Training on 2006 IPCC Guidelines for preparing National GHG Inventory:

2006 IPCC Inventory tool: Solid Waste

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Organized by the Capacity Building Initiative for Transparency
Global Support Programme (CBIT-GSP)

TABLE OF CONTENT

4.A – Solid waste disposal

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- 4.A.1 – Managed waste disposal sites
- 4.A.2 – Unmanaged waste disposal sites
- 4.A.3 – Uncategorized waste disposal sites

Login	Superuser_PHL
Password	Philippines

Example: SWDS (Tier 1)

For the assessment of GHG emissions from solid waste disposal in the **year 2000**, the following table outlines the data to be used for Tier 1 assessments using the IPCC Inventory Software

Data Category	Tier 1	
Region	Asia South-East	
Country	Philippines	
Climate zone	Tropical wet	
Starting year	1950 (Considering 50 years)	
Delay time (months)	6	
Fraction of methane (F)	0.5	
Conversion factors, C to CH4	1.33	
DOC (Degradable organic carbon)	**IPCC default factors** Food waste - 0.15 Garden – 0.2 Paper – 0.4 Wood and straw – 0.43	Textiles – 0.24 Disposable nappies – 0.24
DOCf (fraction of DOC dissimilated)	0.5	
Methane generation rate constant (k) – years^{-1}	**IPCC default factors** Food waste - 0.4 Garden – 0.17 Paper – 0.07 Wood and straw – 0.035	Textiles – 0.07 Disposable nappies – 0.17

Example: SWDS (Tier 1)

Data Category	Tier 1	
Methane correction factors (MCF)	**IPCC Defaults** Managed - 1 Managed – semi – aerobic - 0.5 Unmanaged – deep - 0.8 Unmanaged – Shallow - 0.4 Uncategorised – 0.6	
Distribution of waste by waste management type	**IPCC values (MSW)** Managed - anaerobic - 25 % Managed – semi – aerobic - 5% Unmanaged – deep - 30% Unmanaged – Shallow - 25% Uncategorised – 15%	
Population	**MSW** Population (Philippine) - World Bank (1950 to 2000) - Capita	
Waste generation rate	**MSW - IPCC default for Philippines -** 190 kg/cap/yr	
% to SWDS	**MSW - IPCC default for Philippines -** 62%	
Composition of waste going to SWDS	**IPCC default for region** Food waste - 43.5% Paper – 12.9 %	Textiles – 2.7% Wood – 9.9% Inert – 31%
Amount of methane recovered from SWDS	IPCC default = 0 Gg	
Methane oxidised (OX)	IPCC default (Managed, unmanaged and uncategorised SWDS) = 0	

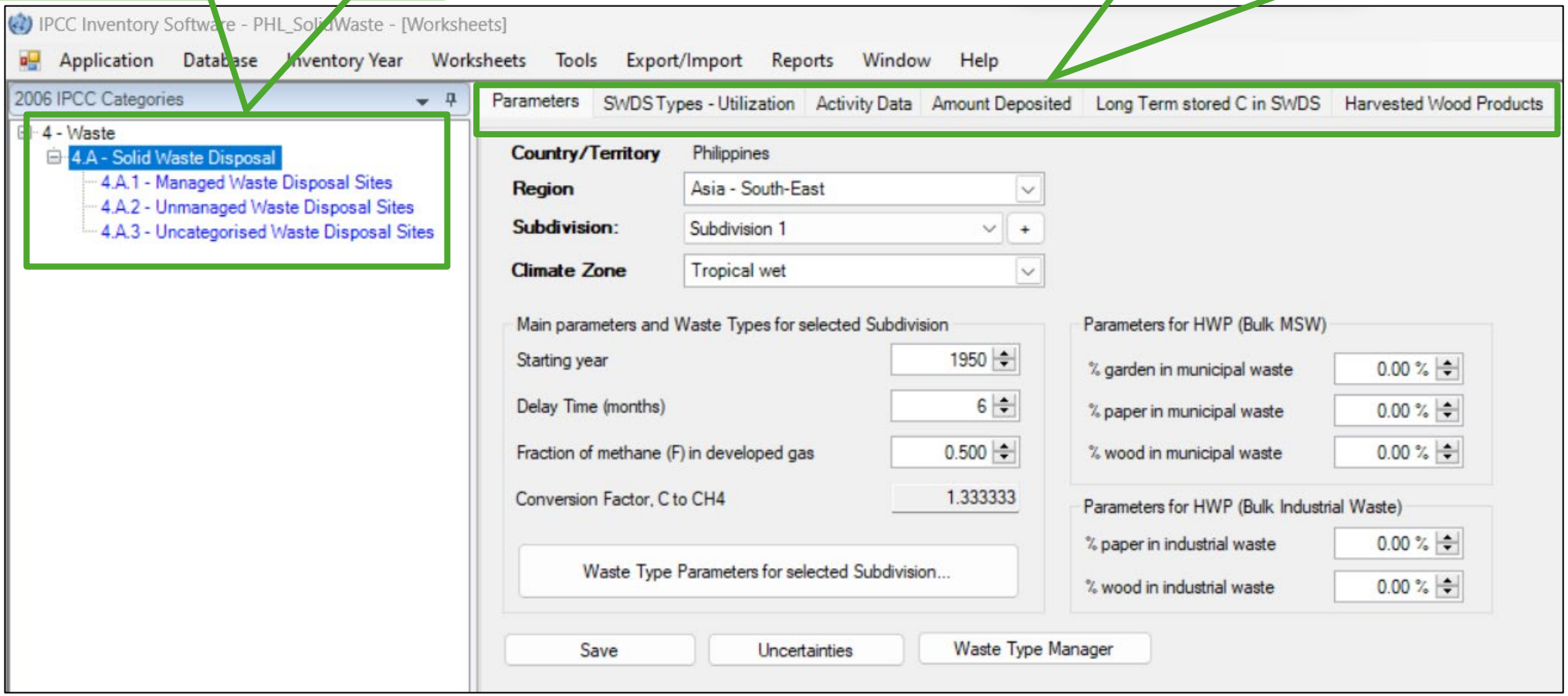
These values will be used to calculate GHG emissions from solid waste disposal for tier 1 method.

User interface for entering data into SWDS within the IPCC Inventory Software Version 2.901

The latest IPCC software also enables the provision of GHG emissions outcomes for **managed waste disposal sites, unmanaged waste disposal sites, and uncategorized waste disposal sites.**

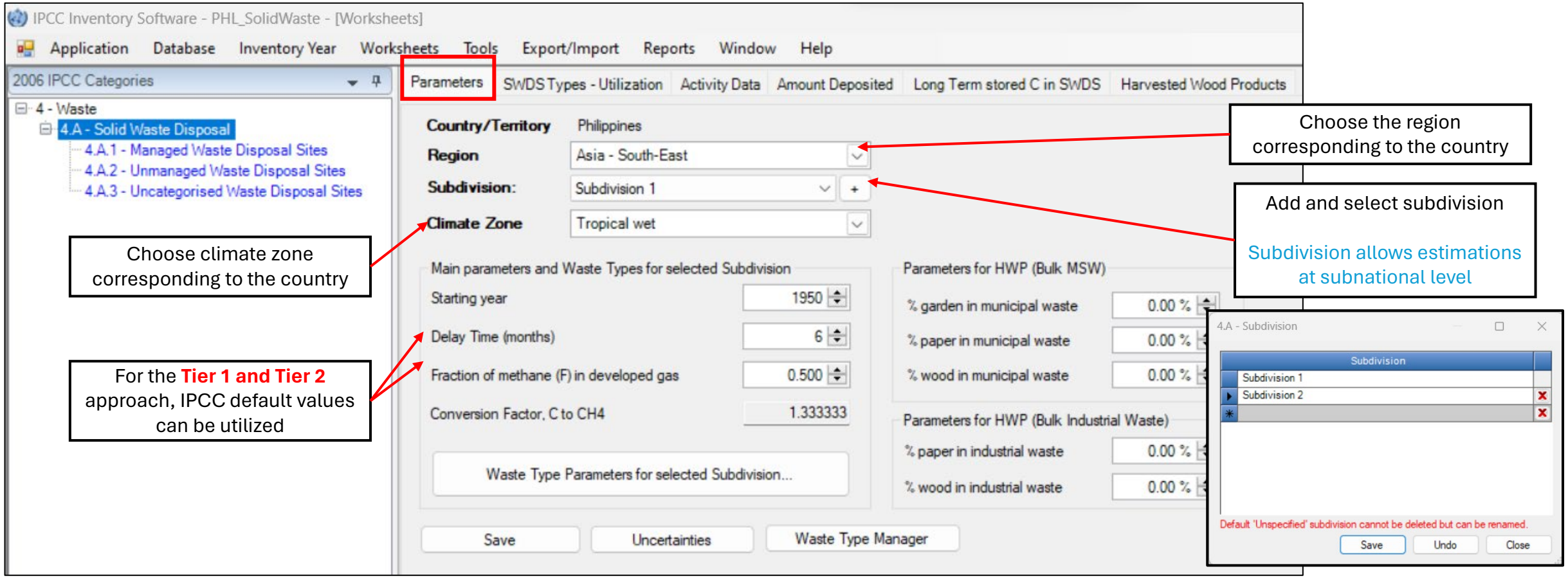
There are 6 worksheets within the Solid Waste Disposal

1. Parameters
2. SWDS Types – Utilization
3. Activity Data
4. Amount Deposited
5. Long term stored C in SWDS
6. Harvested wood products



Step 1.1: Selecting suitable default DOC, DOCf and Methane generation rate constant (k)

Choosing the country and region is crucial as it determines the **default activity data** for the assessment. Additionally, selecting the climate zone is important as it helps determine the **methane generation rate constant (k).**



Selecting suitable default DOC, DOCf and Methane generation rate constant (k)

Parameters

Country

Region: Asia: South-eastern

Please enter parameters in the yellow cells. If no national data are available, copy the IPCC default value.
Help on parameter selection can be found in the 2006 IPCC guidelines

	IPCC default value		Country-specific parameters	
			Value	Reference and remarks
Starting year		1950	1950	
DOC (Degradable organic carbon)	Waste by composition			
(weight fraction, wet basis)	**Range**	**Default**		
Food waste	0.08-0.20	0.15	0.15	
Garden	0.18-0.22	0.2	0.2	
Paper	0.36-0.45	0.4	0.4	
Wood and straw	0.39-0.46	0.43	0.43	
Textiles	0.20-0.40	0.24	0.24	
Disposable nappies	0.18-0.32	0.24	0.24	
Sewage sludge	0.04-0.05	0.05	0.05	
Industrial waste	0-0.54	0.15	0.15	
DOCf (fraction of DOC dissimilated)		0.5	0.5	

Methane generation rate constant (k)	Moist and wet tropical		
(years^{-1})	**Range**	**Default**	
Food waste	0.17–0.7	0.4	0.4
Garden	0.15–0.2	0.17	0.17
Paper	0.06–0.085	0.07	0.07
Wood and straw	0.03–0.05	0.035	0.035
Textiles	0.06–0.085	0.07	0.07
Disposable nappies	0.15–0.2	0.17	0.17
Sewage sludge	0.17–0.7	0.4	0.4
Industrial waste	0.15–0.2	0.17	0.17

The region and climate zone of a country can influence the decay rate of waste. For example, if a country has both hot and wet regions and hot and dry regions, the decay rates may vary between these regions.

The FOD method requires data on solid waste disposal, including quantities and composition, collected over a **50-year period**. Countries lacking historical statistical data for the full 50 years may estimate this data using surrogates like population or economic indicators.

Model provides two options to calculation can be chosen depending on the available activity data
- Multi-phase model based on **waste composition data**.
- Single-phase model based on **bulk waste.**

Based on the chosen region, climate zone, and calculation option, default data for parameters such as DOC, DOCf, and k will be selected accordingly.

TABLE 2.4
DEFAULT DRY MATTER CONTENT, DOC CONTENT, TOTAL CARBON CONTENT AND FOSSIL CARBON FRACTION OF DIFFERENT MSW COMPONENTS

MSW component	Dry matter content in % of wet weight	DOC content in % of wet waste		DOC content in % of dry waste		Total carbon content in % of dry weight		Fossil carbon fraction in % of total carbon	
	Default	Default	Range	Default	Range [2]	Default	Range	Default	Range
Paper/cardboard	90	40	36 - 45	44	40 - 50	46	42 - 50	1	0 - 5
Textiles [3]	80	24	20 - 40	30	25 - 50	50	25 - 50	20	0 - 50
Food waste	40	15	8 - 20	38	20 - 50	38	20 - 50	-	-
Wood	85 [4]	43	39 - 46	50	46 - 54	50	46 - 54	-	-
Garden and Park waste	40	20	18 - 22	49	45 - 55	49	45 - 55	0	0
Nappies	40	24	18 - 32	60	44 - 80	70	54 - 90	10	10
Rubber and Leather	84	(39) [5]	(39) [5]	(47) [5]	(47) [5]	67	67	20	20
Plastics	100	-	-	-	-	75	67 - 85	100	95 - 100
Metal [6]	100	-	-	-	-	NA	NA	NA	NA
Glass [6]	100	-	-	-	-	NA	NA	NA	NA
Other, inert waste	90	-	-	-	-	3	0 - 5	100	50 - 100

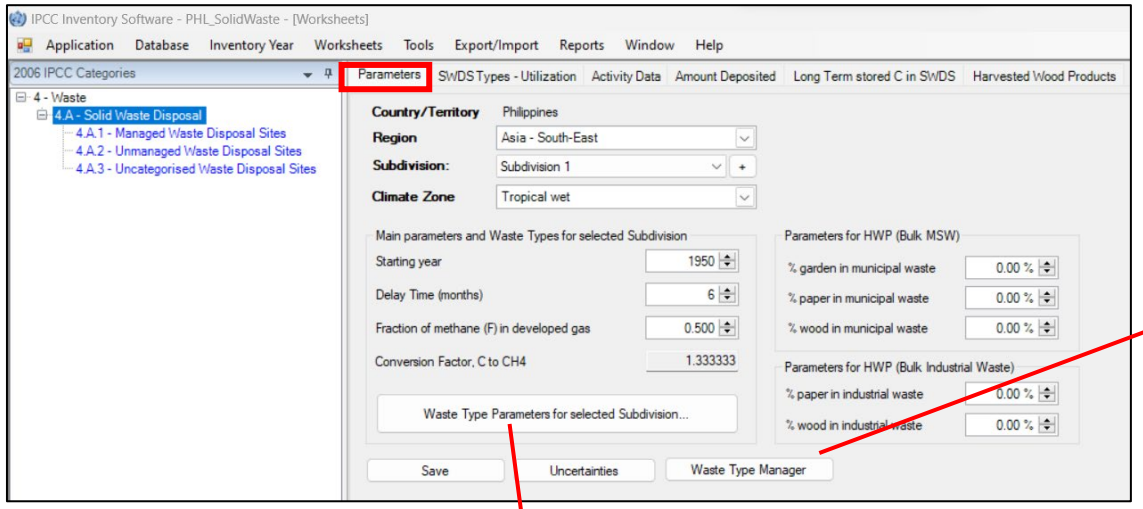
TABLE 2.5
DEFAULT DOC AND FOSSIL CARBON CONTENT IN INDUSTRIAL WASTE (PERCENTAGE IN WET WASTE PRODUCED)[1]

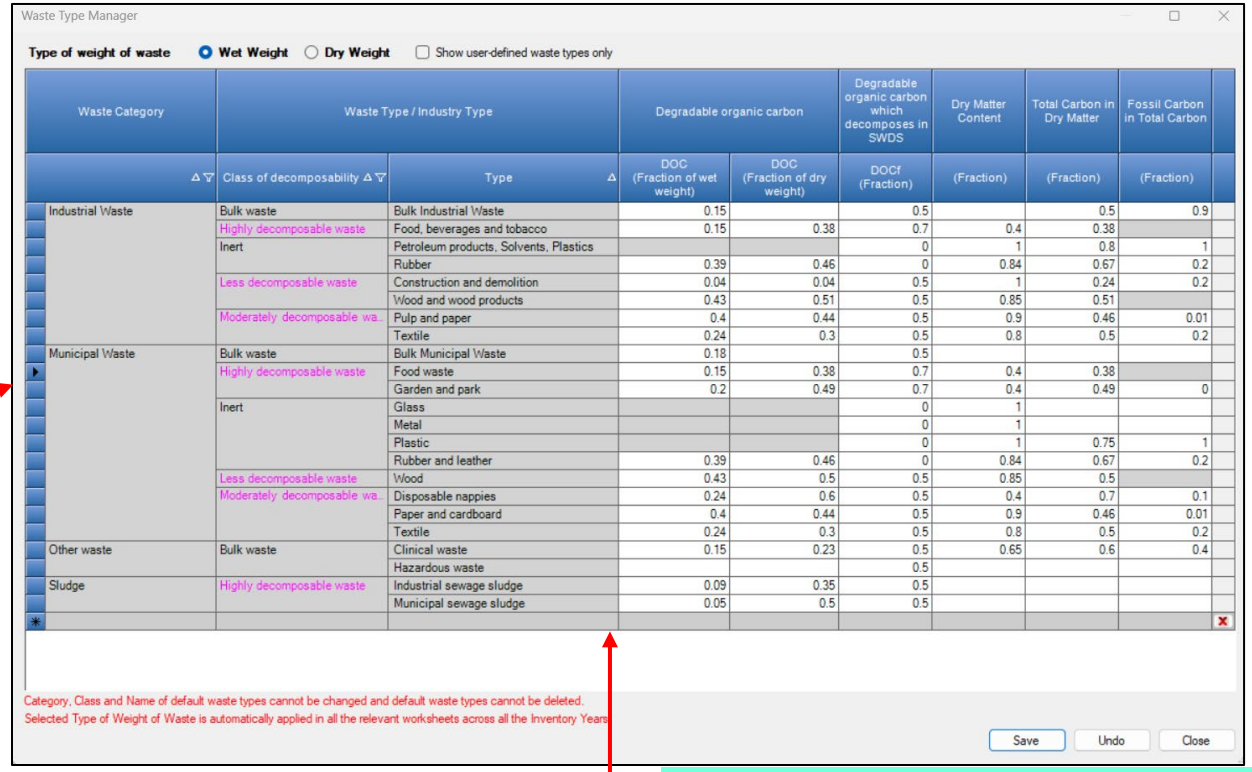
Industry type	DOC	Fossil carbon	Total carbon	Water content [2]
Food, beverages and tobacco (other than sludge	15	-	15	60
Textile	24	16	40	20
Wood and wood products	43	-	43	15
Pulp and paper (other than sludge)	40	1	41	10
Petroleum products, Solvents, Plastics	-	80	80	0
Rubber	(39) [3]	17	56	16
Construction and demolition	4	20	24	0
Other [4]	1	3	4	10

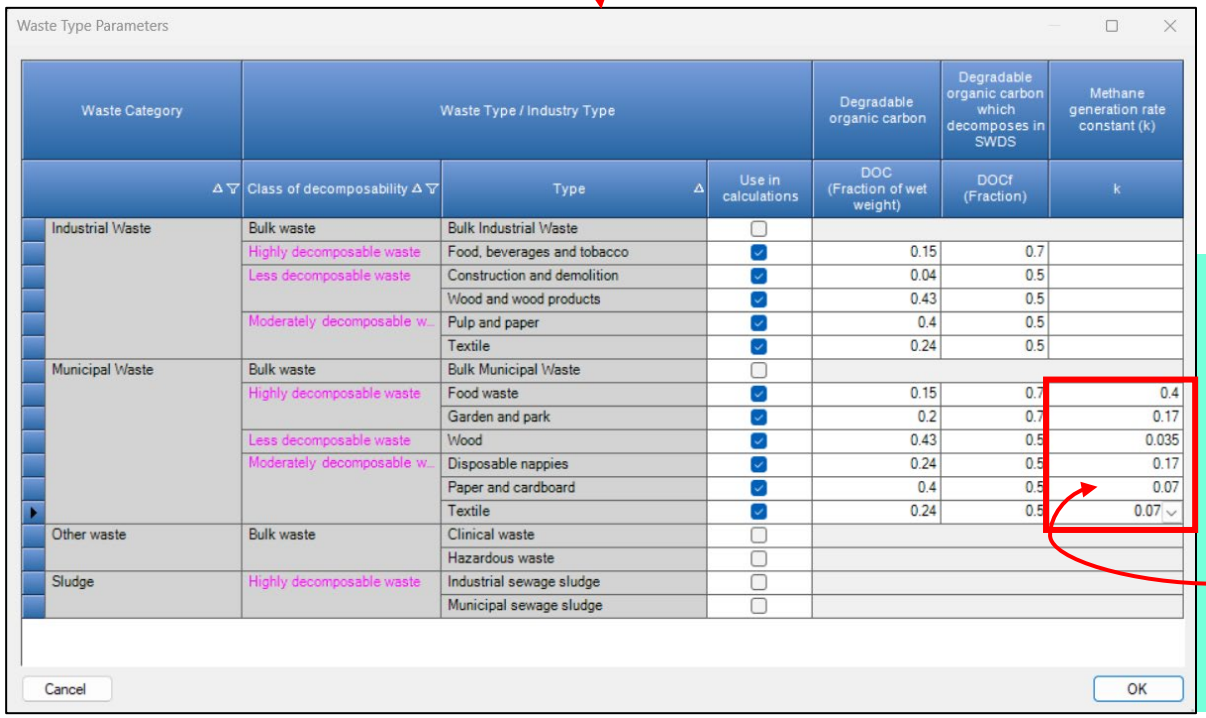
TABLE 3.3
RECOMMENDED DEFAULT METHANE GENERATION RATE (*k*) VALUES UNDER TIER 1
(Derived from *k* values obtained in experimental measurements, calculated by models, or used in greenhouse gas inventories and other studies)

