector** (Metric Tons CO_2e).
    - The table shows the emissions by sector and by pollutant (i.e., CH4, Sox, PM2.5, PM10)

*Please note that even though the landfills will be closed by that year, emissions will still be generated.

Results – Tables

Review total emissions in Table 1, starting at row 44.

Table 1: Total Emissions (Metric Tons CO_2e)

Year	BAU	Alternative Scenario 1	Alternative Scenario 2
1960	0	0	0
1994	0	0	0
1995	7,261	0	0
1996	18,384	0	0
1997	28,838	0	0
1998	38,690	0	0
1999	47,999	0	0
2000	56,822	0	0
2001	65,207	0	0
2002	73,202	0	0
2003	80,846	0	0
2004	88,179	0	0
2005	95,234	0	0
2006	102,043	0	0
2007	108,634	0	0
2008	115,033	0	0
2009	121,265	0	0
2010	127,350	0	0
2011	133,310	0	0
2012	139,161	0	0
2013	144,922	0	0
2014	150,606	0	0
2015	159,356	0	0
2016	161,804	0	0
2017	167,341	0	0
2018	172,854	0	0
2019	178,351	0	0
2020	183,468	0	0
2021	187,677	0	0
2022	191,964	0	0
2023	196,331	0	0
2024	200,779	0	0
2025	205,310	0	0
2026	210,052	0	0
2027	215,070	0	0
2028	220,361	0	0
2029	225,920	0	0
2030	231,747	0	0
2031	237,840	0	0
2032	244,198	0	0
2033	250,822	0	0
2034	257,713	0	0
2035	264,872	0	0
2036	272,302	0	0
2037	280,007	0	0
2038	287,988	0	0
2039	296,252	0	0
2040	304,801	0	0
2041	313,642	0	0
2042	322,780	0	0
2043	332,220	0	0
2044	341,970	0	0
2045	352,035	0	0
2046	362,425	0	0
2047	373,145	0	0
2048	384,205	0	0
2049	395,613	0	0
2050	407,378	0	0
2051	419,509	0	0
2052	432,016	0	0
2053	444,910	0	0
2054	458,200	0	0
2055	471,898	0	0
2056	486,015	0	0
2057	500,563	0	0
2058	515,554	0	0
2059	531,001	0	0
2060	546,917	0	0
2061	563,316	0	0
2062	580,211	0	0

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Results – Tables

Review BAU Pollutants Emissions by Sector in Table 2, starting at row 44.

Table 2: BAU Pollutants by Sector (Metric Tons CO_2e)