Type of Waste		Climate Zone*							
		Boreal and Temperate (MAT ≤ 20°C)				Tropical[1] (MAT > 20°C)			
		Dry (MAP/PET < 1)		Wet (MAP/PET > 1)		Dry (MAP < 1000 mm)		Moist and Wet (MAP ≥ 1000 mm)	
		Default	Range[2]	Default	Range[2]	Default	Range[2]	Default	Range[2]
Slowly degrading waste	Paper/textiles waste	0.04	0.03[3,5] – 0.05[3,4]	0.06	0.05 – 0.07[3,5]	0.045	0.04 – 0.06	0.07	0.06 – 0.085
	Wood/ straw waste	0.02	0.01[3,4] – 0.03[6,7]	0.03	0.02 – 0.04	0.025	0.02 – 0.04	0.035	0.03 – 0.05
Moderately degrading waste	Other (non – food) organic putrescible/ Garden and park waste	0.05	0.04 – 0.06	0.1	0.06 – 0.1[8]	0.065	0.05 – 0.08	0.17	0.15 – 0.2
Rapidly degrading waste	Food waste/Sewage sludge	0.06	0.05 – 0.08	0.185[4]	0.1[3,4] – 0.2[9]	0.085	0.07 – 0.1	0.4	0.17 – 0.7[10]
Bulk Waste		0.05	0.04 – 0.06	0.09	0.08[8] – 0.1	0.065	0.05 – 0.08	0.17	0.15[11] – 0.2

Step 1.2: Selecting suitable default DOC, DOCf and Methane generation rate constant (k)







Functions under Waste Type Parameters

1. Select waste types use in calculation
2. Select already defined DOC and DOCf factors from the dropdown
3. Select **default IPCC methane generation rate constant (k) – Tier 1 and Tier 2**

Functions under Waste Type Manager

1. Select parameters related to either the wet weight or dry weight
2. Manage parameters associated with DOC, DOCf, Dry Matter Content, Total Carbon in Dry Matter and Fossil Carbon in Total Carbon by selecting **IPCC default – Tier 1 and Tier 2**
3. Adding user defined waste types (new waste types)

Selecting remaining parameters

EQUATION 3.6
CH_4 GENERATED FROM DECAYED DDOCm

$$CH_4\ generated_T = DDOCm\ decomp_T \bullet F \bullet 16/12$$

Where:

CH_4 $generated_T$	=	amount of CH_4 generated from decomposable material
DDOCm $decomp_T$	=	DDOCm decomposed in year *T*, Gg
F	=	fraction of CH_4, by volume, in generated landfill gas (fraction)
16/12	=	molecular weight ratio CH_4/C (ratio)

	IPCC default value		Country-specific parameters	
			Value	Reference and remarks
Delay time (months)		6	6	
Fraction of methane (F) in developed gas		0.5	0.5	
Conversion factor, C to CH_4		1.33	1.33	
Oxidation factor (OX)		0	0	
Parameters for carbon storage				
% paper in industrial waste		0%	0%	
% wood in industrial waste		0%	0%	
For Harwested Wood Products calculations for Bulk waste option only:				

EQUATION 3.1
CH_4 EMISSION FROM SWDS

$$CH_4\ Emissions = \left[\sum_x CH_4\ generated_{x,T} - R_T\right] \bullet (1 - OX_T)$$

Where:

CH_4 Emissions	=	CH_4 emitted in year *T*, Gg
T	=	inventory year
x	=	waste category or type/material
R_T	=	recovered CH_4 in year *T*, Gg
OX_T	=	oxidation factor in year *T*, (fraction)

CH_4 generated $_T$

The **period between waste deposition and full methane production**, during which aerobic decomposition and acidification processes occur, is typically estimated. The IPCC offers a default value of **six months** for this time delay.

Fraction of CH4 in generated landfill gas (F). It is recommended to utilize the default value provided by the IPCC for the fraction of methane in landfill gas, which is **0.5.**

Molecular weight ratio (CH4/C) = **16/12**

The oxidation factor (OX) reflects the amount of CH4 from SWDS that is oxidised in the soil or other material covering the waste.
The oxidation factor varies depending on the landfill site conditions. Sites with thick and well-aerated cover materials may exhibit different oxidation factors compared to sites with no cover or where significant amounts of methane can escape through cracks or fissures in the cover.

TABLE 3.2
OXIDATION FACTOR (OX) FOR SWDS

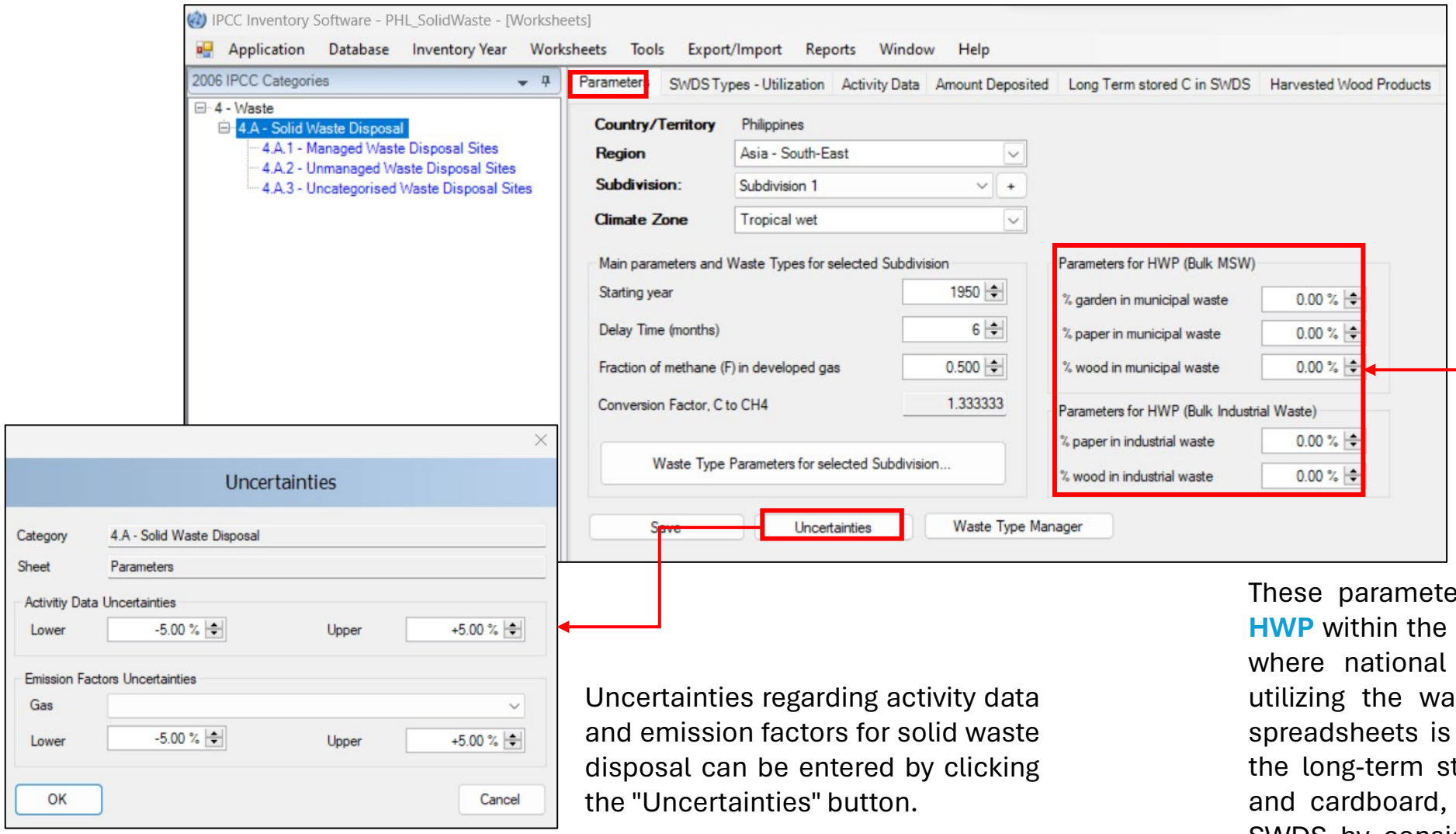
Type of Site	Oxidation Factor (OX) Default Values
Managed [1], unmanaged and uncategorised SWDS	0
Managed covered with CH_4 oxidising material [2]	0.1

[1] Managed but not covered with aerated material
[2] Examples: soil, compost

CH_4 generated $_T$

CH_4 generated $_T$

Additional Step: Managing uncertainty and parameters for Harvested Wood Products (Only for Bulk waste option)

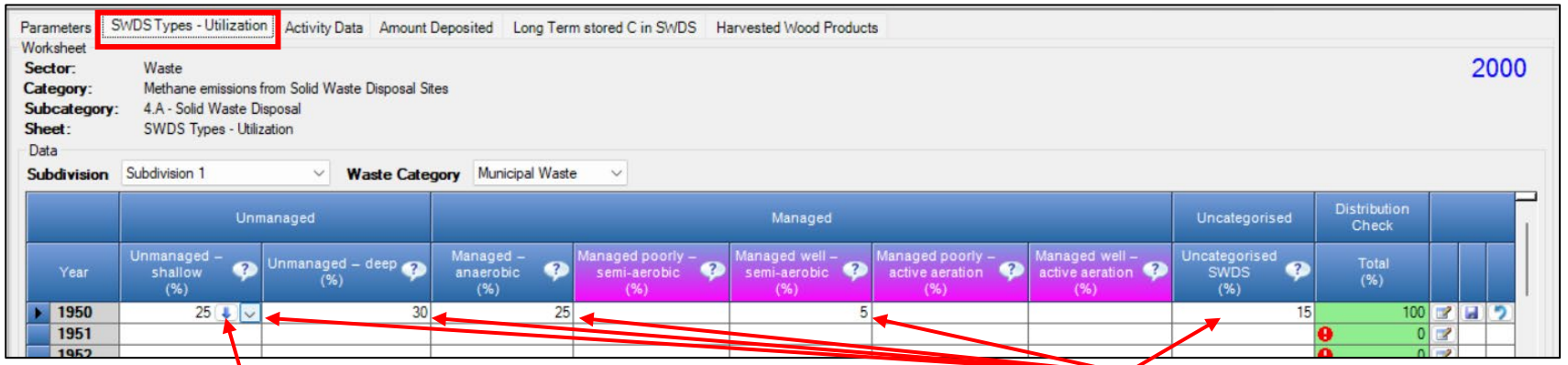


Uncertainties regarding activity data and emission factors for solid waste disposal can be entered by clicking the "Uncertainties" button.

These parameters are essential for computing **HWP** within the **bulk waste option**. In instances where national bulk waste data are lacking, utilizing the waste composition option in the spreadsheets is advised. This option calculates the long-term stored carbon from wood, paper and cardboard, and garden and park waste in SWDS by considering the remaining portion of the DOC after decay.

Step 2: Selecting distribution of waste by waste management type

Identifying the **distribution of waste by waste management type** is crucial for determining **Methane Correction Factors (MCF).** For instance, unmanaged solid waste disposal sites (SWDS) produce less methane (CH4) from a given amount of waste compared to anaerobically managed SWDS.

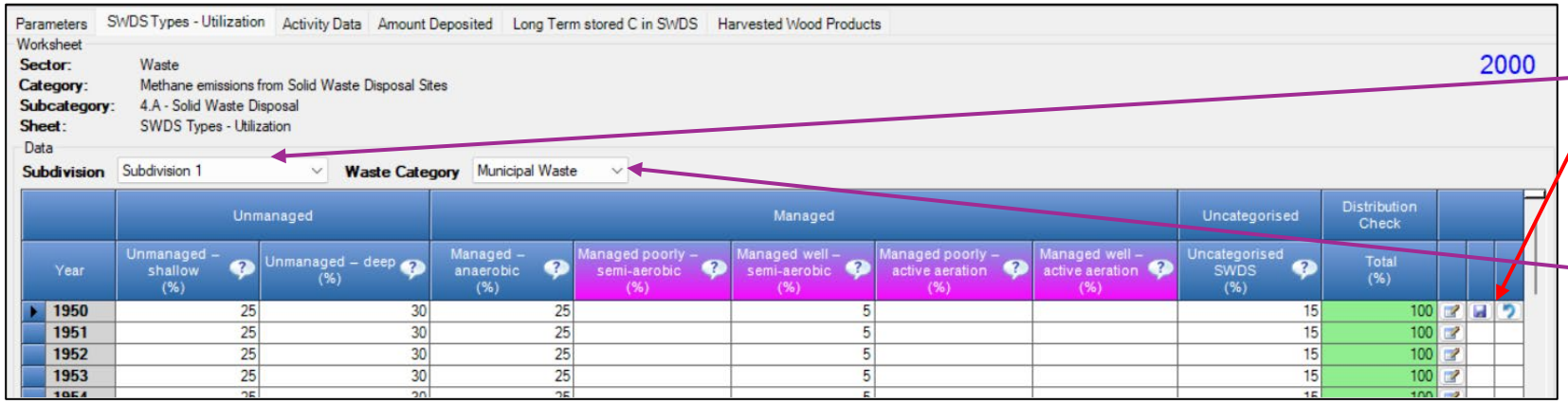


The user can update the same value for all years by pressing the down arrow.

However, **if country-specific distribution values are unavailable,** the software offers distribution values for common waste management types based on the country and region to facilitate **Tier 1 assessments.**

The IPCC software offers 8 management types categorized under 3 main types, each with default MCF values provided by IPCC.

1. **Unmanaged** - Unmanaged - shallow and Unmanaged – deep
2. **Managed** - Managed – anaerobic, Managed poorly – semi-aerobic, Managed well – semi-aerobic, Managed poorly – active aeration and Managed well– active aeration
3. **Uncategorised**



Save an entry after filling data

Similarly, the user can enter data for each subdivision

The same process used for Municipal Waste can be applied to other types of waste using the dropdown menu.

1. Municipal Waste
2. Industrial Waste
3. Sludge
4. Other waste

Selecting remaining parameters

EQUATION 3.6
CH_4 GENERATED FROM DECAYED DDOCm

$$CH_4\ generated_T = DDOCm\ decomp_T \bullet F \bullet 16/12$$

Where:

CH_4 $generated_T$	=	amount of CH_4 generated from decomposable material
DDOCm $decomp_T$	=	DDOCm decomposed in year *T*, Gg
F	=	fraction of CH_4, by volume, in generated landfill gas (fraction)
16/12	=	molecular weight ratio CH_4/C (ratio)

	IPCC default value		Country-specific parameters	
			Value	Reference and remarks
Delay time (months)		6	6	
Fraction of methane (F) in developed gas		0.5	0.5	
Conversion factor, C to CH_4		1.33	1.33	
Oxidation factor (OX)		0	0	
Parameters for carbon storage				
% paper in industrial waste		0%	0%	
% wood in industrial waste		0%	0%	
For Harwested Wood Products calculations for Bulk waste option only:				

EQUATION 3.1
CH_4 EMISSION FROM SWDS

$$CH_4\ Emissions = \left[\sum_x CH_4\ generated_{x,T} - R_T\right] \bullet (1 - OX_T)$$

Where:

CH_4 Emissions	=	CH_4 emitted in year *T*, Gg
T	=	inventory year
x	=	waste category or type/material
R_T	=	recovered CH_4 in year *T*, Gg
OX_T	=	oxidation factor in year *T*, (fraction)

CH_4 generated $_T$

The **period between waste deposition and full methane production**, during which aerobic decomposition and acidification processes occur, is typically estimated. The IPCC offers a default value of **six months** for this time delay.

Fraction of CH4 in generated landfill gas (F). It is recommended to utilize the default value provided by the IPCC for the fraction of methane in landfill gas, which is **0.5.**

Molecular weight ratio (CH4/C) = **16/12**

The oxidation factor (OX) reflects the amount of CH4 from SWDS that is oxidised in the soil or other material covering the waste.
The oxidation factor varies depending on the landfill site conditions. Sites with thick and well-aerated cover materials may exhibit different oxidation factors compared to sites with no cover or where significant amounts of methane can escape through cracks or fissures in the cover.

TABLE 3.2
OXIDATION FACTOR (OX) FOR SWDS

Type of Site	Oxidation Factor (OX) Default Values
Managed [1], unmanaged and uncategorised SWDS	0
Managed covered with CH_4 oxidising material [2]	0.1

[1] Managed but not covered with aerated material
[2] Examples: soil, compost

CH_4 generated $_T$

CH_4 generated $_T$

Selecting parameters – Bulk waste data

	IPCC default value		Country-specific parameters	
			Value	Reference and remarks
Starting year		1950	1950	
DOC (Degradable organic carbon)	Bulk waste data only			
(weight fraction, wet basis)	**Range**	**Default**		
Bulk MSW	0.08-0.17	0.13	0.13	
Industrial waste	0-0.54	0.15	0.15	
Sewage sludge	0.04-0.05	0.05	0.05	
DOCf (fraction of DOC dissimilated)		0.5	0.5	
Less decomposable waste, e.g. wood, engineered wood products, branches		0.1	0.1	
Moderately decomposable waste, e.g. paper, textile, nappies		0.5	0.5	
Highly decomposable waste, e.g. food waste, grass (garden and park waste excluding tree branches)		0.7	0.7	
Methane generation rate constant (k)	Moist and wet tropical			
(years^{-1})	**Range**	**Default**		
Bulk MSW	0.15–0.2	0.17	0.17	
Industrial waste	0.15–0.2	0.17	0.17	
Sewage sludge	0.17–0.7	0.4	0.4	
Delay time (months)		6	6	
Fraction of methane (F) in developed gas		0.5	0.5	
Conversion factor, C to CH_4		1.33	1.33	
Oxidation factor (OX)		0	0	
Parameters for carbon storage				
% paper in industrial waste		0%	0%	
% wood in industrial waste		0%	0%	
For Harwested Wood Products calculations for Bulk waste option only:				
DOC for garden waste		0.2	0.2	
DOC for paper and cardboard		0.4	0.4	
DOC for wood and straw		0.43	0.43	

Similar to waste compositions option

When opting for the bulk waste approach, it's crucial to estimate the proportion of DOC originating from harvested wood products within the total DOC of the waste, before determining the quantities of long-term stored carbon

Step 3: Entering activity data for tier 1 approach

The IPCC software offers two approaches for entering activity data based on tiers.

For **the tier 1 approach**, users can calculate total waste using **population** data and the **percentage of waste going to solid waste disposal sites (SWDS).**

In a manner similar to the previous section, users have the ability to input data **subdivision-wise** and **waste category-wise,** including Municipal Waste, Industrial Waste, Sludge, and Other Waste.

Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A - Solid Waste Disposal
Sheet: Activity Data

2000

Data

Subdivision Subdivision 1 | **Waste Category** Municipal Waste | **Total Waste** Calculated from Population | **Waste Type Amounts** % of Total Waste going to SWDS

						Composition of waste going to solid waste disposal sites							
Year	Population (Capita)	Waste per capita (kg/cap/yr)	Total Waste (Gg)	% to SWDS (%)	Total to SWDS (Gg)	Food waste	Garden and park	Disposable nappies	Paper and cardboard	Textile	Wood	Inert	Total
	A	B	C = A * B * 10^-6	D	E = C * (D/100)	% of E	% of E	% of E	% of E	% of E	% of E	% of E	%
1997	72718840	190	13816.5796	62	8566.27935	43.5			12.9	2.7	9.9	31	100
1998	74491920	190	14153.4648	62	8775.14818	43.5			12.9	2.7	9.9	31	100
1999	76249060	190	14487.3214	62	8982.13927	43.5			12.9	2.7	9.9	31	100
2000	77958220	190	14812.0618	62	9183.47832	43.5			12.9	2.7	9.9	31	100
2001	79626086	190	15128.956...	62	9379.95293	43.5			12.9	2.7	9.9	31	100
2002	81285572	190	15444.258...	62	9575.44038	43.5			12.9	2.7	9.9	31	100
2003	82942837	190	15759.139...	62	9770.6662	43.5			12.9	2.7	9.9	31	100
2004	84607501	190	16075.425...	62	9966.76362	43.5			12.9	2.7	9.9	31	100
2005	86261250	190	16389.6375	62	10161.575...	43.5			12.9	2.7	9.9	31	100
2006	87901835	190	16701.348...	62	10354.836...	43.5			12.9	2.7	9.9	31	100
2007	86261250	190	16389.6375	62	10161.575...	43.5			12.9	2.7	9.9	31	100
2008	91252326	190	17337.941...	62	10749.524	43.5			12.9	2.7	9.9	31	100
2009	92946951	190	17659.920...	62	10949.150...	43.5			12.9	2.7	9.9	31	100

Population (Philippine)

Users can input a **set of data directly** from an **Excel sheet** into the software by selecting the **corresponding number of rows in the column** within the software interface.

IPCC software provides - Philippine specific data given in the IPCC 2006 guideline

IPCC software provides - Asia-south-east region specific shares given in the IPCC 2006 guideline

Entering and selecting data to calculate MSW generation (Activity data)

MSW activity data

Enter population, waste per capita and MSW waste composition into the yellow cells.
Help and default regional values are given in the 2006 IPCC Guidelines.
Industrial waste activity data must be entered separately starting in Column Q.

IPCC Regional defaults

		270		59%	44%	0%	13%	10%	3%	0%	31%	100%
					Composition of waste going to solid waste disposal sites							
Year	Population	Waste per capita	Total MSW	% to SWDS	Food	Garden	Paper	Wood	Textile	Nappies	Plastics, other inert	Total
	millions	kg/cap/yr	Gg	%	%	%	%	%	%	%	%	(=100%)
1989	60.127343	270	16234.38	59%	44%	0%	13%	10%	3%	0%	31%	100%
1990	61.558898	270	16620.9	59%	44%	0%	13%	10%	3%	0%	31%	100%
1991	63.039751	270	17020.73	59%	44%	0%	13%	10%	3%	0%	31%	100%
1992	64.543525	270	17426.75	59%	44%	0%	13%	10%	3%	0%	31%	100%
1993	66.083321	270	17842.5	59%	44%	0%	13%	10%	3%	0%	31%	100%
1994	67.650283	270	18265.58	59%	44%	0%	13%	10%	3%	0%	31%	100%
1995	69.250468	270	18697.63	59%	44%	0%	13%	10%	3%	0%	31%	100%
1996	70.944969	270	19155.14	59%	44%	0%	13%	10%	3%	0%	31%	100%
1997	72.718837	270	19634.09	59%	44%	0%	13%	10%	3%	0%	31%	100%
1998	74.491918	270	20112.82	59%	44%	0%	13%	10%	3%	0%	31%	100%
1999	76.249064	270	20587.25	59%	44%	0%	13%	10%	3%	0%	31%	100%
2000	77.958223	270	21048.72	59%	44%	0%	13%	10%	3%	0%	31%	100%

For countries lacking national data on MSW generation, management practices, and composition over a period, urban population or total population figures can be utilized to estimate the data.

Additionally, the IPCC provides default compositions of waste going to waste disposal sites based on the region.

The IPCC offers regional defaults for waste generation per capita (kg/cap/yr) and the percentage of waste disposed to SWDS.

Population (Philippine) - World Bank

TABLE 2.1
MSW GENERATION AND TREATMENT DATA - REGIONAL DEFAULTS

Region	MSW Generation Rate[1, 2, 3] (tonnes/cap/yr)	Fraction of MSW disposed to SWDS	Fraction of MSW incinerated	Fraction of MSW composted	Fraction of other MSW management, unspecified[4]
Asia					
Eastern Asia	0.37	0.55	0.26	0.01	0.18
South-Central Asia	0.21	0.74	-	0.05	0.21
South-East Asia	0.27	0.59	0.09	0.05	0.27
Africa[5]	0.29	0.69	-	-	0.31
Europe					
Eastern Europe	0.38	0.90	0.04	0.01	0.02
Northern Europe	0.64	0.47	0.24	0.08	0.20
Southern Europe	0.52	0.85	0.05	0.05	0.05
Western Europe	0.56	0.47	0.22	0.15	0.15
America					
Caribbean	0.49	0.83	0.02	-	0.15
Central America	0.21	0.50	-	-	0.50
South America	0.26	0.54	0.01	0.003	0.46
North America	0.65	0.58	0.06	0.06	0.29
Oceania[6]	0.69	0.85	-	-	0.15

IPCC waste model in 2006 provide: Asia-south-eastern region specific shares given in the IPCC 2006 guideline

Entering and selecting data to calculate MSW generation (Activity data)

MSW activity data

Enter population, waste per capita and MSW waste composition into the yellow cells.
Help and default regional values are given in the 2006 IPCC Guidelines.
Industrial waste activity data must be entered separately starting in Column Q.

IPCC Regional defaults

		270		59%	44%	0%	13%	10%	3%	0%	31%	100%
					Composition of waste going to solid waste disposal sites							
Year	Population	Waste per capita	Total MSW	% to SWDS	Food	Garden	Paper	Wood	Textile	Nappies	Plastics, other inert	Total
	millions	kg/cap/yr	Gg	%	%	%	%	%	%	%	%	(=100%)
1989	60.127343	270	16234.38	59%	44%	0%	13%	10%	3%	0%	31%	100%
1990	61.558898	270	16620.9	59%	44%	0%	13%	10%	3%	0%	31%	100%
1991	63.039751	270	17020.73	59%	44%	0%	13%	10%	3%	0%	31%	100%
1992	64.543525	270	17426.75	59%	44%	0%	13%	10%	3%	0%	31%	100%
1993	66.083321	270	17842.5	59%	44%	0%	13%	10%	3%	0%	31%	100%
1994	67.650283	270	18265.58	59%	44%	0%	13%	10%	3%	0%	31%	100%
1995	69.250468	270	18697.63	59%	44%	0%	13%	10%	3%	0%	31%	100%
1996	70.944969	270	19155.14	59%	44%	0%	13%	10%	3%	0%	31%	100%
1997	72.718837	270	19634.09	59%	44%	0%	13%	10%	3%	0%	31%	100%
1998	74.491918	270	20112.82	59%	44%	0%	13%	10%	3%	0%	31%	100%
1999	76.249064	270	20587.25	59%	44%	0%	13%	10%	3%	0%	31%	100%
2000	77.958223	270	21048.72	59%	44%	0%	13%	10%	3%	0%	31%	100%

For countries lacking national data on MSW generation, management practices, and composition over a period, urban population or total population figures can be utilized to estimate the data.

Additionally, the IPCC provides default compositions of waste going to waste disposal sites based on the region.

The IPCC offers regional defaults for waste generation per capita (kg/cap/yr) and the percentage of waste disposed to SWDS.

Population (Philippine) - World Bank

TABLE 2.1
MSW GENERATION AND TREATMENT DATA - REGIONAL DEFAULTS

Region	MSW Generation Rate[1, 2, 3] (tonnes/cap/yr)	Fraction of MSW disposed to SWDS	Fraction of MSW incinerated	Fraction of MSW composted	Fraction of other MSW management, unspecified[4]
Asia					
Eastern Asia	0.37	0.55	0.26	0.01	0.18
South-Central Asia	0.21	0.74	-	0.05	0.21
South-East Asia	0.27	0.59	0.09	0.05	0.27
Africa[5]	0.29	0.69	-	-	0.31
Europe					
Eastern Europe	0.38	0.90	0.04	0.01	0.02
Northern Europe	0.64	0.47	0.24	0.08	0.20
Southern Europe	0.52	0.85	0.05	0.05	0.05
Western Europe	0.56	0.47	0.22	0.15	0.15
America					
Caribbean	0.49	0.83	0.02	-	0.15
Central America	0.21	0.50	-	-	0.50
South America	0.26	0.54	0.01	0.003	0.46
North America	0.65	0.58	0.06	0.06	0.29
Oceania[6]	0.69	0.85	-	-	0.15

IPCC waste model in 2006 provide: Asia-south-eastern region specific shares given in the IPCC 2006 guideline

Entering and selecting data to calculate industrial waste generation (Activity data)

Industrial waste activity data

Enter GDP, waste generation rate, % to SWDS and distribution of waste between site types into the yellow cells.
Help and default regional values are given in the 2006 IPCC Guidelines.

Year	GDP	Waste generation rate	Total industrial waste	% to SWDS	Total to SWDS
	$ millions	Gg/$m GDP/yr	Gg	%	Gg
1988	43152.129	0.02	863.04258	100%	863.0426
1989	48513.7737	0.02	970.27547	100%	970.2755
1990	50508.2866	0.02	1010.1657	100%	1010.166
1991	51784.1449	0.02	1035.6829	100%	1035.683
1992	60422.3282	0.02	1208.4466	100%	1208.447
1993	62036.5291	0.02	1240.7306	100%	1240.731
1994	73159.3369	0.02	1463.1867	100%	1463.187
1995	84644.3287	0.02	1692.8866	100%	1692.887
1996	94648.0844	0.02	1892.9617	100%	1892.962
1997	94106.3176	0.02	1882.1264	100%	1882.126
1998	74492.4163	0.02	1489.8483	100%	1489.848
1999	85640.171	0.02	1712.8034	100%	1712.803
2000	83669.7883	0.02	1673.3958	100%	1673.396

GDP in $ (Philippine) - World Bank

For countries lacking production data, historical disposal of industrial waste can be estimated proportionally to GDP or other economic indicators. GDP serves as the driver in the Tier 1 method.

Assessed waste generations

Amount deposited data Country **Philippines**

Countries with good inventory data:
Enter those data onto this sheet.

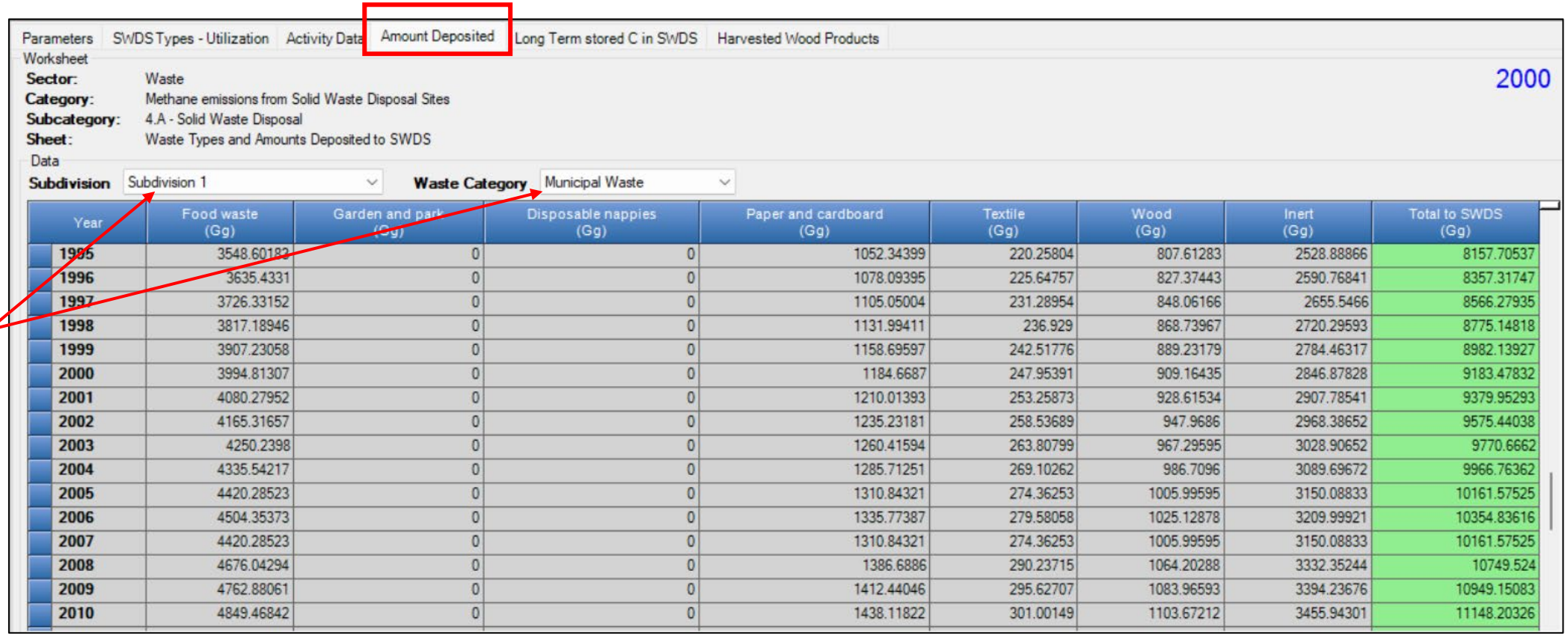
Year	Amounts deposited in SWDS									
	Food	Garden	Paper	Wood	Textile	Nappies	Sludge	Deposited MSW	Inert	Industrial
	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg
1985	3,798	0	1,126	864	236	0	0	8,732	2,707	699
1986	3,888	0	1,153	885	241	0	0	8,938	2,771	680
1987	3,979	0	1,180	905	247	0	0	9,146	2,835	756
	4,072	0	1,207	927	253	0	0	9,360	2,902	863
	4,167	0	1,236	948	259	0	0	9,578	2,969	970
	4,266	0	1,265	971	265	0	0	9,806	3,040	1,010
	4,368	0	1,295	994	271	0	0	10,042	3,113	1,036
	4,473	0	1,326	1,018	278	0	0	10,282	3,187	1,208
	4,579	0	1,358	1,042	284	0	0	10,527	3,263	1,241
	4,688	0	1,390	1,067	291	0	0	10,777	3,341	1,463
1995	4,799	0	1,423	1,092	298	0	0	11,032	3,420	1,693
1996	4,916	0	1,458	1,119	305	0	0	11,302	3,503	1,893
1997	5,039	0	1,494	1,147	313	0	0	11,584	3,591	1,882
1998	5,162	0	1,531	1,175	320	0	0	11,867	3,679	1,490
1999	5,284	0	1,567	1,203	328	0	0	12,146	3,765	1,713
2000	5,402	0	1,602	1,229	335	0	0	12,419	3,850	1,673

Year	2000	
MSW generation (Food waste)	5402.154	Gg
Population	77.95822	millions
Waste per capita	270	kg/cap/yr
Percentage to SWDS	59%	
Composition of food waste	43.50%	

Year	2000	
Industrial waste generation	1673.396	Gg
GDP	83669.79	$ millions
Waste per capita	0.02	Gg/$ million
Percentage to SWDS	100%	

The amount of waste deposited is determined based on the data entered into the software

Similar to the previous sections, users have the ability to check data based on subdivision-wise and waste category-wise, including Municipal Waste, Industrial Waste, Sludge, and Other Waste.



Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A - Solid Waste Disposal
Sheet: Waste Types and Amounts Deposited to SWDS

2000

Data

Subdivision Subdivision 1 **Waste Category** Municipal Waste

Year	Food waste (Gg)	Garden and park (Gg)	Disposable nappies (Gg)	Paper and cardboard (Gg)	Textile (Gg)	Wood (Gg)	Inert (Gg)	Total to SWDS (Gg)
1995	3548.60183	0	0	1052.34399	220.25804	807.61283	2528.88866	8157.70537
1996	3635.4331	0	0	1078.09395	225.64757	827.37443	2590.76841	8357.31747
1997	3726.33152	0	0	1105.05004	231.28954	848.06166	2655.5466	8566.27935
1998	3817.18946	0	0	1131.99411	236.929	868.73967	2720.29593	8775.14818
1999	3907.23058	0	0	1158.69597	242.51776	889.23179	2784.46317	8982.13927
2000	3994.81307	0	0	1184.6687	247.95391	909.16435	2846.87828	9183.47832
2001	4080.27952	0	0	1210.01393	253.25873	928.61534	2907.78541	9379.95293
2002	4165.31657	0	0	1235.23181	258.53689	947.9686	2968.38652	9575.44038
2003	4250.2398	0	0	1260.41594	263.80799	967.29595	3028.90652	9770.6662
2004	4335.54217	0	0	1285.71251	269.10262	986.7096	3089.69672	9966.76362
2005	4420.28523	0	0	1310.84321	274.36253	1005.99595	3150.08833	10161.57525
2006	4504.35373	0	0	1335.77387	279.58058	1025.12878	3209.99921	10354.83616
2007	4420.28523	0	0	1310.84321	274.36253	1005.99595	3150.08833	10161.57525
2008	4676.04294	0	0	1386.6886	290.23715	1064.20288	3332.35244	10749.524
2009	4762.88061	0	0	1412.44046	295.62707	1083.96593	3394.23676	10949.15083
2010	4849.46842	0	0	1438.11822	301.00149	1103.67212	3455.94301	11148.20326

Unlike the IPCC 2006 excel model, In the latest **IPCC software**, users have the capability to conduct **separate assessments for methane (CH4) generation and emissions at solid waste disposal sites** under solid waste subcategories. This can be done after determining the amount of waste deposited, as outlined in the previous slides under the "Solid Waste Disposal" section.

Given that the **categorization of solid waste disposal sites (SWDS)** in the software aligns more closely with the **2019 refinement of the IPCC guidelines,** users can utilize the default Methane Correction Factor (MCF) values provided in the 2019 refinement for SWDS that have been newly added.

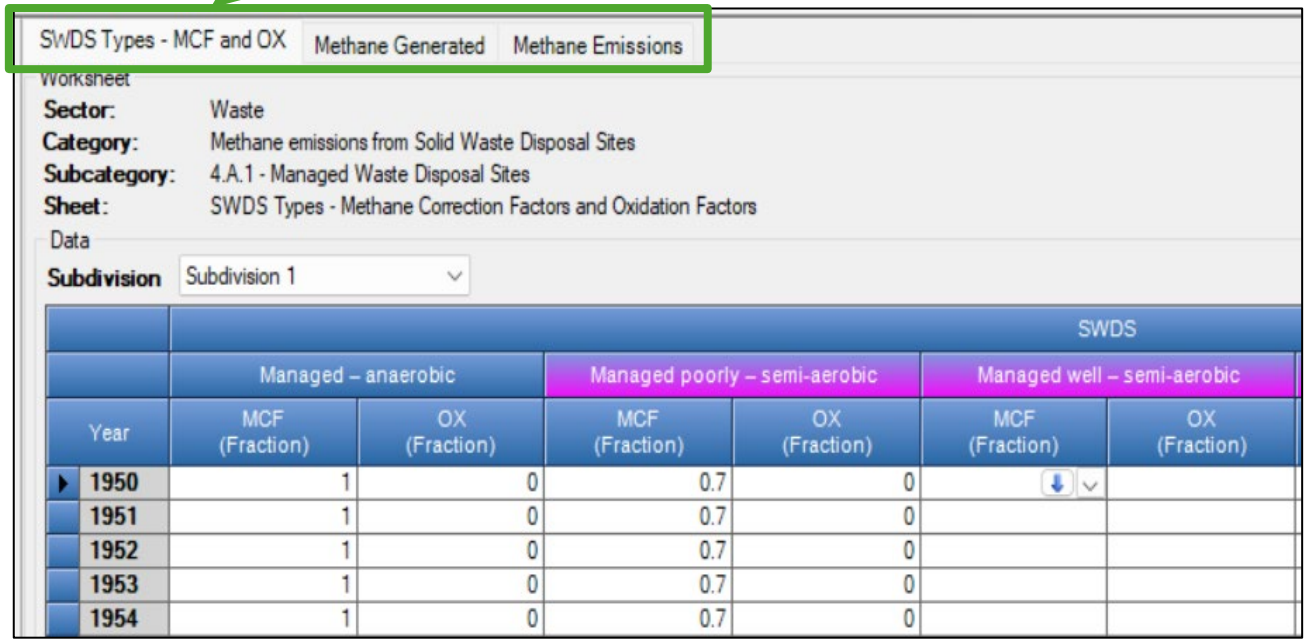
TABLE 3.1 (UPDATED)
SWDS CLASSIFICATION AND METHANE CORRECTION FACTORS (MCF)

Type of Site	Methane Correction Factor (MCF) Default Values	Remarks
Managed – anaerobic	1.0[a]	These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste.
Managed well – semi-aerobic	0.5[b]	When semi-aerobic managed SWDS type is managed under one of the following condition, it is regarded as well magement ; (i) permeable cover material; (ii) leachate drainage system without sunk; (iii) regulating pondage; and (iv) gas ventilation system without cap, (v) connection of leachate drainage system and gas ventilation system.
Managed poorly – semi-aerobic	0.7[c]	When semi-aerobic managed SWDS type is managed under one of the following condition, it is regarded as poor management; (i) condition of sunk of leachate drainage system; (ii) closing of valve of drainage or atmosphere-unopening of drainage exit; (iii) capping of gas ventilation exit.
Managed well – active-aeration	0.4[d,e,f]	Active aeration of managed landfills includes the technology of in-situ low pressure aeration, air sparging, bioventing, passive ventilation with extraction (suction). These must have controlled placement of waste and will include leachate drainage system to avoid the blockage of air penetration, and (i) cover material; (ii) air injection or gas extraction system without drying of waste.
Managed poorly – active-aeration	0.7[f,g,h]	When SWDS, that is equipped as well as active aeration of managed SWDS, is managed under one of the following condition, it is judged as poor management; (i) blockage of aeration system due to failure of drainage; (ii) lack of available moisture for microorganisms due to high- pressure aeration.
Unmanaged – deep (>5 m waste) and /or high water table	0.8[a]	All SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 metres and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste.
Unmanaged – shallow (<5 m waste)	0.4[a]	All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres.
Uncategorised SWDS	0.6[a]	Only if countries cannot categorise their SWDS into above four categories of managed and unmanaged SWDS, the MCF for this category can be used.