Year	Waste Collection & Transport	Waste Burning	Landfills & LFG Combustion	Organics Management	Waste Handling Equipment	Waste Combustion	Total	CH4 Total Metric Tons	SO_x Total Metric Tons	PM2.5 Total Metric Tons	PM10 Total Metric Tons
1960	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0
1995	6,146	0	0	0	1,115	0	7,261	3	1	2	2
1996	6,269	0	10,978	0	1,137	0	18,384	10,981	1	2	2
1997	6,394	0	21,284	0	1,160	0	28,838	21,287	1	2	2
1998	6,522	0	30,985	0	1,183	0	38,690	30,988	1	2	2
1999	6,653	0	40,140	0	1,206	0	47,999	40,143	1	2	2
2000	6,786	0	48,805	0	1,231	0	56,822	48,808	1	2	2
2001	6,921	0	57,031	0	1,255	0	65,207	57,034	1	2	2
2002	7,060	0	64,862	0	1,280	0	73,202	64,865	1	2	2
2003	7,201	0	72,340	0	1,306	0	80,846	72,343	1	2	2
2004	7,345	0	79,502	0	1,332	0	88,179	79,506	1	2	2
2005	7,492	0	86,384	0	1,359	0	95,234	86,387	1	2	2
2006	7,642	0	93,015	0	1,386	0	102,043	93,019	1	2	2
2007	7,795	0	99,426	0	1,413	0	108,634	99,429	1	2	2
2008	7,951	0	105,641	0	1,442	0	115,033	105,645	1	2	3
2009	8,110	0	111,685	0	1,471	0	121,265	111,688	1	2	3
2010	8,272	0	117,579	0	1,500	0	127,350	117,582	1	3	3
2011	8,437	0	123,342	0	1,530	0	133,310	123,346	1	3	3
2012	8,606	0	128,995	0	1,561	0	139,161	128,999	1	3	3
2013	8,778	0	134,552	0	1,592	0	144,922	134,556	1	3	3
2014	8,954	0	140,029	0	1,624	0	150,606	140,033	1	3	3
2015	9,133	0	148,567	0	1,656	0	159,356	148,571	1	3	3
2016	9,315	0	150,799	0	1,689	0	161,804	150,803	2	3	3
2017	9,502	0	156,117	0	1,723	0	167,341	156,121	2	3	3
2018	9,692	0	161,404	0	1,757	0	172,854	161,409	2	3	3
2019	9,886	0	166,673	0	1,793	0	178,351	166,677	2	3	3
2020	10,083	0	171,930	-805	1,689	0	182,898	172,000	2	3	3
2021	10,285	0	175,908	-821	1,723	0	187,095	175,979	2	3	3
2022	10,491	0	179,960	-837	1,757	0	191,370	180,032	2	3	3
2023	10,700	0	184,087	-854	1,792	0	195,725	184,161	2	3	3
2024	10,914	0	188,290	-871	1,828	0	200,162	188,365	2	3	3
2025	11,133	0	192,571	-888	1,865	0	204,680	192,648	2	3	3
2026	11,467	0	196,930	-915	1,920	0	209,403	197,010	2	3	4
2027	11,811	0	201,555	-942	1,978	0	214,401	201,637	2	3	4

Results – Tables – Checkpoint

- If all the waste management data from this module has been entered correctly, the results in the SWEET workbook should be the same as the ones shown in the previous slides.

- ***Data verification***
  - For **Table 1**: The user should check that the total emissions (CO_2e MT) for the years 1995 to 2062 in the workbook match the ones shown in the slide with the total emissions data table.
    - The table shows the emissions start in year 1995 because the landfill started operating in that year. The emissions for 1994 are zero.
  - For **Table 2**: The user should check that the BAU pollutant emissions by sector (CO_2e MT) for the years 1995 to 2027 in the workbook match the ones in the previous slide.

- ***Steps to take when data doesn't match:***
  - The user should review each data point entered in the Data Entry steps individually to ensure that the information has been entered correctly.

Results Analysis – Tables

- As illustrated in **Table 1**, total emissions rise dramatically over time, up to year 2077.
- **Table 2** indicates that these emissions predominantly originate from the landfill sector. Additionally, waste collection and transportation contribute to the overall emissions.
- **Table 2** further reveals that methane (CH_4) is the primary pollutant being generated, primarily attributable to landfills.
- Notably, **Table 2** also shows a reduction in emissions starting in 2020, due to the diversion of organic waste from landfills to composting facilities.