Sources: [a]IPCC (2000); [b]Matsufuji *et al.* (1996); [c]Yamada *et al.* (2013); [d]Hrad *et al.* (2013); [e]Ishigaki *et al.* (2003); [f]Ritzkowski & Stegmann (2013); [g]Raga & Cossu (2014); [h]Ritzkowski *et al.* (2016)

There are 3 worksheets within each subcategories (4. A. 1, 4. A. 2, 4. A. 3)

1. SWDS Types – MCF and OX - **Step 4**
2. Methane Generated – **Step 5**
3. Methane Emissions - **Step 6 / Results**



	SWDS					
	Managed – anaerobic		Managed poorly – semi-aerobic		Managed well – semi-aerobic	
Year	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)
1950	1	0	0.7	0		
1951	1	0	0.7	0		
1952	1	0	0.7	0		
1953	1	0	0.7	0		
1954	1	0	0.7	0		

Step 4: Selecting MCF and OX

For **Tier 1 and Tier 2** approach, IPCC default MCF and OX can be used

4. A. 1 – Managed Waste Disposal Sites

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet
Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.1 - Managed Waste Disposal Sites
Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors

2000

Data
Subdivision Subdivision 1

	SWDS									
	Managed – anaerobic		Managed poorly – semi-aerobic		Managed well – semi-aerobic		Managed poorly – active aeration		Managed well – active aeration	
Year	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)
1997	1	0			0.5	0				
1998	1	0			0.5	0				
1999	1	0			0.5	0				
2000	1	0			0.5	0				
2001	1	0			0.5	0				

4. A. 2 – Unmanaged Waste Disposal Sites

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet
Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.2 - Unmanaged Waste Disposal Sites
Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors

2000

Data
Subdivision Subdivision 1

	SWDS			
	Unmanaged – shallow		Unmanaged – deep	
Year	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)
1997	0.4	0	0.8	0
1998	0.4	0	0.8	0
1999	0.4	0	0.8	0
2000	0.4	0	0.8	0
2001	0.4	0	0.8	0

4. A. 3 – Uncategorised Waste Disposal Sites

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet
Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.3 - Uncategorised Waste Disposal Sites
Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors

2000

Data
Subdivision Subdivision 1

	SWDS		
	Uncategorised SWDS		
Year	MCF (Fraction)	OX (Fraction)	
1997	0.6	0	
1998	0.6	0	
1999	0.6	0	
2000	0.6	0	
2001	0.6	0	

MCF

TABLE 3.1 (UPDATED)
SWDS CLASSIFICATION AND METHANE CORRECTION FACTORS (MCF)

Type of Site	Methane Correction Factor (MCF) Default Values	Remarks
Managed – anaerobic	1.0[a]	These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste.
Managed well – semi-aerobic	0.5[b]	When semi-aerobic managed SWDS type is managed under one of the following condition, it is regarded as well magement ; (i) permeable cover material; (ii) leachate drainage system without sunk; (iii) regulating pondage; and (iv) gas ventilation system without cap, (v) connection of leachate drainage system and gas ventilation system.
Managed poorly – semi-aerobic	0.7[c]	When semi-aerobic managed SWDS type is managed under one of the following condition, it is regarded as poor management; (i) condition of sunk of leachate drainage system; (ii) closing of valve of drainage or atmosphere-unopening of drainage exit; (iii) capping of gas ventilation exit.
Managed well – active-aeration	0.4[d,e,f]	Active aeration of managed landfills includes the technology of in-situ low pressure aeration, air sparging, bioventing, passive ventilation with extraction (suction). These must have controlled placement of waste and will include leachate drainage system to avoid the blockage of air penetration, and (i) cover material; (ii) air injection or gas extraction system without drying of waste.
Managed poorly – active-aeration	0.7[f,g,h]	When SWDS, that is equipped as well as active aeration of managed SWDS, is managed under one of the following condition, it is judged as poor management; (i) blockage of aeration system due to failure of drainage; (ii) lack of available moisture for microorganisms due to high- pressure aeration.
Unmanaged – deep (>5 m waste) and /or high water table	0.8[a]	All SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 metres and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste.
Unmanaged – shallow (<5 m waste)	0.4[a]	All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres.
Uncategorised SWDS	0.6[a]	Only if countries cannot categorise their SWDS into above four categories of managed and unmanaged SWDS, the MCF for this category can be used.

Sources: [a]IPCC (2000); [b]Matsufuji *et al.* (1996); [c]Yamada *et al.* (2013); [d]Hrad *et al.* (2013); [e]Ishigaki *et al.* (2003); [f]Ritzkowski & Stegmann (2013); [g]Raga & Cossu (2014); [h]Ritzkowski *et al.* (2016)

OX

TABLE 3.2
OXIDATION FACTOR (OX) FOR SWDS

Type of Site	Oxidation Factor (OX) Default Values
Managed [1], unmanaged and uncategorised SWDS	0
Managed covered with CH_4 oxidising material [2]	0.1

[1] Managed but not covered with aerated material

[2] Examples: soil, compost

Selecting methane correction factor (MCF)

Methane Correction Factor (MCF) — **Calculated values for MCF**

This worksheet calculates a weighted average MCF from the estimated distribution of site types
Enter either IPCC default values or national values into the yellow MCF cells in row 12
Then enter the approximate distribution of waste disposals (by mass) between site types in the columns below.
Totals on each row must add up to 100% (see "distribution check" values)

	MSW						Industrial							MSW	Industrial
	Un-managed, shallow	Un-managed, deep	Managed	Managed, semi-aerobic	Uncate-gorised	Distri-bution Check	Un-managed, shallow	Un-managed, deep	Managed	Managed, semi-aerobic	Uncate-gorised	Distri-bution Check	References / remarks	Weighted average MCF for MSW	Weighted average MCF for Industrial Waste
	MCF	MCF	MCF	MCF	MCF		MCF	MCF	MCF	MCF	MCF				
IPCC default	0.4	0.8	1	0.5	0.6		0.4	0.8	1	0.5	0.6				
Country-specific value	0.4	0.8	1	0.5	0.6		0.4	0.8	1	0.5	0.6				
	Distribution of Waste by Waste Management Type						Distribution of Waste by Waste Management Type								
"Fixed" Country-specifc value	25%	30%	25%	5%	15%	Total (100%)	20%	30%	25%	5%	20%	Total (100%)			
Year	%	%	%	%	%		%	%	%	%	%			wt. fraction	wt. fraction
1995	25%	30%	25%	5%	15%	100%	20%	30%	25%	5%	20%	100%		0.71	0.72
1996	25%	30%	25%	5%	15%	100%	20%	30%	25%	5%	20%	100%		0.71	0.72
1997	25%	30%	25%	5%	15%	100%	20%	30%	25%	5%	20%	100%		0.71	0.72
1998	25%	30%	25%	5%	15%	100%	20%	30%	25%	5%	20%	100%		0.71	0.72
1999	25%	30%	25%	5%	15%	100%	20%	30%	25%	5%	20%	100%		0.71	0.72
2000	25%	30%	25%	5%	15%	100%	20%	30%	25%	5%	20%	100%		0.71	0.72

The MCF acknowledges that unmanaged SWDS generate less CH4 from a specific amount of waste compared to anaerobically managed SWDS.
In unmanaged SWDS, a greater portion of waste decomposes aerobically in the upper layer. However, in unmanaged SWDS with deep disposal, the proportion of waste undergoing aerobic degradation should be lower than in shallow SWDS.

The model also offers fixed country-specific values for the distribution of waste by waste management type. It's important to note that the total distribution should add up to **100%,** as indicated in the final column.

	A	B	
Waste Management Type	IPCC default - MCF	Distribustion of waste	A*B
Un-managed, shallow	0.4	25%	0.1
Un-managed, deep	0.8	30%	0.24
Managed	1	25%	0.25
Managed semi-aerobic	0.5	5%	0.025
Uncategorised	0.6	15%	0.09
			0.705

TABLE 3.1
SWDS CLASSIFICATION AND METHANE CORRECTION FACTORS (MCF)

Type of Site	Methane Correction Factor (MCF) Default Values
Managed – anaerobic [1]	1.0
Managed – semi-aerobic [2]	0.5
Unmanaged [3] – deep (>5 m waste) and /or high water table	0.8
Unmanaged [4] – shallow (<5 m waste)	0.4
Uncategorised SWDS [5]	0.6

[1] **Anaerobic managed solid waste disposal sites**: These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste.

[2] **Semi-aerobic managed solid waste disposal sites**: These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system.

[3] **Unmanaged solid waste disposal sites – deep and/or with high water table**: All SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 metres and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste.

[4] **Unmanaged shallow solid waste disposal sites**; All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres.

[5] **Uncategorised solid waste disposal sites**: Only if countries cannot categorise their SWDS into above four categories of managed and unmanaged SWDS, the MCF for this category can be used.

Sources: IPCC (2000); Matsufuji *et al.* (1996)

Methane Recovery

Methane Recovery and methane oxidised in top layer (OX)

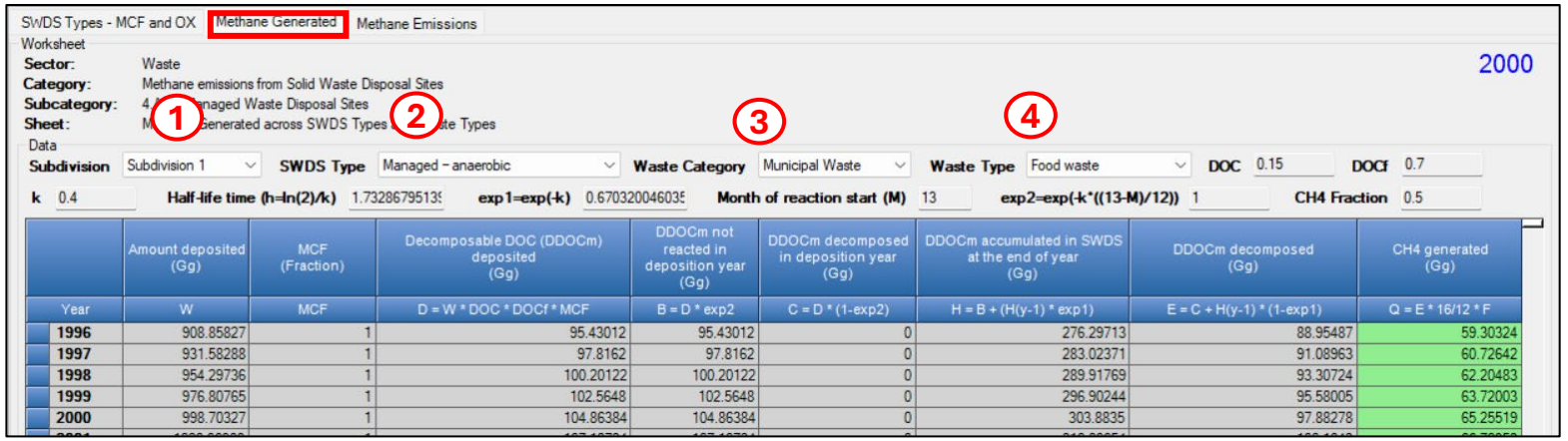
Enter the total amount of methane recovered from all SWDS.

	Amount of Methane Recovered from SWDS	References / remarks	Fraction recovered methane	Methane oxidised (OX)	References/remarks
IPCC default	0			0	
Year	Gg			Fraction	
1988	0.0		0.00	0.00	
1989	0.0		0.00	0.00	
1990	0.0		0.00	0.00	
1991	0.0		0.00	0.00	
1992	0.0		0.00	0.00	
1993	0.0		0.00	0.00	
1994	0.0		0.00	0.00	
1995	0.0		0.00	0.00	
1996	0.0		0.00	0.00	
1997	0.0		0.00	0.00	
1998	0.0		0.00	0.00	
1999	0.0		0.00	0.00	
2000	0.0		0.00	0.00	

CH4 generated at SWDS can be recovered and combusted in a flare or energy device. The default value for CH4 recovery is zero.

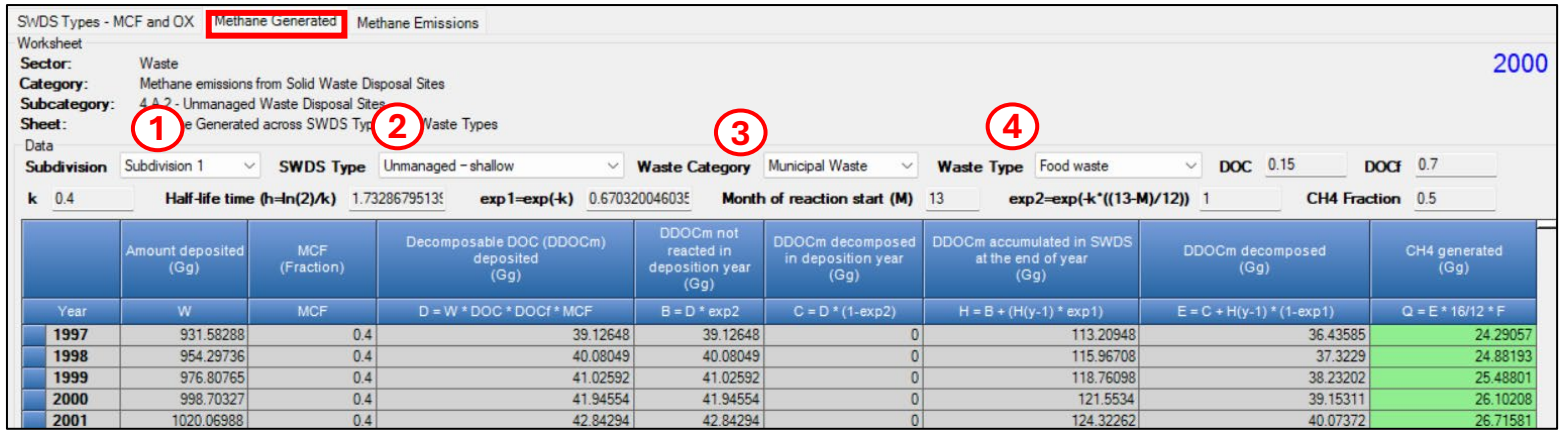
Step 5.1 : Calculated Methane Generation

4. A. 1 – Managed Waste Disposal Sites



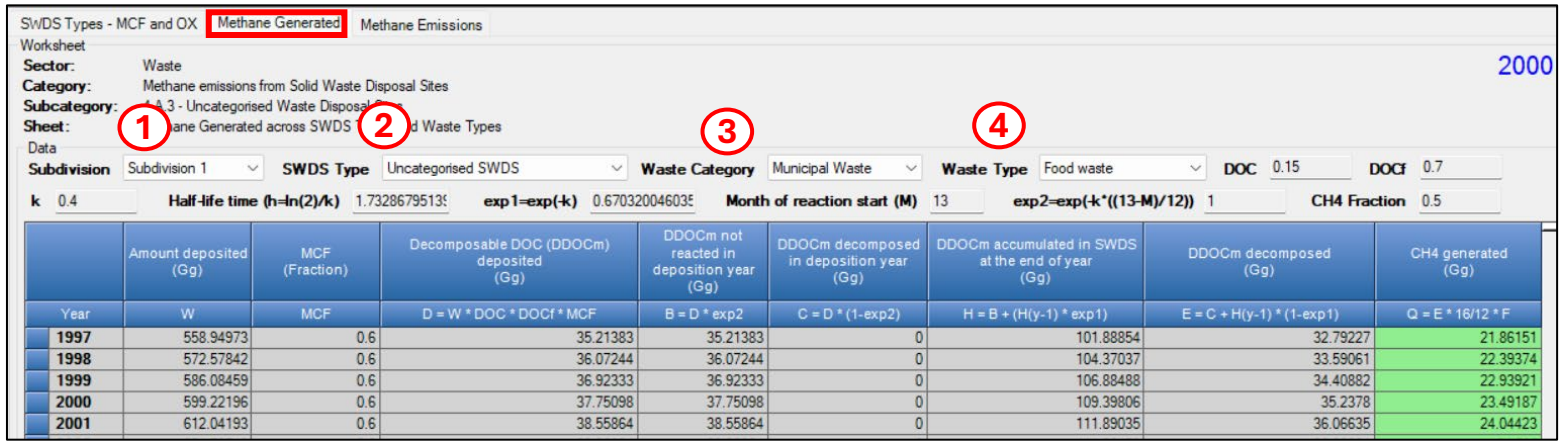
	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
1996	908.85827	1	95.43012	95.43012	0	276.29713	88.95487	59.30324
1997	931.58288	1	97.8162	97.8162	0	283.02371	91.08963	60.72642
1998	954.29736	1	100.20122	100.20122	0	289.91769	93.30724	62.20483
1999	976.80765	1	102.5648	102.5648	0	296.90244	95.58005	63.72003
2000	998.70327	1	104.86384	104.86384	0	303.8835	97.88278	65.25519

4. A. 2 – Unmanaged Waste Disposal Sites



	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
1997	931.58288	0.4	39.12648	39.12648	0	113.20948	36.43585	24.29057
1998	954.29736	0.4	40.08049	40.08049	0	115.96708	37.3229	24.88193
1999	976.80765	0.4	41.02592	41.02592	0	118.76098	38.23202	25.48801
2000	998.70327	0.4	41.94554	41.94554	0	121.5534	39.15311	26.10208
2001	1020.06988	0.4	42.84294	42.84294	0	124.32262	40.07372	26.71581

4. A. 3 – Uncategorised Waste Disposal Sites



	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
1997	558.94973	0.6	35.21383	35.21383	0	101.88854	32.79227	21.86151
1998	572.57842	0.6	36.07244	36.07244	0	104.37037	33.59061	22.39374
1999	586.08459	0.6	36.92333	36.92333	0	106.88488	34.40882	22.93921
2000	599.22196	0.6	37.75098	37.75098	0	109.39806	35.2378	23.49187
2001	612.04193	0.6	38.55864	38.55864	0	111.89035	36.06635	24.04423

① Similar to the previous sections, users have the ability to check methane generation based on **subdivision-wise.**

② Users have the ability to check methane generation based on **SWDS Type –wise.**

4. A. 1 – Managed Waste Disposal Sites

Managed – anaerobic
Managed well – semi-aerobic
Managed poorly – semi-aerobic
Managed well – active-aeration
Managed poorly – active-aeration

4. A. 2 – Unmanaged Waste Disposal Sites

Unmanaged – deep
Unmanaged – shallow

4. A. 3 – Uncategorised Waste Disposal Sites

Uncategorised SWDS

③ Similar to the previous sections, users have the ability to check methane generation based on waste category-wise, including **Municipal Waste, Industrial Waste, Sludge, and Other Waste.**

Step 5.2 : Calculated Methane Generation

4. A. 1 – Managed Waste Disposal Sites

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste **Category:** Methane emissions from Solid Waste Disposal Sites **Subcategory:** 4.A.1 - Managed Waste Disposal Sites **Sheet:** Methane Generated across SWDS Types ... Waste Types

2000

Data

Subdivision Subdivision 1 **SWDS Type** Managed – anaerobic **Waste Category** Municipal Waste **Waste Type** Food waste **DOC** 0.15 **DOCf** 0.7

k 0.4 **Half-life time (h=ln(2)/k)** 1.7328679513 **exp1=exp(-k)** 0.670320046035 **Month of reaction start (M)** 13 **exp2=exp(-k*((13-M)/12))** 1 **CH4 Fraction** 0.5

	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
1996	908.85827	1	95.43012	95.43012	0	276.29713	88.95487	59.30324
1997	931.58288	1	97.8162	97.8162	0	283.02371	91.08963	60.72642
1998	954.29736	1	100.20122	100.20122	0	289.91769	93.30724	62.20483
1999	976.80765	1	102.5648	102.5648	0	296.90244	95.58005	63.72003
2000	998.70327	1	104.86384	104.86384	0	303.8835	97.88278	65.25519
2001	1020.06988	1	107.10734	107.10734	0	310.80654	100.1843	66.78953

4. A. 2 – Unmanaged Waste Disposal Sites

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste **Category:** Methane emissions from Solid Waste Disposal Sites **Subcategory:** 4.A.2 - Unmanaged Waste Disposal Sites **Sheet:** Methane Generated across SWDS Types ... Waste Types

2000

Data

Subdivision Subdivision 1 **SWDS Type** Unmanaged – shallow **Waste Category** Municipal Waste **Waste Type** Food waste **DOC** 0.15 **DOCf** 0.7

k 0.4 **Half-life time (h=ln(2)/k)** 1.7328679513 **exp1=exp(-k)** 0.670320046035 **Month of reaction start (M)** 13 **exp2=exp(-k*((13-M)/12))** 1 **CH4 Fraction** 0.5

	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
1997	931.58288	0.4	39.12648	39.12648	0	113.20948	36.43585	24.29057
1998	954.29736	0.4	40.08049	40.08049	0	115.96708	37.3229	24.88193
1999	976.80765	0.4	41.02592	41.02592	0	118.76098	38.23202	25.48801
2000	998.70327	0.4	41.94554	41.94554	0	121.5534	39.15311	26.10208
2001	1020.06988	0.4	42.84294	42.84294	0	124.32262	40.07372	26.71581

4. A. 3 – Uncategorised Waste Disposal Sites

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste **Category:** Methane emissions from Solid Waste Disposal Sites **Subcategory:** 4.A.3 - Uncategorised Waste Disposal Sites **Sheet:** Methane Generated across SWDS Types ... Waste Types

2000

Data

Subdivision Subdivision 1 **SWDS Type** Uncategorised SWDS **Waste Category** Municipal Waste **Waste Type** Food waste **DOC** 0.15 **DOCf** 0.7

k 0.4 **Half-life time (h=ln(2)/k)** 1.7328679513 **exp1=exp(-k)** 0.670320046035 **Month of reaction start (M)** 13 **exp2=exp(-k*((13-M)/12))** 1 **CH4 Fraction** 0.5

	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
1997	558.94973	0.6	35.21383	35.21383	0	101.88854	32.79227	21.86151
1998	572.57842	0.6	36.07244	36.07244	0	104.37037	33.59061	22.39374
1999	586.08459	0.6	36.92333	36.92333	0	106.88488	34.40882	22.93921
2000	599.22196	0.6	37.75098	37.75098	0	109.39806	35.2378	23.49187
2001	612.04193	0.6	38.55864	38.55864	0	111.89035	36.06635	24.04423

④

Users have the ability to check methane generation based on **Waste Type –wise.**

- Food waste
- Garden and park
- Disposable nappies
- Paper and cardboard
- Textile
- Wood

The default IPCC values for DOC and DOCf utilized in **Tier 1 and Tier 2** assessments are derived from the **Waste Type**. These factors were selected under the **"Parameter sheets"** in the 4.A – Solid Waste Disposal

Waste Type Parameters

DOC DOCf

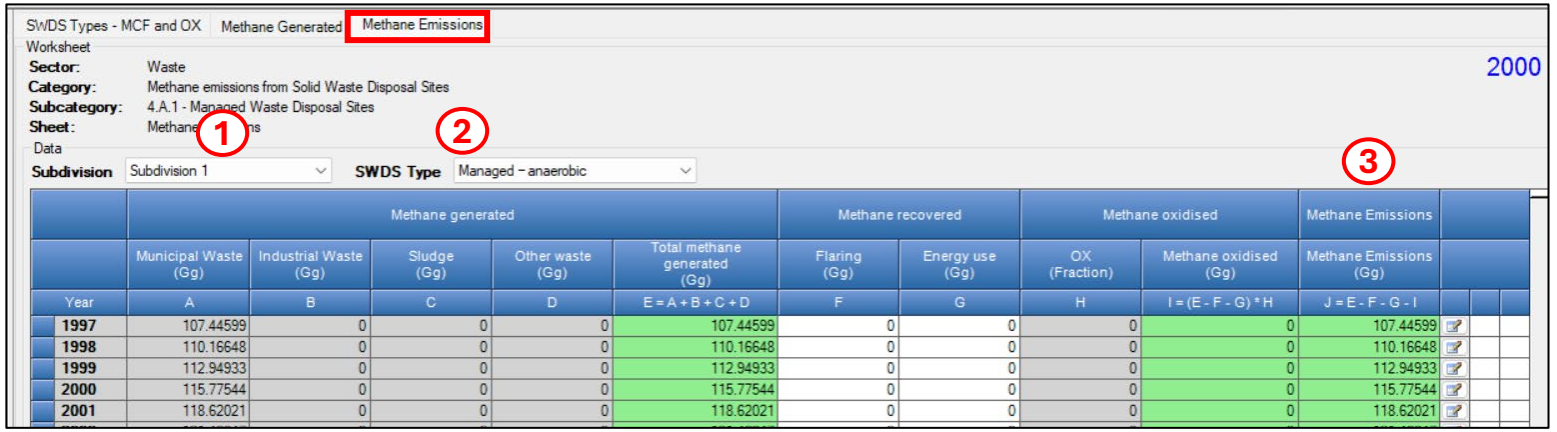
Waste Category	Waste Type / Industry Type				
	Class of decomposability	Type	Use in calculations	DOC (Fraction of wet weight)	DOCf (Fraction)
Industrial Waste	Bulk waste	Bulk Industrial Waste	☐		
	Highly decomposable waste	Food, beverages and tobacco	☐		
	Less decomposable waste	Construction and demolition	☐		
		Wood and wood products	☐		
	Moderately decomposable w...	Pulp and paper	☐		
		Textile	☐		
Municipal Waste	Bulk waste	Bulk Municipal Waste	☐		
	Highly decomposable waste	Food waste	☑	0.15	0.7
		Garden and park	☑	0.2	0.7
	Less decomposable waste	Wood	☑	0.43	0.5
	Moderately decomposable w...	Disposable nappies	☑	0.24	0.5
		Paper and cardboard	☑	0.4	0.5
		Textile	☑	0.24	0.5

k

The default IPCC values for Methane Generation Rate (k) utilized in **Tier 1 and Tier 2** assessments are derived from the **Climate Zone and Waste Type.** These factors were selected under the **"Parameter sheets"** in the 4.A – Solid Waste Disposal

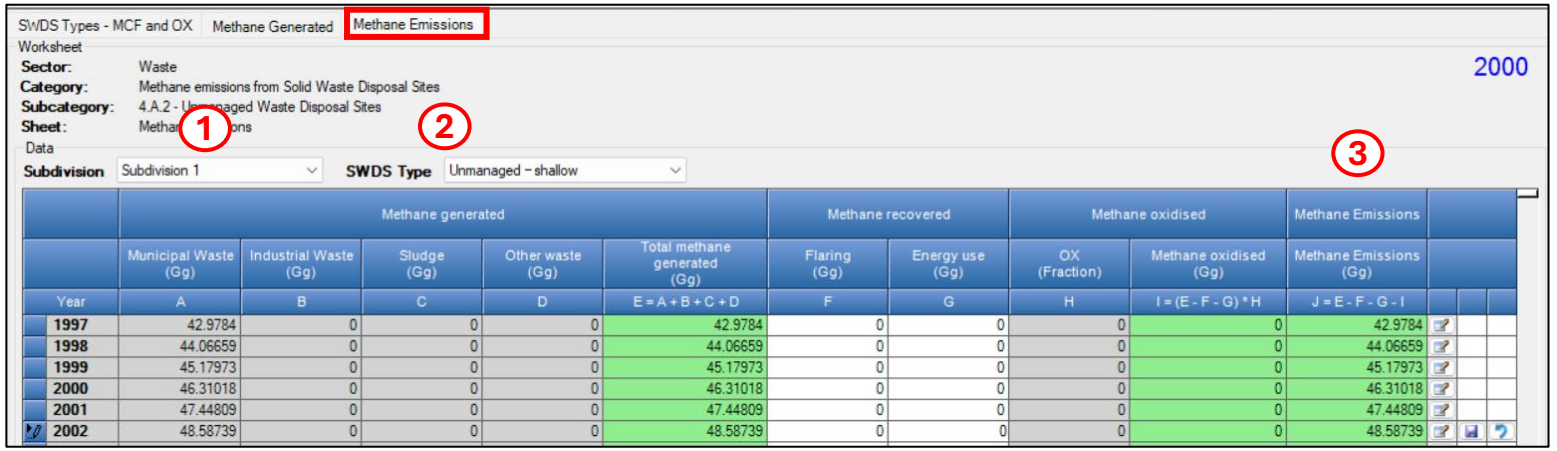
Step 6/ Results: Methane Emissions

4. A. 1 – Managed Waste Disposal Sites



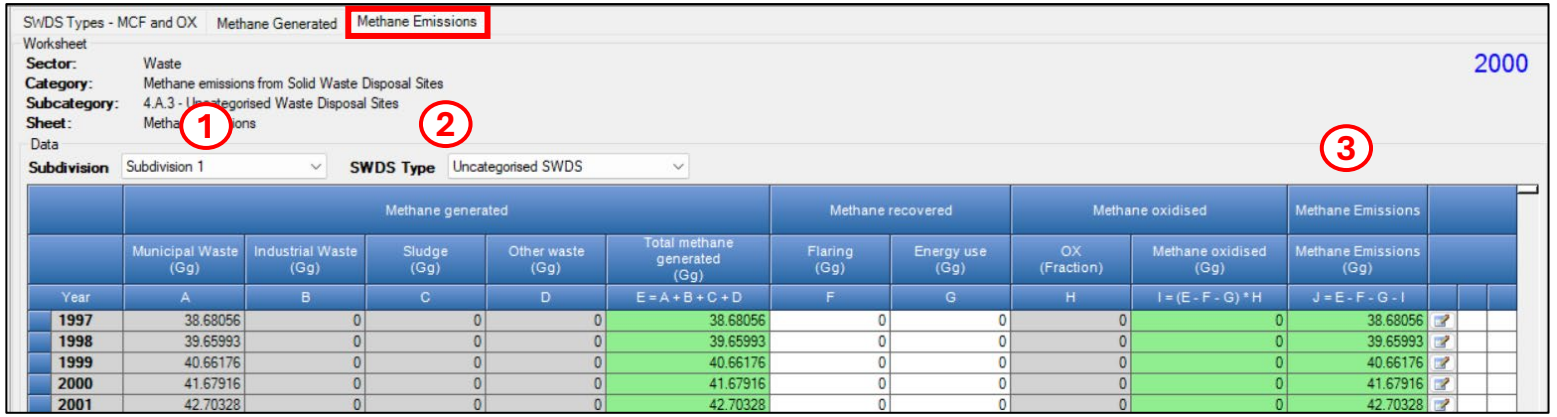
Year	Methane generated: Municipal Waste (Gg) A	Industrial Waste (Gg) B	Sludge (Gg) C	Other waste (Gg) D	Total methane generated (Gg) E=A+B+C+D	Methane recovered: Flaring (Gg) F	Energy use (Gg) G	Methane oxidised: OX (Fraction) H	Methane oxidised (Gg) I=(E-F-G)*H	Methane Emissions (Gg) J=E-F-G-I
1997	107.44599	0	0	0	107.44599	0	0	0	0	107.44599
1998	110.16648	0	0	0	110.16648	0	0	0	0	110.16648
1999	112.94933	0	0	0	112.94933	0	0	0	0	112.94933
2000	115.77544	0	0	0	115.77544	0	0	0	0	115.77544
2001	118.62021	0	0	0	118.62021	0	0	0	0	118.62021

4. A. 2 – Unmanaged Waste Disposal Sites



Year	Methane generated: Municipal Waste (Gg) A	Industrial Waste (Gg) B	Sludge (Gg) C	Other waste (Gg) D	Total methane generated (Gg) E=A+B+C+D	Methane recovered: Flaring (Gg) F	Energy use (Gg) G	Methane oxidised: OX (Fraction) H	Methane oxidised (Gg) I=(E-F-G)*H	Methane Emissions (Gg) J=E-F-G-I
1997	42.9784	0	0	0	42.9784	0	0	0	0	42.9784
1998	44.06659	0	0	0	44.06659	0	0	0	0	44.06659
1999	45.17973	0	0	0	45.17973	0	0	0	0	45.17973
2000	46.31018	0	0	0	46.31018	0	0	0	0	46.31018
2001	47.44809	0	0	0	47.44809	0	0	0	0	47.44809
2002	48.58739	0	0	0	48.58739	0	0	0	0	48.58739

4. A. 3 – Uncategorised Waste Disposal Sites



Year	Methane generated: Municipal Waste (Gg) A	Industrial Waste (Gg) B	Sludge (Gg) C	Other waste (Gg) D	Total methane generated (Gg) E=A+B+C+D	Methane recovered: Flaring (Gg) F	Energy use (Gg) G	Methane oxidised: OX (Fraction) H	Methane oxidised (Gg) I=(E-F-G)*H	Methane Emissions (Gg) J=E-F-G-I
1997	38.68056	0	0	0	38.68056	0	0	0	0	38.68056
1998	39.65993	0	0	0	39.65993	0	0	0	0	39.65993
1999	40.66176	0	0	0	40.66176	0	0	0	0	40.66176
2000	41.67916	0	0	0	41.67916	0	0	0	0	41.67916
2001	42.70328	0	0	0	42.70328	0	0	0	0	42.70328

1. Similar to the previous sections, users have the ability to check methane emissions based on **subdivision-wise.**

2. Users have the ability to check methane emissions based on **SWDS Type –wise.**

4. A. 1 – Managed Waste Disposal Sites

Managed – anaerobic
Managed well – semi-aerobic
Managed poorly – semi-aerobic
Managed well – active-aeration
Managed poorly – active-aeration

4. A. 2 – Unmanaged Waste Disposal Sites

Unmanaged – deep
Unmanaged – shallow

4. A. 3 – Uncategorised Waste Disposal Sites

Uncategorised SWDS

3. **Methane Emissions**

By- products of FOD model

Information items in the Waste sector

Long Term Stored C in SWDS

A portion of carbon remains stored for extended periods in SWDS, particularly from **slow-decaying materials like wood and paper, resulting in long-term storage within the sites**. The quantity of carbon held in SWDS can be approximated using the FOD model, with the long-term stored carbon being documented as an **information item within the Waste sector**.

Similar to the previous sections, users have the ability to check data based on subdivision-wise and waste category-wise, including Municipal Waste, Industrial Waste, Sludge, and Other Waste.

Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A - Solid Waste Disposal
Sheet: Long-term stored C in SWDS

2000

Data

Subdivision Subdivision 1 **Waste Category** Municipal Waste

Year	Food waste (Gg / Year)	Garden and park (Gg / Year)	Disposable nappies (Gg / Year)	Paper and cardboard (Gg / Year)	Textile (Gg / Year)	Wood (Gg / Year)	Long-term stored C (Gg / Year)	Long-term stored C accumulated (Gg)
1984	86.99842	0	0	114.66459	14.39974	94.59829	310.66104	7311.3098
1985	89.10807	0	0	117.44512	14.74892	96.89223	318.19435	7629.50415
1986	91.21688	0	0	120.22455	15.09797	99.18525	325.72464	7955.22879
1987	93.33895	0	0	123.02145	15.44921	101.4927	333.3023	8288.53109
1988	95.51857	0	0	125.89421	15.80997	103.86272	341.08547	8629.61655
1989	97.74807	0	0	128.8327	16.17899	106.28698	349.04673	8978.66328
1990	100.07533	0	0	131.90005	16.56419	108.81754	357.35712	9336.0204
1991	102.48272	0	0	135.07302	16.96266	111.43524	365.95364	9701.97404
1992	104.9274	0	0	138.29511	17.36729	114.09347	374.68327	10076.6573
1993	107.43061	0	0	141.59436	17.78162	116.81535	383.62194	10460.27924
1994	109.97799	0	0	144.95183	18.20325	119.58526	392.71834	10852.99758
1995	112.57939	0	0	148.3805	18.63383	122.41391	402.00764	11255.00522
1996	115.33412	0	0	152.01125	19.08978	125.40928	411.84443	11666.84965
1997	118.21787	0	0	155.81206	19.5671	128.54495	422.14196	12088.99161
1998	121.10034	0	0	159.61117	20.04419	131.67922	432.43491	12521.42653
1999	123.95689	0	0	163.37613	20.517	134.78531	442.63533	12964.06186
2000	126.73544	0	0	167.03829	20.9769	137.80659	452.55722	13416.61908

Harvested Wood Products

The accumulation of carbon in long-term storage, particularly in paper, cardboard, wood, garden, and park waste, is noteworthy due to its implications for **harvested wood products (HWP).** Changes in carbon stock originating from HWP, including those disposed of in SWDS within the reporting country, are **examined in Chapter 12 of the AFOLU Volume.**

Similar to the previous sections, users have the ability to check data based on subdivision-wise

Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A - Solid Waste Disposal
Sheet: Harvested Wood Products

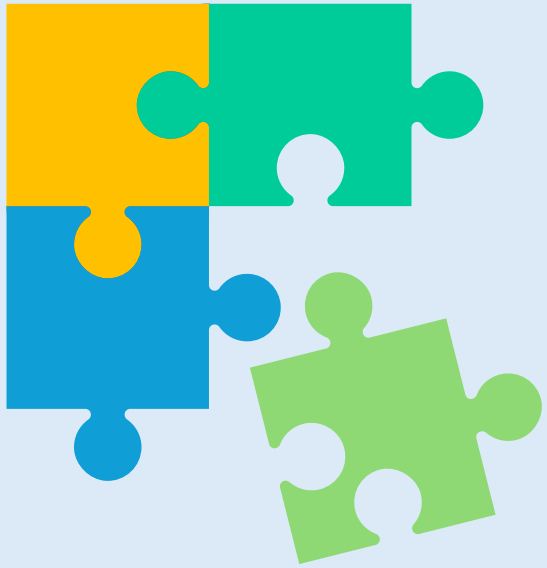
2000

Data

Subdivision Subdivision 1

	Long-term stored C			Long-term stored C accumulated			CH4 generated			CH4 emitted		
Year	Garden C (Gg / Year)	Paper C (Gg / Year)	Wood C (Gg / Year)	Garden C (Gg)	Paper C (Gg)	Wood C (Gg)	Garden (Gg)	Paper (Gg)	Wood (Gg)	Garden (Gg)	Paper (Gg)	Wood (Gg)
1984	0	114.66459	94.59829	0	2698.59503	2226.3409	0	53.18707	31.46328	0	53.18707	31.46328
1985	0	117.44512	96.89223	0	2816.04016	2323.23313	0	54.75932	32.55023	0	54.75932	32.55023
1986	0	120.22455	99.18525	0	2936.2647	2422.41838	0	56.35059	33.65239	0	56.35059	33.65239
1987	0	123.02145	101.4927	0	3059.28615	2523.91108	0	57.95956	34.76922	0	57.95956	34.76922
1988	0	125.89421	103.86272	0	3185.18036	2627.7738	0	59.58581	35.90055	0	59.58581	35.90055
1989	0	128.8327	106.28698	0	3314.01306	2734.06077	0	61.23159	37.04731	0	61.23159	37.04731
1990	0	131.90005	108.81754	0	3445.91311	2842.87832	0	62.89855	38.21021	0	62.89855	38.21021
1991	0	135.07302	111.43524	0	3580.98612	2954.31355	0	64.59106	39.39114	0	64.59106	39.39114
1992	0	138.29511	114.09347	0	3719.28124	3068.40702	0	66.31215	40.59148	0	66.31215	40.59148
1993	0	141.59436	116.81535	0	3860.8756	3185.22237	0	68.06211	41.81148	0	68.06211	41.81148
1994	0	144.95183	119.58526	0	4005.82743	3304.80763	0	69.84246	43.05194	0	69.84246	43.05194
1995	0	148.3805	122.41391	0	4154.20794	3427.22155	0	71.65377	44.31324	0	71.65377	44.31324
1996	0	152.01125	125.40928	0	4306.21918	3552.63083	0	73.49716	45.59602	0	73.49716	45.59602
1997	0	155.81206	128.54495	0	4462.03124	3681.17577	0	75.37956	46.90337	0	75.37956	46.90337
1998	0	159.61117	131.67922	0	4621.64241	3812.85499	0	77.30601	48.23765	0	77.30601	48.23765
1999	0	163.37613	134.78531	0	4785.01854	3947.6403	0	79.27345	49.5979	0	79.27345	49.5979
2000	0	167.03829	137.80659	0	4952.05683	4085.44688	0	81.27756	50.98259	0	81.27756	50.98259

Let’s do an exercise with the IPCC Inventory Software!



Solid Waste Disposal

Exercise for Solid Waste Disposal

Activity 01

Step 01: Open the worksheets for 4.A – Solid Waste Disposal

Step 02: In the first worksheet, Parameters, enter the following data accordingly

Input parameter	Entry	Note
Region	Asia- Eastern	If this is not suggested in the drop-down menu, please check whether you have entered your country correctly
Subdivision	Subdivision 2	
Climate zone	Tropical wet	
Starting year	1950	
Delay time	6 months	
Fraction of methane (F) in developed gas	0.500	
Conversion factor, C to CH_4	1.333333	

Activity 02

Step 01: Click the option waste type parameters for selected subdivision in the above same sheet 'parameters'

Note: In here we hope to calculations for Municipal waste. Therefore, entering parameters (default/ specific) for municipal waste is sufficient.

Step 02: Select (put a tick on the option 'use in calculations') the following types in following classes of decomposability

Class of decomposability	Type
Bulk waste	Bulk municipal waste
Moderately degrading waste	Disposable nappies
	Garden and park
Rapidly degrading waste	Food waste
Slowly degrading waste	Paper and cardboard
	Textile
	Wood

Step 03: Enter following parameters in previously selected types accordingly

Class of decomposability	Type	DOC	DOCf	Methane generation rate constant (k)	Note
Bulk waste	Bulk municipal waste	0.18	0.5	0.17	Default
Moderately degrading waste	Disposable nappies	0.24	0.5	0.17	Default
	Garden and park	0.2	0.5	0.17	Default
Rapidly degrading waste	Food waste	0.15	0.5	0.4	Default
Slowly degrading waste	Paper and cardboard	0.4	0.5	0.07	Default
	Textile	0.24	0.5	0.07	Default
	Wood	0.43	0.5	0.035	Default

Activity 03

Step 01: Enter parameters for Harvested Wood Products (HWP) as follow

Input parameter	Entry
% garden in municipal waste	85.00%
% paper in municipal waste	10.00%
% wood in municipal waste	5.00%
% paper in industrial waste	75.00%
% wood in industrial waste	25.00%

Step 02: Enter Uncertainties as below

Entry parameter		Entry
Activity data uncertainties	Upper	+0.00%
	Lower	-0.00%
Emission factors uncertainties	Upper	+0.00%
	Lower	-0.00%

Step 03: Save entered data

Activity 04

Step 01: Open the worksheet SWDS types – utilization

Step 02: Select the subdivision as subdivision 2 and waste category as municipal waste

Step 03: Enter following parameters accordingly in the selected inventory year (or current inventory year) by you

Input parameter	Entry	Note
Unmanaged – shallow (%)	25	Default
Unmanaged – deep (%)	30	Default
Managed – anaerobic (%)	25	Default
Managed poorly – semi-aerobic (%)		
Managed well – semi-aerobic (%)	5	Default
Managed poorly – active aeration (%)		
Managed well – active aeration (%)		
Uncategorized SWDS (%)	15	Default

Step 04: Save entered data

Note: You must enter data for parameters from starting year (in here, 1950) to current inventory year

Step 05: Open the worksheet activity data and select following entries as below

Entry	Selection
Subdivision	Subdivision 2
Waste category	Municipal waste
Total waste	Calculated from population
Waste type amounts	% of total waste going to SWDS