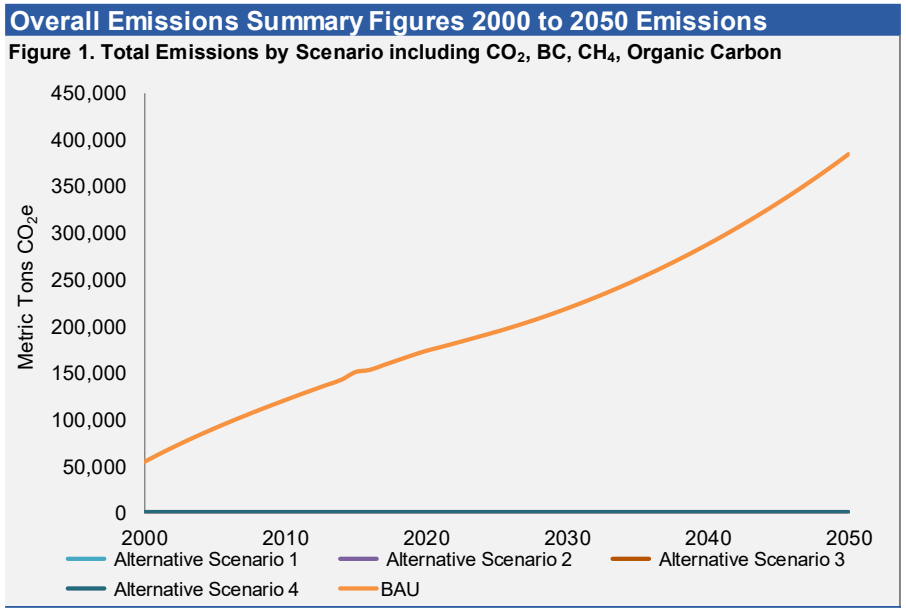
STEP 3: Review Results – Graphics

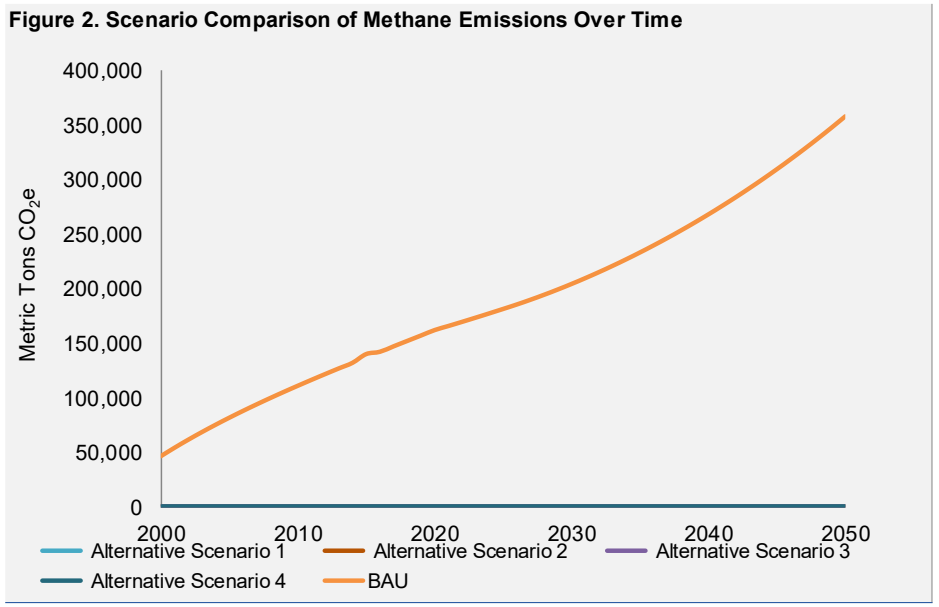
- The results of the calculations of the emissions of the baseline or business-as-usual (BAU) are shown in graphic form in the "Summary-Graphics" tab (shown below).

Screenshot of Excel tabs in SWEET

- The following slides will show the resulting emissions from the solid waste management. The BAU emissions are shown for the year 2000 to 2050.
  - Overall Emissions Summary Figures (correspond to values in **Table 1**)
    - **Figure 1: BAU Total Emissions** (Metric Tons CO_2e) including CO_2, BC, CH_4, Organic Carbon
    - **Figure 2: BAU Methane Emissions Over Time**
  - Sector Specific Emissions Sources
    - **Figure 5: Baseline All Climate Forcing Emissions by Source** (CH_4, BC, OC, NOx, CO_2), as shown in ***Table 2*** under columns J to O.