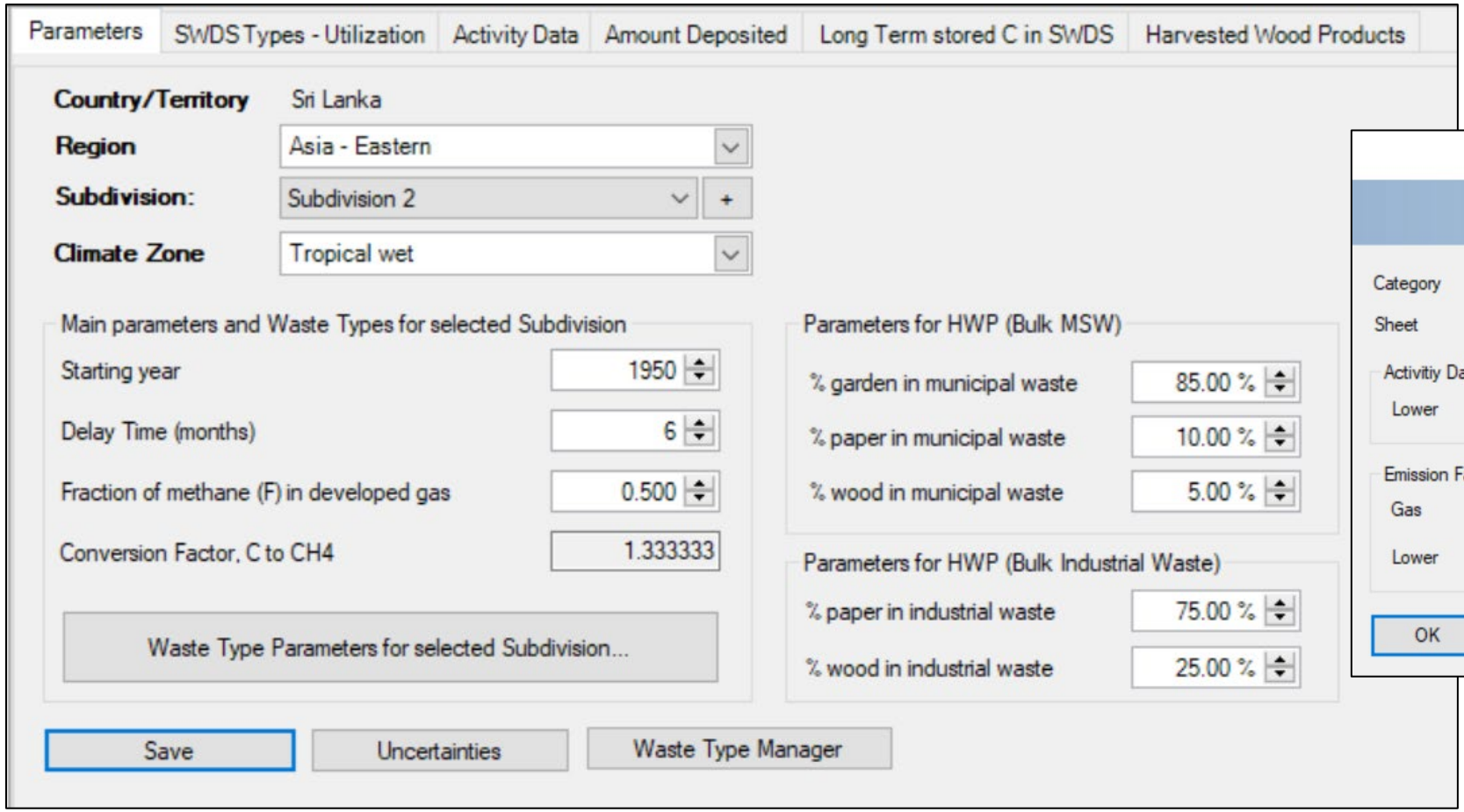
Step 06: Enter following data accordingly

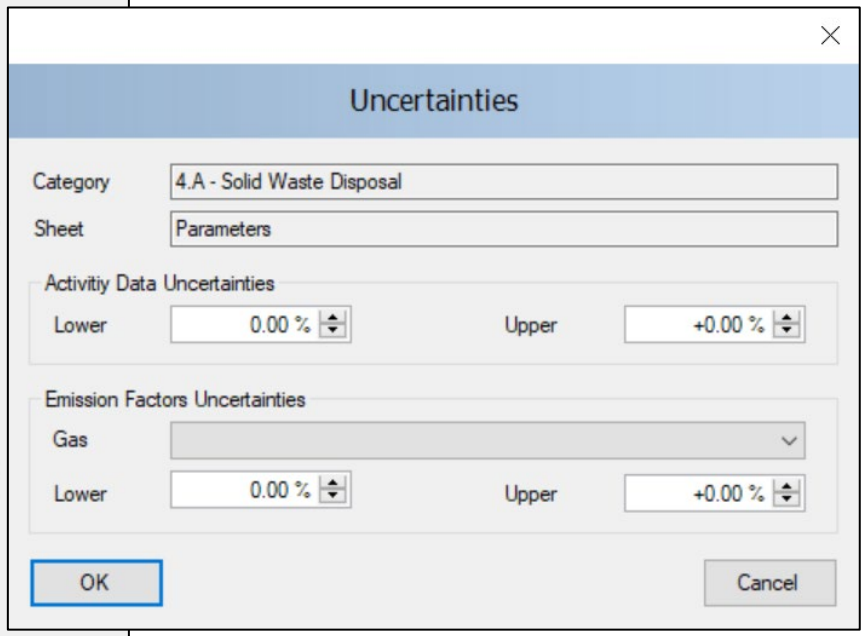
Input parameter	Entry	Input parameter	Entry
Population (capita)	115000000	Garden and park	1%
Waste per capita	160 kg/cap/yr	Paper and cardboard	18.8%
% SWDS	75%	Textile	2.5%
Food waste	25.2%	wood	3.5%
Disposable nappies	1%	Bulk municipal waste	5%
Inert	43%		
Above these data are only assumptions for this activity only			

step 07: Save entered data

RESULTS

Activity 01 and 03





Activity 02

Waste Type Parameters

Waste Category	Waste Type / Industry Type			Degradable organic carbon	Degradable organic carbon which decomposes in SWDS	Methane generation rate constant (k)
	Class of decomposability	Type	Use in calculations	DOC (Fraction of wet weight)	DOCf (Fraction)	k
Industrial Waste	Bulk waste	Bulk Industrial Waste	☑	0.15	0.5	0.17
	Rapidly degrading waste	Food, beverages and tobacco	☑	0.15	0.5	
	Slowly degrading waste	Construction and demolition	☑	0.04	0.5	
		Pulp and paper	☑	0.4	0.5	
		Textile	☑	0.24	0.5	
		Wood and wood products	☑	0.43	0.5	
Municipal Waste	Bulk waste	Bulk Municipal Waste	☑	0.18	0.5	0.17
	Moderately degrading waste	Disposable nappies	☑	0.24	0.5	0.17
		Garden and park	☑	0.2	0.5	0.17
	Rapidly degrading waste	Food waste	☑	0.15	0.5	0.4
	Slowly degrading waste	Paper and cardboard	☑	0.4	0.5	0.07
		Textile	☑	0.24	0.5	0.07
		Wood	☑	0.43	0.5	0.035
Other waste	Bulk waste	Clinical waste	☑	0.15	0.5	
		Hazardous waste	☑		0.5	
Sludge	Rapidly degrading waste	Industrial sewage sludge	☑	0.09	0.5	
		Municipal sewage sludge	☑	0.05	0.5	0.4

Activity 04

SWDS types – Utilization

Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste

Category: Methane emissions from Solid Waste Disposal Sites

Subcategory: 4.A - Solid Waste Disposal

Sheet: SWDS Types - Utilization

2020

Data

Subdivision Subdivision 2 **Waste Category** Municipal Waste

	Unmanaged		Managed					Uncategorised	Distribution Check			
Year	Unmanaged – shallow (%)	Unmanaged – deep (%)	Managed – anaerobic (%)	Managed poorly – semi -aerobic (%)	Managed well – semi-aerobic (%)	Managed poorly – active aeration	Managed well – active aeration (%)	Uncategorised SWDS (%)	Total (%)			
2006									0			
2007									0			
2008									0			
2009									0			
2010									0			
2011									0			
2012									0			
2013									0			
2014									0			
2015									0			
2016									0			
2017									0			
2018									0			
2019									0			
2020	25	30	25		5			15	100			
2021									0			
2022									0			
2023									0			

Activity data

Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A - Solid Waste Disposal
Sheet: Activity Data

2020

Data

Subdivision Subdivision 2 **Waste Category** Municipal Waste **Total Waste** Calculated from Population **Waste Type Amounts** % of Total Waste going to SWDS

						Composition of waste going to solid waste disposal sites.								
Year	Population (Capita)	Waste per capita (kg/cap/yr)	Total Waste (Gg)	% to SWDS (%)	Total to SWDS (Gg)	Food waste	Disposable nappies	Garden and park	Paper and cardboard	Textile	Wood	Bulk Municipal Waste	Inert	Total
	A	B	C = A * B * 10^-6	D	E = C * (D/100)	% of E	% of E	% of E	% of E	% of E	% of E	% of E	% of E	%
2009														0
2010														0
2011														0
2012														0
2013														0
2014														0
2015														0
2016														0
2017														0
2018														0
2019														0
2020	115000000	160	18400	75	13800	26.2			18.8	3.5	3.5		48	100
2021														0
2022														0
2023														0

Amount deposited

Parameters | SWDS Types - Utilization | Activity Data | Amount Deposited | Long Term stored C in SWDS | Harvested Wood Products

Worksheet

Sector: Waste

Category: Methane emissions from Solid Waste Disposal Sites

Subcategory: 4.A - Solid Waste Disposal

Sheet: Waste Types and Amounts Deposited to SWDS

2020

Data

Subdivision Subdivision 2 **Waste Category** Municipal Waste

Year	Food waste (Gg)	Disposable nappies (Gg)	Garden and park (Gg)	Paper and cardboard (Gg)	Textile (Gg)	Wood (Gg)	Bulk Municipal Waste (Gg)	Inert (Gg)	Total to SWDS (Gg)
2008								0	0
2009								0	0
2010								0	0
2011								0	0
2012								0	0
2013								0	0
2014								0	0
2015								0	0
2016								0	0
2017								0	0
2018								0	0
2019								0	0
2020	3615.6	0	0	2594.4	483	483	0	6624	13800
2021								0	0
2022								0	0
2023								0	0

Exercise for Managed Waste Disposal Sites

Activity 01

Step 01: Open the worksheets for 4.A.1 – Managed Waste Disposal Sites

Step 02: In the first worksheet, SWDS Types- MCF and OX, enter the following data accordingly

Input parameter	Entry	Note
Managed Anaerobic – MCF	1	Default value
Managed Anaerobic – OX	0.1	Default value
Managed poorly semi aerobic - MCF	0.7	Default value
Managed poorly semi aerobic - OX	0.1	Default value
Managed well semi aerobic - MCF	0.5	Default value
Managed well semi aerobic - OX	0.1	Default value
Managed poorly active aeration- MCF	0.7	Default value
Managed poorly active aeration- OX	0.1	Default value
Managed well active aeration- MCF	0.4	Default value
Managed well active aeration- OX	0.1	Default value

Exercise for Managed Waste Disposal Sites

Activity 02

Step 01: Open the worksheets for 4.A.1 – Managed Waste Disposal Sites

Step 02: In the third worksheet, methane emissions enter the following data accordingly

Input parameter	Entry	Note
Flaring (Gg)	0.0001	
Energy Use (Gg)	0.0005	

Exercise for Unmanaged Waste Disposal Sites

Activity 01

Step 01: Open the worksheets for 4.A.2 – Unmanaged Waste Disposal Sites

Step 02: In the first worksheet, SWDS Types- MCF and OX, enter the following data accordingly

Input parameter	Entry	Note
MCF (Fraction) – Unmanaged shallow	0.4	
OX (Fraction) – Unmanaged shallow	0	Default value
MCF (Fraction) – Unmanaged deep	0.8	
OX (Fraction) – Unmanaged deep	0	Default value

Exercise for Unmanaged Waste Disposal Sites

Activity 02

Step 01: Open the worksheets for 4.A.2 – Uncategorized Waste Disposal Sites

Step 02: In the third worksheet, methane emissions enter the following data accordingly

Input parameter	Entry	Note
Flaring (Gg)	0	
Energy Use (Gg)	0.001	

Exercise for Uncategorized Waste Disposal Sites

Activity 01

Step 01: Open the worksheets for 4.A.3 – Uncategorized Waste Disposal Sites

Step 02: In the first worksheet, SWDS Types- MCF and OX, enter the following data accordingly

Input parameter	Entry	Note
MCF (Fraction)	0.6	Default value
OX (Fraction)	0	Default value

Exercise for Uncategorized Waste Disposal Sites

Activity 02

Step 01: Open the worksheets for 4.A.3 – Uncategorized Waste Disposal Sites

Step 02: In the third worksheet, methane emissions enter the following data accordingly

Input parameter	Entry	Note
Flaring (Gg)	0	
Energy Use (Gg)	0.005	

4.A.1 – Managed Waste Disposal Sites
SWDS types – MCF and OX

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.1 - Managed Waste Disposal Sites
Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors

2020

Data

Subdivision Subdivision 2

	SWDS									
	Managed – anaerobic		Managed poorly – semi-aerobic		Managed well – semi-aerobic		Managed poorly – active aeration		Managed well – active aeration	
Year	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015										
2016										
2017										
2018										
2019										
2020	1	0.1	0.7	0.1	0.5	0.1	0.7	0.1	0.4	0.1
2021										
2022										
2023										

Methane Generated

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste

Category: Methane emissions from Solid Waste Disposal Sites

Subcategory: 4.A.1 - Managed Waste Disposal Sites

Sheet: Methane Generated across SWDS Types and Waste Types

2020

Data

Subdivision Subdivision 2 | **SWDS Type** Managed – anaerobic | **Waste Category** Municipal Waste | **Waste Type** Food waste | **DOC** 0.15 | **DOCf** 0.5

k 0.4 | **Half-life time (h=ln(2)/k)** 1.73286795139 | **exp1=exp(-k)** 0.670320046035 | **Month of reaction start (M)** 13 | **exp2=exp(-k*((13-M)/12))** 1 | **CH4 Fraction** 0.5

	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0
2020	869.4	1	65.205	65.205	0	65.205	0	0
2021	0	0	0	0	0	43.70822	21.49678	14.33119
2022	0	0	0	0	0	29.2985	14.40972	9.60648
2023	0	0	0	0	0	19.63937	9.65913	6.43942

Methane Emissions

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.1 - Managed Waste Disposal Sites
Sheet: Methane Emissions

2020

Data

Subdivision Subdivision 2 **SWDS Type** Managed – anaerobic

	Methane generated					Methane recovered		Methane oxidised		Methane Emissions
	Municipal Waste (Gg)	Industrial Waste (Gg)	Sludge (Gg)	Other waste (Gg)	Total methane generated (Gg)	Flaring (Gg)	Energy use (Gg)	OX (Fraction)	Methane oxidised (Gg)	Methane Emissions (Gg)
Year	A	B	C	D	E = A + B + C + D	F	G	H	I = (E - F - G) * H	J = E - F - G - I
2007	0	0	0	0	0			0	0	0
2008	0	0	0	0	0			0	0	0
2009	0	0	0	0	0			0	0	0
2010	0	0	0	0	0			0	0	0
2011	0	0	0	0	0			0	0	0
2012	0	0	0	0	0			0	0	0
2013	0	0	0	0	0			0	0	0
2014	0	0	0	0	0			0	0	0
2015	0	0	0	0	0			0	0	0
2016	0	0	0	0	0			0	0	0
2017	0	0	0	0	0			0	0	0
2018	0	0	0	0	0			0	0	0
2019	0	0	0	0	0			0	0	0
2020	0	0	0	0	0			0.1	0	0
2021	23.64866	0	0	0	23.64866	0.0001	0.0005	0	0	23.64806
2022	18.10005	0	0	0	18.10005			0	0	18.10005
2023	14.19752	0	0	0	14.19752			0	0	14.19752

4.A.2 – Unmanaged Waste Disposal Sites

SWDS types – MCF and OX

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.2 - Unmanaged Waste Disposal Sites
Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors

2020

Data

Subdivision Subdivision 2

	SWDS						
	Unmanaged – shallow		Unmanaged – deep				
Year	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)			
2008							
2009							
2010							
2011							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							
2020	0.4	0	0.8	0			
2021							
2022							
2023							

Methane Generated

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste

Category: Methane emissions from Solid Waste Disposal Sites

Subcategory: 4.A.2 - Unmanaged Waste Disposal Sites

Sheet: Methane Generated across SWDS Types and Waste Types

2020

Data

Subdivision Subdivision 2 | **SWDS Type** Unmanaged – shallow | **Waste Category** Municipal Waste | **Waste Type** Food waste | **DOC** 0.15 | **DOCf** 0.5

k 0.4 | **Half-life time (h=ln(2)/k)** 1.7328679513 | **exp1=exp(-k)** 0.670320046035 | **Month of reaction start (M)** 13 | **exp2=exp(-k*((13-M)/12))** 1 | **CH4 Fraction** 0.5

	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0
2020	869.4	0.4	26.082	26.082	0	26.082	0	0
2021	0	0	0	0	0	17.48329	8.59871	5.73248
2022	0	0	0	0	0	11.7194	5.76389	3.84259
2023	0	0	0	0	0	7.85575	3.86365	2.57577

Methane Emissions

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.2 - Unmanaged Waste Disposal Sites
Sheet: Methane Emissions

2020

Data

Subdivision Subdivision 2 **SWDS Type** Unmanaged - shallow

	Methane generated					Methane recovered		Methane oxidised		Methane Emissions
	Municipal Waste (Gg)	Industrial Waste (Gg)	Sludge (Gg)	Other waste (Gg)	Total methane generated (Gg)	Flaring (Gg)	Energy use (Gg)	OX (Fraction)	Methane oxidised (Gg)	Methane Emissions (Gg)
Year	A	B	C	D	E = A + B + C + D	F	G	H	I = (E - F - G) * H	J = E - F - G - I
2007	0	0	0	0	0			0	0	0
2008	0	0	0	0	0			0	0	0
2009	0	0	0	0	0			0	0	0
2010	0	0	0	0	0			0	0	0
2011	0	0	0	0	0			0	0	0
2012	0	0	0	0	0			0	0	0
2013	0	0	0	0	0			0	0	0
2014	0	0	0	0	0			0	0	0
2015	0	0	0	0	0			0	0	0
2016	0	0	0	0	0			0	0	0
2017	0	0	0	0	0			0	0	0
2018	0	0	0	0	0			0	0	0
2019	0	0	0	0	0			0	0	0
2020	0	0	0	0	0			0	0	0
2021	9.45946	0	0	0	9.45946	0	0.001	0	0	9.45846
2022	7.24002	0	0	0	7.24002			0	0	7.24002
2023	5.67901	0	0	0	5.67901			0	0	5.67901

4.A.3 – Uncategorized Waste Disposal Sites

SWDS types – MCF and OX

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.3 - Uncategorised Waste Disposal Sites
Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors

2020

Data

Subdivision Subdivision 2

Year	SWDS – Uncategorised SWDS – MCF (Fraction)	SWDS – Uncategorised SWDS – OX (Fraction)
2006		
2007		
2008		
2009		
2010		
2011		
2012		
2013		
2014		
2015		
2016		
2017		
2018		
2019		
2020	0.6	0
2021		
2022		
2023		

Methane Generated

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste
Category: Methane emissions from Solid Waste Disposal Sites
Subcategory: 4.A.3 - Uncategorised Waste Disposal Sites
Sheet: Methane Generated across SWDS Types and Waste Types

2020

Data

Subdivision Subdivision 2 | **SWDS Type** Uncategorised SWDS | **Waste Category** Municipal Waste | **Waste Type** Food waste | **DOC** 0.15 | **DOCf** 0.5

k 0.4 | **Half-life time (h=ln(2)/k)** 1.7328679513 | **exp1=exp(-k)** 0.6703200460 | **Month of reaction start (M)** 13 | **exp2=exp(-k*((13-M)/12))** 1 | **CH4 Fraction** 0.5

	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
Year	W	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	C = D * (1-exp2)	H = B + (H(y-1) * exp1)	E = C + H(y-1) * (1-exp1)	Q = E * 16/12 * F
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0
2020	521.64	0.6	23.4738	23.4738	0	23.4738	0	0
2021	0	0	0	0	0	15.73496	7.73884	5.15923
2022	0	0	0	0	0	10.54746	5.1875	3.45833
2023	0	0	0	0	0	7.07017	3.47729	2.31819

Methane Emissions

SWDS Types - MCF and OX | Methane Generated | Methane Emissions

Worksheet

Sector: Waste

Category: Methane emissions from Solid Waste Disposal Sites

Subcategory: 4.A.3 - Uncategorised Waste Disposal Sites

Sheet: Methane Emissions

2020

Data

Subdivision Subdivision 2 **SWDS Type** Uncategorised SWDS

	Methane generated					Methane recovered		Methane oxidised		Methane Emissions			
	Municipal Waste (Gg)	Industrial Waste (Gg)	Sludge (Gg)	Other waste (Gg)	Total methane generated (Gg)	Flaring (Gg)	Energy use (Gg)	OX (Fraction)	Methane oxidised (Gg)	Methane Emissions (Gg)			
Year	A	B	C	D	E = A + B + C + D	F	G	H	I = (E - F - G) * H	J = E - F - G - I			
2007	0	0	0	0	0			0	0	0			
2008	0	0	0	0	0			0	0	0			
2009	0	0	0	0	0			0	0	0			
2010	0	0	0	0	0			0	0	0			
2011	0	0	0	0	0			0	0	0			
2012	0	0	0	0	0			0	0	0			
2013	0	0	0	0	0			0	0	0			
2014	0	0	0	0	0			0	0	0			
2015	0	0	0	0	0			0	0	0			
2016	0	0	0	0	0			0	0	0			
2017	0	0	0	0	0			0	0	0			
2018	0	0	0	0	0			0	0	0			
2019	0	0	0	0	0			0	0	0			
2020	0	0	0	0	0			0	0	0			
2021	8.51352	0	0	0	8.51352	0	0.005	0	0	8.50852			
2022	6.51602	0	0	0	6.51602			0	0	6.51602			
2023	5.11111	0	0	0	5.11111			0	0	5.11111			

4. B – Biological Treatment of Solid Waste

4.B – Biological treatment of solid waste

4.B – Biological treatment of solid waste

Example for Biological treatment of solid wastes

Step 01: 4.B – Biological treatment of solid waste

Step 02: Select the gas as Methane and enter following data accordingly. Finally, save the entered data.