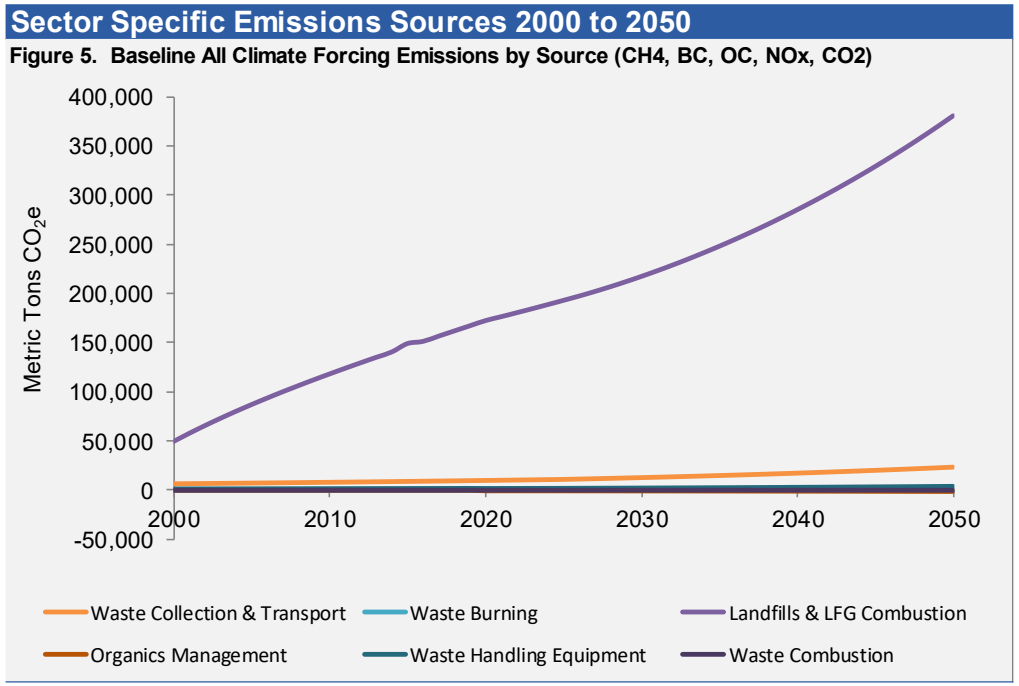
Results and Analysis – Graphics





- Both figures depict the BAU scenario with an orange line.
- **Figure 1** illustrates the total baseline emissions (*as shown in Table 1, column C*) and **Figure** 2 shows the methane baseline emissions (*as shown Table 1, column Q)*
- The figures show that both the total emissions and methane emissions will grow over time.
- Other alternative scenarios are not shown since data for those scenarios has not been entered.

Results and Analysis – Graphics



- **Figure 5** illustrates baseline climate forcing emissions by source. The light purple line represents the contribution of the "Landfills & LFG combustion" sector, highlighting the increase in emissions over time.
- The corresponding values for each curve can be found in Table 2 under each sector (i.e., Waste Collection & Transport, Waste Burning, Landfills & LFG combustion, Organics Management, Waste Handling Equipment, Waste Collection).

End of Results

Verification

- Similar to the results of the emissions tables, the emissions graphics shown in the previous slides should look the same in the user's SWEET workbook.
- After this verification, the exercise of entering data of a fictional city and calculating the solid waste management baseline emissions has concluded.

Additional Information

- The following slides will provide information on:
  - The common applications of a solid waste emissions baseline.
  - Common challenges faced by users when entering baseline data into SWEET and possible solutions to those challenges.

Common Applications of a Solid Waste Management (SWM) Emissions Baseline

- **GHG Inventory:** Quantify emissions for local, national and international reporting requirements.
- **Policy Development:** Develop and implement policies aimed at reducing emissions. This includes setting realistic targets and creating regulations for solid waste management.
- **Project Evaluation:** Assess the environmental impact of proposed solid waste management projects. The baseline is compared with different SWM strategies.
- **Performance Monitoring**: By comparing current emissions to the baseline, organizations can monitor the effectiveness of their SWM practices, such as landfill gas projects, and make necessary adjustments to improve performance.
- **Funding and Investment**: Baseline emissions data can support applications for funding in SWM projects, particularly those aimed at reducing waste emissions.
- **Public Awareness and Education**: Raise public awareness about the environmental impacts of SWM and encourage more sustainable practices.