Input parameter		Entry	Note
Subdivision		Philippines	
Biological treatment system		Composing	
Waste category		Municipal Waste	
Type of waste		Food waste	
Total annual amount treated by biological treatment facilities		10.5 Gg	
Emission factor		IPPC default, 4 g CH_4/ kg	
Methane recovered	Flaring	0 Gg	
	Energy use	0 Gg	
**the activity data used in this activity are not real. Just examples only for this activity.*			

Input parameter		Entry	Note
Subdivision		Philippines	
Biological treatment system		Anaerobic digestion at biogas facilities	
Waste category		Municipal Waste	
Type of waste		Food waste	
Total annual amount treated by biological treatment facilities		10.5 Gg	
Emission factor		IPPC default, 0.8 g CH_4/ kg	
Methane recovered	Flaring	0 Gg	
	Energy use	0 Gg	
**the activity data used in this activity are not real. Just examples only for this activity.*			

For N_2O emission, enter the emission factor as 1 g N_2O/ kg for anaerobic digestion at biogas facilities and for composting, enter it as 0.6 g N_2O/ kg.

CH_4 EMISSIONS FROM BIOLOGICAL TREATMENT

$$CH_4\ Emissions = \sum_i (M_i \bullet EF_i) \bullet 10^{-3} - R$$

Where,

CH_4 Emissions = total CH_4 emissions in inventory year, Gg

Mi = mass of organic waste treated by biological treatment type i, Gg

EF = emission factor for treatment i, g CH4/kg waste treated

i = composting or anaerobic digestion

R = total amount of CH_4 recovered in inventory year, Gg CH_4

CH_4 EMISSIONS FROM BIOLOGICAL TREATMENT – TIER 01

Tier 1 uses the IPCC default emission factors.

A: Composting

Parameter	Value	Source
Mass of organic waste treated by biological treatment type i, Gg	10.5	DENR_News_Alerts_10_January_2021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	4	2006 IPCC guidelines
Total amount of CH_4 recovered in inventory year, Gg CH_4	0	Assumed value

CH_4 EMISSIONS FROM BIOLOGICAL TREATMENT – TIER 01

B: Anaerobic digestion at biogas facilities

Parameter	Value	Source
Mass of organic waste treated by biological treatment type i, Gg	10.5	DENR_News_Alerts_10_January_2021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	0.8	2006 IPCC guidelines
Total amount of CH_4 recovered in inventory year, Gg CH_4	0	Assumed value

CH_4 EMISSIONS FROM BIOLOGICAL TREATMENT-TIER 01

$$CH_4\ Emissions = \sum_i \left(M_i \bullet EF_i\right) \bullet 10^{-3} - R$$

CH_4 Emissions = Σ (10.5 Gg * 4 g CH4/kg + 10.5 Gg * 0.8 g CH4/kg) * 10^{-3}

= 0.0504 Gg

N_2O EMISSIONS FROM BIOLOGICAL TREATMENT

$$N_2O\ Emissions = \sum_i \left(M_i \bullet EF_i\right) \bullet 10^{-3}$$

Where,

N_2O Emissions = total N_2O emissions in inventory year, Gg

Mi = mass of organic waste treated by biological treatment type i, Gg

EF = emission factor for treatment i, g N_2O /kg waste treated

i = composting or anaerobic digestion

N_2O EMISSIONS FROM BIOLOGICAL TREATMENT– TIER 01

Tier 1 uses the IPCC default emission factors.

A: Composting

Parameter	Value	Source
Mass of organic waste treated by biological treatment type i, Gg	10.5	DENR_News_Alerts_10_January_2021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	0.6	2006 IPCC guidelines

N_2O EMISSIONS FROM BIOLOGICAL TREATMENT– TIER 01

B: Anaerobic digestion at biogas facilities

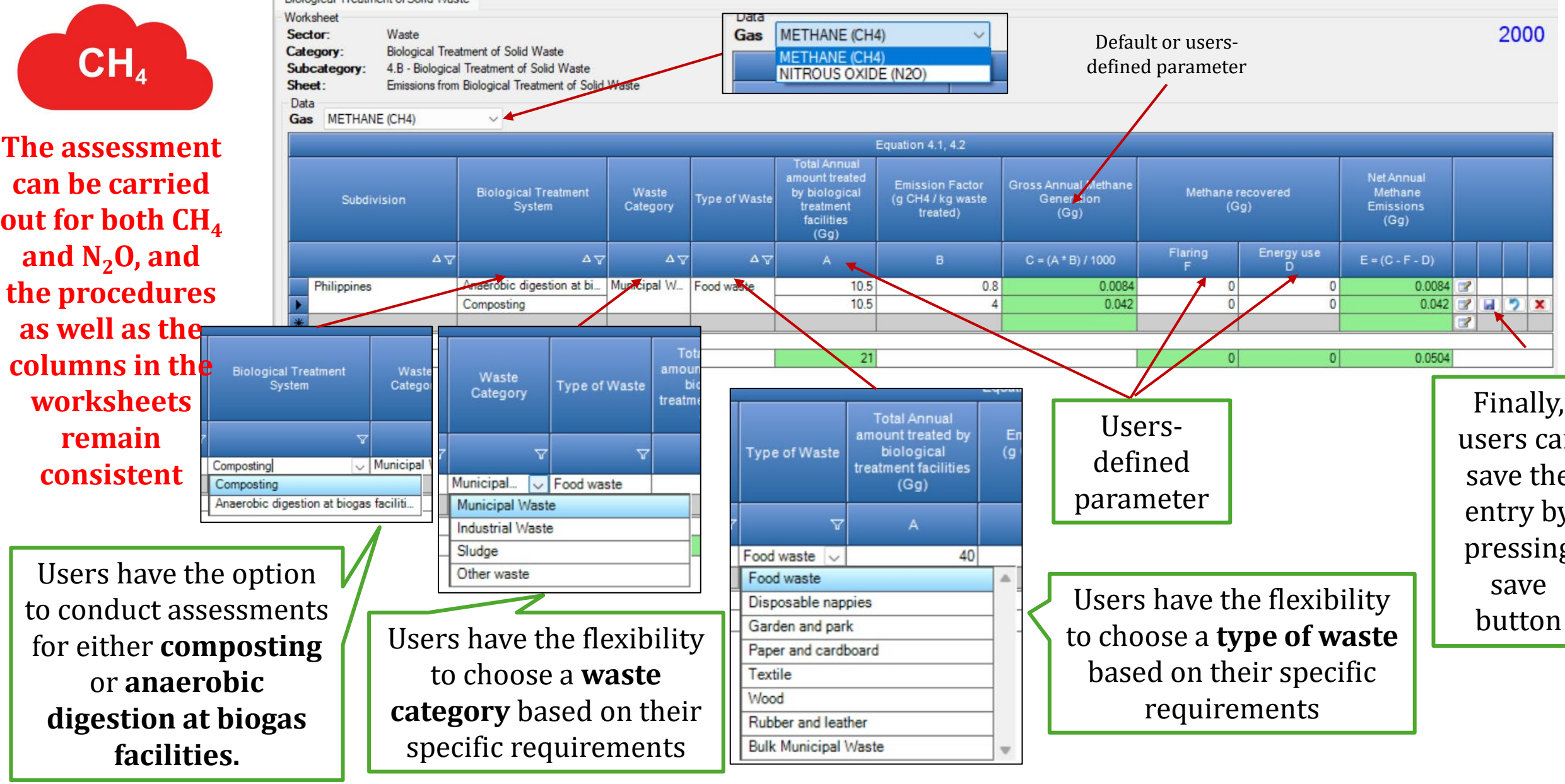
Parameter	Value	Source
Mass of organic waste treated by biological treatment type i, Gg	10.5	DENR_News_Alerts_10_January_2021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	1	Assumed value

N_2O EMISSIONS FROM BIOLOGICAL TREATMENT-TIER 01

$$N_2O\ Emissions = \sum_i \left(M_i \bullet EF_i\right) \bullet 10^{-3}$$

N_2O Emissions = Σ (10.5 Gg * 0.6 g CH4/kg + 10.5 Gg * 1 g CH4/kg) * 10^{-3}

= 0.0168 Gg


CH4
The assessment can be carried out for both CH4 and N2O, and the procedures as well as the columns in the worksheets remain consistent
Biological Treatment of Solid Waste
Worksheet
Sector: Waste
Category: Biological Treatment of Solid Waste
Subcategory: 4.B - Biological Treatment of Solid Waste
Sheet: Emissions from Biological Treatment of Solid Waste
Data
Gas METHANE (CH4)
METHANE (CH4)
NITROUS OXIDE (N2O)
2000
Default or users-defined parameter
Equation 4.1, 4.2
Subdivision
Biological Treatment System
Waste Category
Type of Waste
Total Annual amount treated by biological treatment facilities (Gg)
Emission Factor (g CH4 / kg waste treated)
Gross Annual Methane Generation (Gg)
Methane recovered (Gg)
Flaring F
Energy use D
Net Annual Methane Emissions (Gg)
A
B
C = (A * B) / 1000
E = (C - F - D)
Philippines
Anaerobic digestion at bi...
Composting
Municipal W...
Food waste
10.5
0.8
0.0084
0
0
0.0084
10.5
4
0.042
0
0
0.042
21
0
0
0.0504
Composting
Anaerobic digestion at biogas faciliti...
Municipal...
Food waste
Municipal Waste
Industrial Waste
Sludge
Other waste
Food waste
40
Disposable nappies
Garden and park
Paper and cardboard
Textile
Wood
Rubber and leather
Bulk Municipal Waste
Users-defined parameter
Finally, users can save the entry by pressing save button
Users have the option to conduct assessments for either composting or anaerobic digestion at biogas facilities.
Users have the flexibility to choose a waste category based on their specific requirements
Users have the flexibility to choose a type of waste based on their specific requirements

Default or users-defined parameter

Biological Treatment of Solid Waste

Worksheet

Sector: Waste
Category: Biological Treatment of Solid Waste
Subcategory: 4.B - Biological Treatment of Solid Waste
Sheet: Emissions from Biological Treatment of Solid Waste

2000

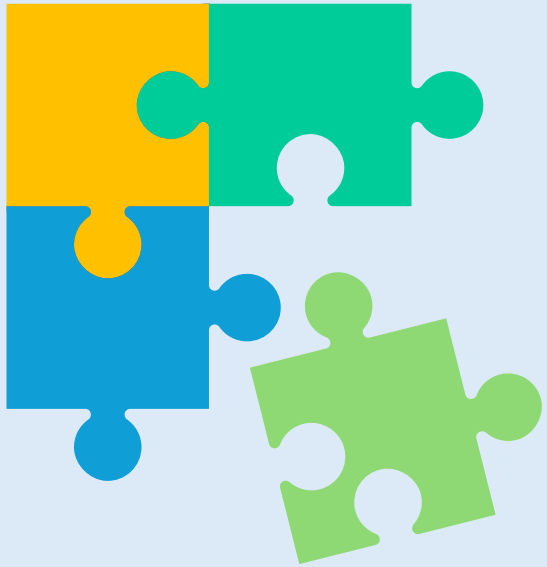
Data

Gas NITROUS OXIDE (N2O)

Equation 4.1, 4.2

Subdivision	Biological Treatment System	Waste Category	Type of Waste	Total Annual amount treated by biological treatment facilities (Gg)	Emission Factor (g N2O / kg waste treated)	Net Annual Nitrous Oxide Emissions (Gg)				
				A	B	E = (A * B) / 1000				
Philippines	Anaerobic digestion at biogas facili...	Municipal Waste	Food waste	10.5	1	0.0105				
	Composting			10.5	0.6	0.0063				
Total										
				21		0.0168				

Let’s do an exercise with the IPCC Inventory Software!



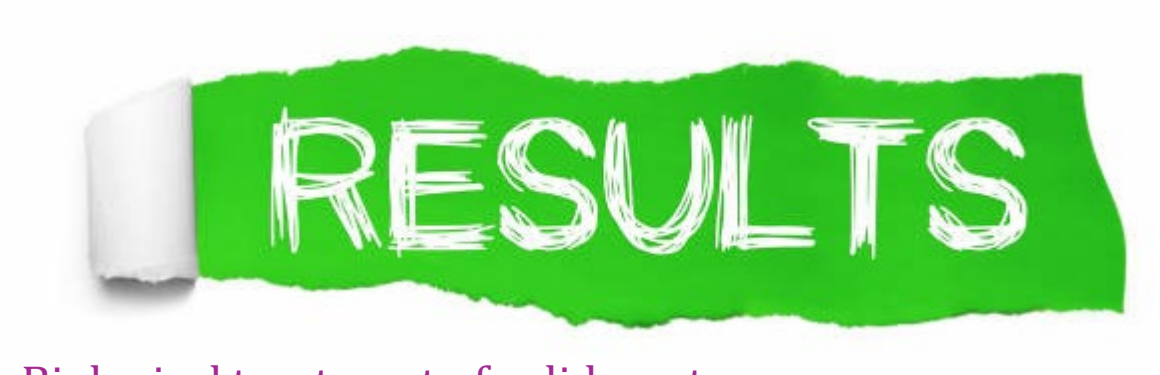
Biological treatment of solid waste

Exercise for Biological treatment of solid wastes

Step 01: Open the worksheet 4.B – Biological treatment of solid waste

Step 02: Select the gas as Methane and enter following data accordingly. Finally, save the entered data.

Input parameter		Entry	Note
Subdivision		Facility 'A'	
Biological treatment system		Composing	
Waste category		Industrial waste	
Type of waste		Pulp and paper	
Total annual amount treated by biological treatment facilities		10 Gg	
Emission factor		IPPC default, 10 g CH_4/ kg	On a dry weight basis
Methane recovered	Flaring	0 Gg	
	Energy use	0.0001 Gg	
**the activity data used in this activity are not real. Just examples only for this activity.*			



Biological treatment of solid waste

Data

Gas METHANE (CH4)

Equation 4.1, 4.2										
Subdivision	Biological Treatment System	Waste Category	Type of Waste	Total Annual amount treated by biological treatment facilities	Emission Factor (g CH4 / kg waste treated)	Gross Annual Methane Generation (Gg)	Methane recovered (Gg)		Net Annual Methane Emissions (Gg)	
				A	B	C = (A * B) / 1000	Flaring F	Energy use D	E = (C - F - D)	
facility 1	Composting	Industrial...	Pulp and...	10	10	0.1	0	0.0001	0.0999	
Total										
				10			0	0.0001	0.0999	

4.C Incineration and Open Burning of Waste

4.C Incineration and Open Burning of Waste

- 4.C.1 – Waste Incineration
- 4.C.2 – Open burning of waste

4.C Incineration and Open Burning of Waste

- There are 2 sub-categories in this category. The format of the worksheets are different in those sub-categories.
- Sub-categories
  - 4.C.1 – Waste incineration
    - 3 worksheets
      1. Waste incineration
      2. Fossil liquid incineration
      3. N_2O emissions from Incineration of wastes – Tier 3
  - 4.C.2 – Open burning of waste
    - 1 worksheet
      1. Open burning of waste

4. C. 1. Emissions from Incineration of Waste

1. Waste incineration

Step 01: Open the worksheet Waste incineration of sub-category 4.C.1 – Waste incineration

Step 02: Select the gas as Carbon dioxide and enter following data accordingly in the worksheet

Input parameter	Entry	Note
Subdivision	Philippines	
Waste category	Municipal waste	
Type of waste	Food waste	
Total amount of waste incinerated	25 Gg	
Dry matter content	0.4	Default value has used. Specific to waste type.
Fraction of carbon in dry matter	0.38	Default value has used. Specific to waste type.
Fraction of fossil carbon in total carbon	0.01	Default value has used. Specific to waste type.
Oxidation factor	Default, 1	
**the activity data used in this activity are not real. Just examples only for this activity.*		

Step 03: Select the gas as N_2O and enter following data accordingly in the worksheet

Input parameter	Entry	Note
Subdivision	Philippines	
Waste category	Municipal waste	
Type of waste	Food waste	
Total amount of waste incinerated	25 Gg	
Nitrous Oxide emission factor	50 kg N2O/Gg Wet waste	Default value has used. Specific to waste type.
**the activity data used in this activity are not real. Just examples only for this activity.*		

Step 03: Select the gas as CH_4 and enter following data accordingly in the worksheet

Input parameter	Entry	Note
Subdivision	Philippines	
Waste category	Municipal waste	
Type of waste	Food waste	
Total amount of waste incinerated	25 Gg	
Methane emission factor	6 kg CH_4/Gg Wet waste	Default value for semi continuous incineration has used. Specific to waste type.
**the activity data used in this activity are not real. Just examples only for this activity.*		

Step 04: Save entered data

4.C.1- Waste Incineration

CO_2 EMISSIONS FROM INCINERATION-TIER 01

$$CO_2\ Emissions = \sum_i \left(SW_i \bullet dm_i \bullet CF_i \bullet FCF_i \bullet OF_i \right) \bullet 44/12$$

CO_2 Emissions = CO_2 emissions in inventory year, Gg/yr

SW_i = total amount of solid waste of type *i* (wet weight) incinerated or open-burned, Gg/yr

dm_i = dry matter content in the waste (wet weight) incinerated or open-burned, (fraction)

CF_i = fraction of carbon in the dry matter (total carbon content), (fraction)

FCF_i = fraction of fossil carbon in the total carbon, (fraction)

OF_i = oxidation factor, (fraction)

44/12 = conversion factor from C to CO_2

i = type of waste incinerated/open-burned specified as follows:

CO_2 Emissions = Σ (25 Gg * 0.4 *0.38* 0.01* 1) * 44/12

=0.13933 Gg

CH_4 EMISSIONS FROM INCINERATION-TIER 01

$$CH_4\ Emissions = \sum_i (IW_i \bullet EF_i) \bullet 10^{-6}$$

CH_4 Emissions = CH_4 emissions in inventory year, Gg/yr

IW_i = amount of solid waste of type *i* incinerated or open-burned, Gg/yr

EF_i = aggregate CH_4 emission factor, kg CH_4/Gg of waste

10^{-6} = conversion factor from kilogram to gigagram

i = category or type of waste incinerated/open-burned, specified as follows:

CH_4 Emissions = Σ (25 Gg *6kg CH_4 /Gg) * 10^{-6}

= 0.00015 Gg

N_2O EMISSIONS FROM INCINERATION-TIER 01

$$N_2O\ Emissions = \sum_i (IW_i \bullet EF_i) \bullet 10^{-6}$$

N_2O Emissions = N_2O emissions in inventory year, Gg/yr

IW_i = amount of incinerated/open-burned waste of type *i* , Gg/yr

EF_i = N_2O emission factor (kg N_2O/Gg of waste) for waste of type *i*

10^{-6} = conversion from kilogram to gigagram

i = category or type of waste incinerated/open-burned, specified as follows:

N_2O Emissions = Σ (25 Gg * 50 kg N_2O /Gg) * 10^{-6}

= 0.00125 Gg

CO_2 EMISSIONS FROM INCINERATION OF FOSSIL LIQUID WASTE-TIER 01

$$CO_2\ Emissions = \sum_i \left(AL_i \bullet CL_i \bullet OF_i\right) \bullet 44/12$$

CO_2 Emissions = CO_2 emissions from incineration of fossil liquid waste, Gg

AL_i = amount of incinerated fossil liquid waste type *i*, Gg

CL_i = carbon content of fossil liquid waste type *i*, (fraction)

OF_i = oxidation factor for fossil liquid waste type *i*, (fraction)

44/12 = conversion factor from C to CO_2

CO_2 Emissions = Σ (25 Gg * 0.8* 1) * 44/12

= 73.333 Gg

4. C. 1. Emissions from Incineration of Waste

1. Waste incineration

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: Emissions from Incineration of Waste

2000

Data

Gas CARBON DIOXIDE (CO2)

Equation 5.1, 5.2											Information for UNFCCC CRT				
Subdivision	Waste Category	Type of Waste	Total Amount of Waste incinerated (Wet Weight) (Gg Waste)			Dry Matter Content - dm (Fraction)	Fraction of Carbon in Dry Matter - CF (Fraction)	Fraction of Fossil Carbon in Total Carbon - FCF	Oxidation Factor - OF (Fraction)	Fossil CO2 Emissions (Gg)	Amount of total waste of fossil origin (Gg Waste)		Amount of total waste of biogenic origin (Gg Waste)		Biogenic CO2 emissions (Gg)
		i		Ai		dmi	CFi	FCFi	OFi	EFi = Ai * dmi * CFi * FCFi * OFi * 44/12		AFi = Ai * FCFi or specified		ABi = Ai * (1-FCFi) or specified	EBi = ABi * dmi * CFi * OFi * 44/12
Philippines	Municip...	Food wa...	Specified	25		0.4	0.38	0.01	1	0.13933	Calculated	0.25	Calculated	24.75	13.794
Total															
				25						0.13933		0.25		24.75	13.794

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: Emissions from Incineration of Waste

2000

Data

Gas NITROUS OXIDE (N2O)

Equation 5.5							Information for UNFCCC CRT				
Subdivision	Waste Category	Type of Waste	Total Amount of Waste incinerated (Wet Weight) (Gg Waste)	N2O Tier 3	Nitrous Oxide Emission Factor (kg N2O/Gg Wet Waste)	Total Nitrous Oxide Emissions (Gg)	Amount of total waste of fossil origin (Gg Waste)	Amount of total waste of biogenic origin (Gg Waste)	Nitrous Oxide Emissions - Fossil Waste (Gg)	Nitrous Oxide Emissions - Biogenic Waste (Gg)	
		i	Ai		EFi	ETi = Ai * EFi / 10^6	AFi	ABi	EFi = AFi * EFi / 10^6	EBi = ABi * EFi / 10^6	
Philippines	Municipal W...	Food waste	25	☐	50	0.00125	0.25	24.75	0.00001	0.00124	
Total											
			25			0.00125	0.25	24.75	0.00001	0.00124	