Common User Issues

- Using incorrect SWEET start year; non-current year
- Using the wrong population details (e.g., using an entire city's population to model a neighborhood-level initiative; using total population when only modeling formal collection service areas)
  - If trying to model landfill-specific data, the population served may be larger or smaller than the city.
- Entering zero percent growth rates can result in unrealistic modeling projections; large growth rates may skew results more than expected.
- Entering diversion scenarios which divert more waste than is collected, either in total, or by waste materials type.

Common User Issues, continued

- Users should ensure they enter a landfill or dumpsite for all years being analyzed; sites must have estimated closure years as well.
- Landfill gas collection systems may be confused with passive venting or aeration systems.
- Entering too many alternative details in the same SWEET analysis can combine effects of several interventions and make interpretation of results challenging.
- Entering details on incineration instead of open burning and the reverse.

Common Challenges and Solutions

Lack of accurate, representative, and complete data set for model inputs	→	Get and apply waste sector data that accurately represents conditions at the sites, cities, regions, and countries being modeled.
Per capita waste generation rate data not available	→	Per capita waste generated $= Total\ annual\ waste\ disposed \div (365 \times population\ in\ formal\ collection \times \%\ of\ waste\ collected\ inside\ collection\ zone)$
Available waste composition data often is not representative of actual waste disposed at the site(s)	→	Consider obtaining a waste characterization of collected and disposed waste
Available waste characterization data categories vary from the ones used on the tool	→	Organize the data according to the waste categories defined by the tool (may need to make informed assumptions)

Common Challenges and Solutions

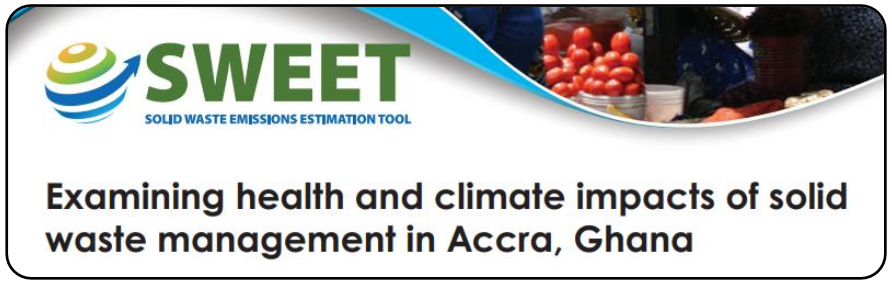
Actual current and future MSW collection rates will vary significantly over time	→	Users could create multiple SWEET analyses using various collection rates and compare outcomes
Estimates of waste burning rates are highly uncertain	→	Users can create two copies of the same SWEET analysis using a high and low estimate for waste burning to obtain an estimated range
Equipment usage rate and waste collection fleet vehicle mileage data is usually unavailable	→	Consider using SWEET default data or representative data from existing studies or reports in similar regions or contexts

For more information about SWEET, check out these resources

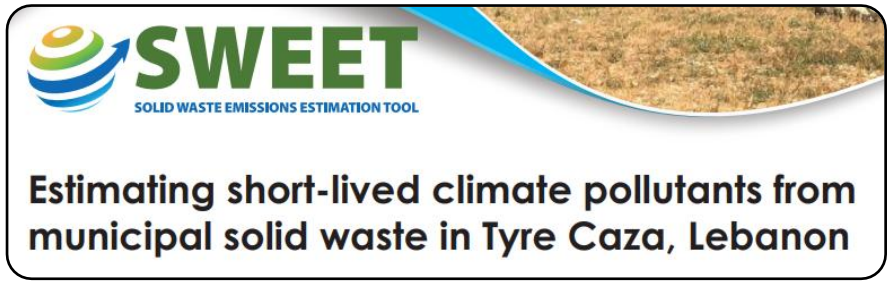
Select a topic to learn more about each resource

- Case Studies
- Videos
- Data Collection Worksheet
- User Manual

Case Studies



Read the case study



Read the case study

Read the case study

Videos

SWEET General Information

Watch the video

SWEET advanced tips

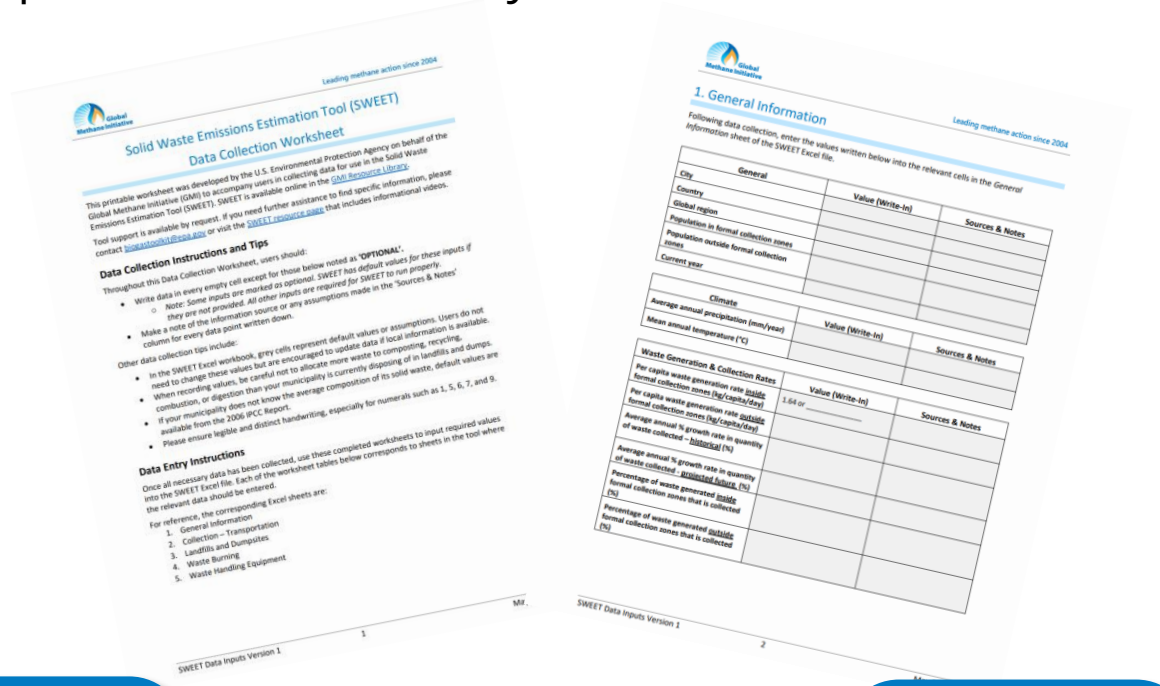
Watch the video

SWEET Landfills & Dumpsites

Watch the video

SWEET Data Collection Worksheet

The tool requires data inputs for **all stages of waste management**, from collection to disposal and diversion. To streamline data entry into SWEET when a computer or tablet is not available, users are invited to use the SWEET data collection worksheet. This worksheet helps users organize data inputs on a printable form for easy transfer into SWEET.


Solid Waste Emissions Estimation Tool (SWEET)
Data Collection Worksheet
1. General Information

Download the **SWEET Data Collection Sheet**

This printable worksheet was developed by the U.S. Environmental Protection Agency on behalf of the GMI to accompany users in collecting data for use in SWEET.

SWEET User Manual

This User Manual accompanies the Solid Waste Emissions Estimation Tool (SWEET).

The **manual** contains:

- An overview of the tool and its design
- Detailed documentation on how to use the tool and interpret results
- Explanation of the tool's assumptions, methodology, and limitations
- Answers to frequently asked questions
- Links to download a data guide
- A list of sources uses to develop this user manual

Download the **SWEET User Manual**

Congratulations! You have completed Module 3.

Home