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: Emissions from Incineration of Waste

2000

Data

Gas METHANE (CH4)

Equation 5.4							Information for UNFCCC CRT				
Subdivision	Waste Category	Type of Waste	Total Amount of Waste incinerated (Wet Weight) (Gg Waste)	Methane Emission Factor (kg CH4/Gg Wet Waste)	Total Methane Emissions (Gg)		Amount of total waste of fossil origin (Gg Waste)	Amount of total waste of biogenic origin (Gg Waste)	Methane Emissions - Fossil Waste (Gg)	Methane Emissions - Biogenic Waste (Gg)	
		i	Ai	EFi	ETi = Ai * EFi / 10^6		AFi	ABi	EFi = AFi * EFi / 10^6	EBi = ABi * EFi / 10^6	
Philippines	Municipal W...	Food waste	25	6	0.00015		0.25	24.75	0	0.00015	
Total											
			25		0.00015		0.25	24.75	0	0.00015	

4. C. 1. Emissions from Incineration of Waste

2.Fossil liquid incineration

Step 01: Open the worksheet Fossil liquid incineration of sub-category 4.C.1 – Waste incineration

Input parameter	Entry	Note
Subdivision	Philippines	
Type of waste	Lubricants	
Total amount of fossil liquid waste incinerated	25 Gg	
Fossil C content of fossil liquid waste	80	Default value has used. Specific to waste type.
Oxidation factor	100	Default value has used. Specific to waste type.
**the activity data used in this activity are not real. Just examples only for this activity.*		

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

Sector: Waste

Category: Incineration and Open Burning of Waste

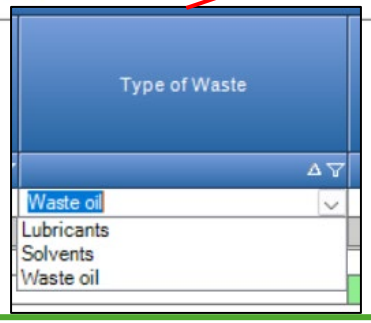
Subcategory: 4.C.1 - Waste Incineration

Sheet: CO2 emissions from incineration of fossil liquid waste

2000

Data

Equation 5.3						
Subdivision	Type of Waste	Total Amount of Fossil Liquid Waste Incinerated (Weight) (Gg Waste)	Fossil Carbon Content of Fossil Liquid Waste - CL (%)	Oxidation Factor for Fossil Liquid Waste of type i - OF (%)	Fossil CO2 Emissions (Gg CO2)	
		A	B	C	D = A * (B/100) * (C/100) * 44/12	
Philippines	Lubricants	25	80	100	73.33333	
Total						
		25			73.33333	

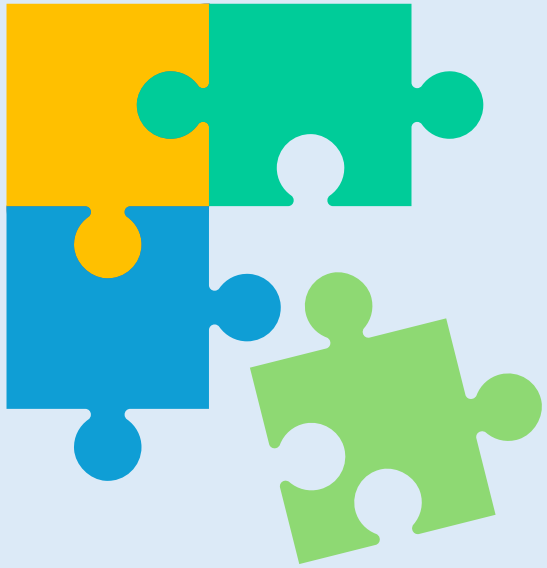


Users have the flexibility to choose a **waste type** based on their specific requirements

Users-defined parameter

Default or users-defined parameter

Let’s do an exercise with the IPCC Inventory Software!



Incineration and Open Burning of Waste

Exercises for Incineration and Open burning of waste

Step 01: Open the worksheet Waste incineration of sub-category 4.C.1 – Waste incineration

Step 02: Select the gas as Carbon dioxide and enter following data accordingly in the worksheet

Input parameter	Entry	Note
Subdivision	Facility 'A'	
Waste category	Industrial waste	
Type of waste	Textile	
Total amount of waste incinerated	10 Gg	
Dry matter content	0.8	Default value has used. Specific to waste type.
Fraction of carbon in dry matter	0.5	Default value has used. Specific to waste type.
Fraction of fossil carbon in total carbon	0.2	Default value has used. Specific to waste type.
Oxidation factor	Default, 1	
**the activity data used in this activity are not real. Just examples only for this activity.*		

Step 03: Save entered data

Step 04: Enter uncertainties for activity data and emission factors as below

Entry parameter		Entry
Activity data uncertainties	Upper	+1.00%
	Lower	-1.00%
Emission factors uncertainties		
Select the gas as Carbon Dioxide and enter following *(*when you are entering data for real GHG inventory calculation, please make sure to add uncertainties for other gases also)*		
	Upper	+1.00%
	Lower	-1.00%

*these values are not real. Just examples only for this activity.

Step 05: Open the worksheet Fossil liquid incineration of the same sub-category above and, enter following data accordingly

Input parameter	Entry	Note
Subdivision	Facility 'C'	
Type of waste	Waste oil	
Total amount of fossil liquid waste incinerated	2.5 Gg	
Fossil carbon content of fossil liquid waste	Default, 80	
Oxidation factor for fossil liquid waste of type I	Default, 100	
**the activity data used in this activity are not real. Just example only for this activity.*		

Step 06: Save entered data

Step 07: Enter uncertainties in the above same worksheet

Entry parameter		Entry
Activity data uncertainties	Upper	+1.00%
	Lower	-1.00%
Emission factors uncertainties		
Select the gas as Carbon Dioxide and enter following *(*when you are entering data for real GHG inventory calculation, please make sure to add uncertainties for other gases also)*		
	Upper	+1.00%
	Lower	-1.00%

*these values are not real. Just examples only for this activity.

Before you are going to do calculation using Tier 3, as explained in the N2O emissions from incineration of waste – Tier 3 , you should choose "Nitrous oxide (N2O)" from the dropdown menu in the waste incineration worksheet.

After doing so, there is no need to enter data again. You have only to select the gas N_2O and, select the option 'N_2O Tier 3' in the data entry worksheet

Then, in the worksheet for N_2O emissions from Incineration of waste, you must enter following data.

Input parameter	Entry	Note
N_2O emission concentration in flue gas from the incineration of waste type i	0.01 mg N_2O/ m^3	
Flue gas volume by amount of incinerated waste type i	0.1 m^3/ Mg	
**the activity data used in this activity are not real. Just example only for this activity.*		

Waste incineration

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

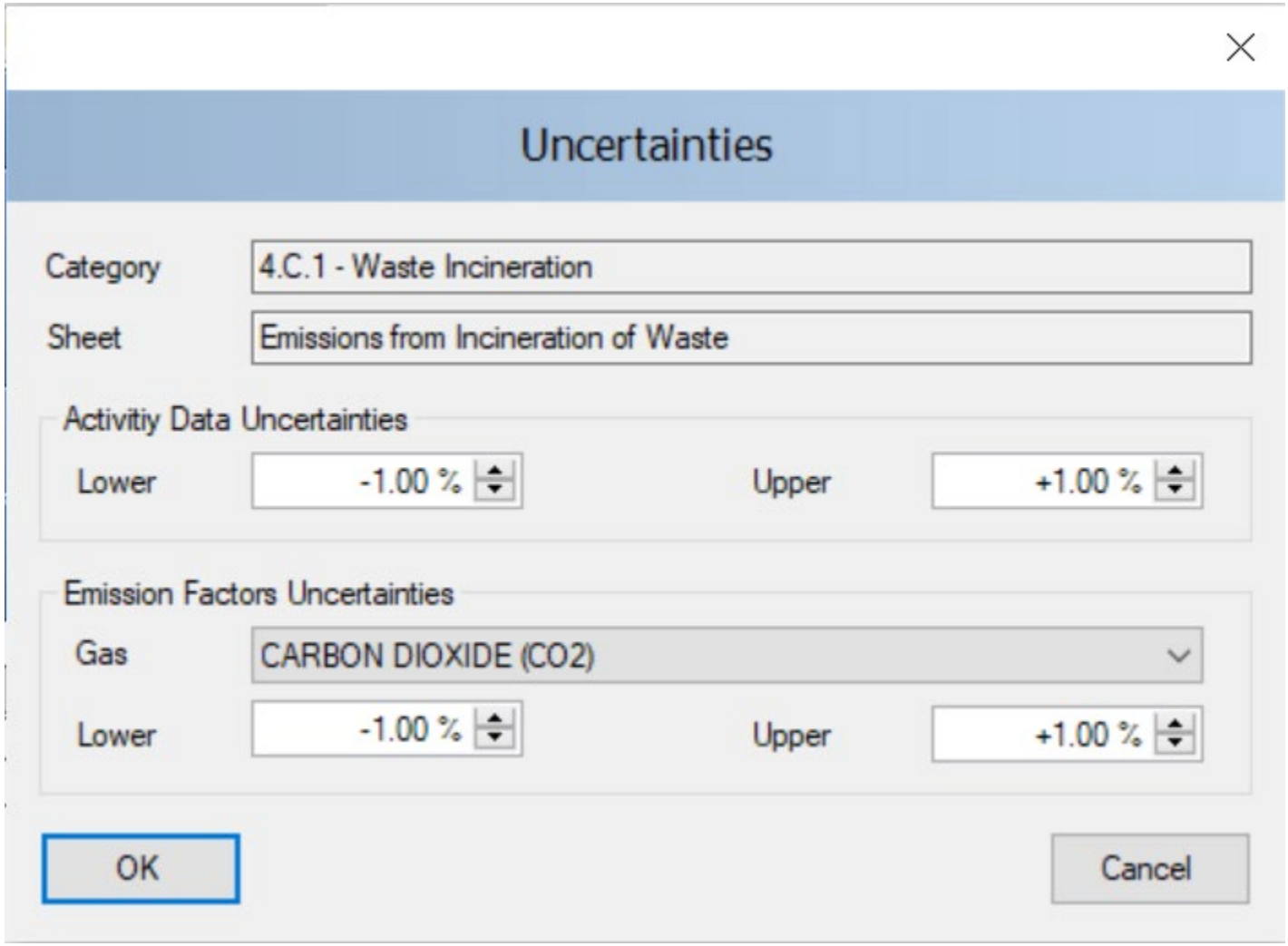
Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: Emissions from Incineration of Waste

Data

Gas CARBON DIOXIDE (CO2)

Equation 5.1, 5.2										
Subdivision	Waste Category	Type of Waste	Total Amount of Waste incinerated (Wet Weight) (Gg Waste)			Dry Matter Content - dm (Fraction)	Fraction of Carbon in Dry Matter - CF	Fraction of Fossil Carbon in Total Carbon - FCF	Oxidation Factor - OF (Fraction)	Fossil CO2 Emissions (Gg)
		i		Ai		dmi	CFi	FCFi	OFi	EFi = Ai * dmi * CFi * FCFi * OFi * 44/12
facility 'A'	Indust...	Textile	Specifi...	10		0.8	0.5	0.2	1	2.93333
Total										
				10						2.93333

Uncertainties – waste incineration



Fossil liquid incineration

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

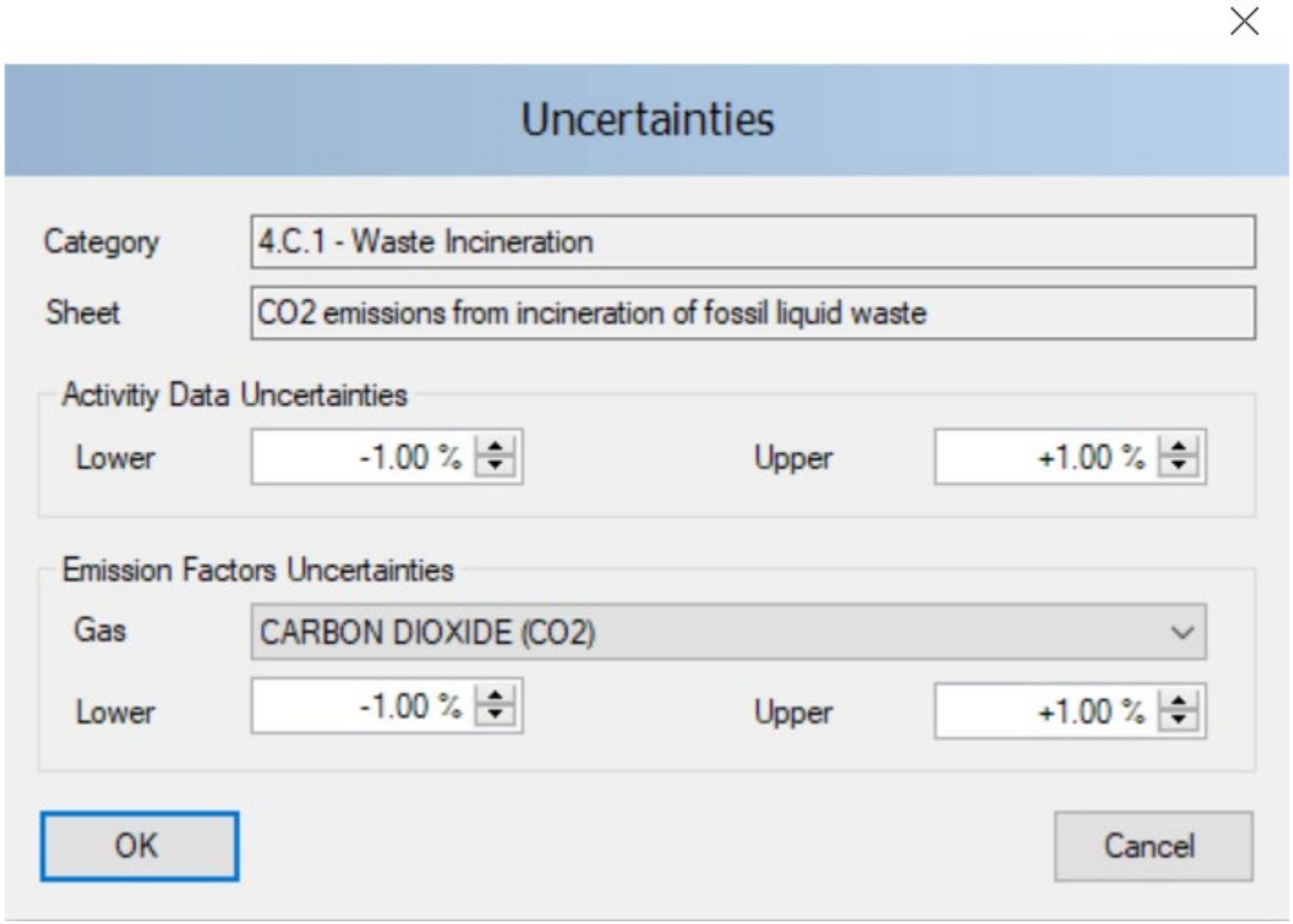
Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: CO2 emissions from incineration of fossil liquid waste

Data

Equation 5.3					
Subdivision	Type of Waste	Total Amount of Fossil Liquid Waste Incinerated (Weight) (Gg Waste)	Fossil Carbon Content of Fossil Liquid Waste - CL (%)	Oxidation Factor for Fossil Liquid Waste of type i - OF (%)	Fossil CO2 Emissions (Gg CO2)
		A	B	C	D = A * (B/100) * (C/100) * 44/12
Facility `A`	Waste oil	2.5	80	100	7.33333
Total					
		2.5			7.33333

Uncertainties – Incineration of fossil liquid waste



Waste incineration – N_2O

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: Emissions from Incineration of Waste

Data

Gas NITROUS OXIDE (N2O)

Equation 5.5

Subdivision	Waste Category	Type of Waste	Total Amount of Waste incinerated (Wet Weight) (Gg Waste)	N2O Tier 3	Nitrous Oxide Emission Factor (kg N2O/Gg Wet Waste)	Total Nitrous Oxide Emissions (Gg)
		i	Ai		EFi	ETi = Ai * EFi / 10^6
facility `A`	Industrial...	Textile	10	☑		
Total			10			0

N2O emissions from Incineration of waste –Tier 3

Waste incineration | Fossil liquid incineration | N2O Emissions from Incineration of waste - Tier 3

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.1 - Waste Incineration
Sheet: N2O Emissions from Incineration of waste - Tier 3

Data

Equation 5.6						
Subdivision	Waste Category	Type of Waste	Total Amount of Waste incinerated (Gg Waste)	N2O emission concentration in flue gas from the incineration of waste type i	Flue gas volume by amount of incinerated waste type i (m3/Mg)	N2O Emissions (Gg N2O)
		i	IWi	ECi	FGVi	Ei = IWi * ECi * FGVi * 10^-9
facility `A`	Indust...	Textile	10	0.01	0.1	0
Total						
			10			0

4. C. 2. Open Burning of waste

In line with the assessments conducted for waste incineration, a comparable data collection structure is adhered to under open burning to facilitate the calculation of CO2, CH4, and N2O gases.

Open Burning of Waste

Worksheet

Sector: Waste

Category: Incineration and Open Burning of Waste

Subcategory: 4.C.2 - Open Burning of Waste

Sheet: Emissions from Open Burning

2000

Data

Gas CARBON DIOXIDE (CO2)

	Equation 5.1, 5.2, 5.7											Information for UNFCCC CRT					
Subdivision	Waste Category	Type of Waste		Total Amount of Waste open-burned (Wet Weight) (Gg Waste)		Dry Matter Content - dm (Fraction)	Fraction of Carbon in Dry Matter - CF (Fraction)	Fraction of Fossil Carbon in Total Carbon - FCF	Oxidation Factor - OF (Fraction)	Fossil CO2 Emissions (Gg)		Amount of total waste of fossil origin (Gg Waste)		Amount of total waste of biogenic origin (Gg Waste)		Biogenic CO2 emissions (Gg)	
		i		Ai		dmi	CFi	FCFi	OFi	EFi = Ai * dmi * CFi * FCFi * OFi * 44/12			AFi = Ai * FCFi or specified		ABi = Ai * (1-FCFi) or specified	EBi = ABi * dmi * CFi * OFi * 44/12	
Philippines	Municip...	Food...	Specified	25		0.4	0.38	0.01	0.58	0.08081		Calcul...	0.25	Calculated	24.75	8.00052	
Total																	
				25						0.08081			0.25		24.75	8.00052	

Open Burning of Waste

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.2 - Open Burning of Waste
Sheet: Emissions from Open Burning

2000

Data

Gas METHANE (CH4)

Equation 5.4							Information for UNFCCC CRT			
Subdivision	Waste Category	Type of Waste	Total Amount of Waste open-burned (Wet Weight) (Gg Waste)	Methane Emission Factor (kg CH4/Gg Wet Waste)	Total Methane Emissions (Gg)		*Amount of total waste of fossil origin (Gg Waste)*	*Amount of total waste of biogenic origin (Gg Waste)*	*Methane Emissions - Fossil Waste (Gg)*	*Methane Emissions - Biogenic Waste (Gg)*
		i	Ai	EFi	ETi = Ai * EFi / 10^6		*AFi*	*ABi*	*EFi = AFi * EFi / 10^6*	*EBi = ABi * EFi / 10^6*
Philippines	Municipal W...	Food waste	25	6500	0.1625		0.25	24.75	0.00163	0.16088
Total										
			25		0.1625		0.25	24.75	0.00163	0.16088

Open Burning of Waste

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.2 - Open Burning of Waste
Sheet: Emissions from Open Burning

2000

Data

Gas NITROUS OXIDE (N2O)

Equation 5.5								Information for UNFCCC CRT			
Subdivision	Waste Category	Type of Waste	Total Amount of Waste open-burned (Wet Weight) (Gg Waste)	Dry Matter Content - dm (Fraction)	Total Amount of Waste open-burned (Dry Weight) (Gg Waste)	Nitrous Oxide Emission Factor (kg N2O/Gg Dry Waste)	Total Nitrous Oxide Emissions (Gg)	*Amount of total waste of fossil origin (Gg Waste)*	*Amount of total waste of biogenic origin (Gg Waste)*	*Nitrous Oxide Emissions - Fossil Waste (Gg)*	*Nitrous Oxide Emissions - Biogenic Waste (Gg)*
		i	Ai	dmi	Admi = Ai * dmi	EFi	ETi = Admi * EFi / 10^6	*AFi*	*ABi*	*EFi = AFi * dmi * EFi / 10^6*	*EBi = ABi * dmi * EFi / 10^6*
Philippines	Municipal...	Food waste	25	0.4	10	150	0.0015	0.25	24.75	0.00002	0.00149
Total											
			25				0.0015	0.25	24.75	0.00002	0.00149

Default or users-defined parameter

Let’s do an example with the IPCC GHGI tool!

Exercise for open burning of waste

Step 01: Open the worksheet open burning waste

Step 02: Select the gas as CO_2 and enter following data accordingly

Input parameter	Entry	Note
Subdivision	District 'A'	
Waste category	Municipal waste	
Type of waste	Paper & cardboard	
Total amount of waste open-burned	5 Gg	
Dry matter content	0.9	Default value has used. Specific to waste type.
Fraction of carbon in dry matter	0.46	Default value has used. Specific to waste type.
Fraction of fossil carbon in total carbon	0.01	Default value has used. Specific to waste type.
Oxidation factor	Default, 0.58	
**the activity data used in this activity are not real. Just examples only for this activity.*		

Step 03: Save Entered Data

Step 04: Select the gas as CH_4 and enter following data accordingly

Input parameter	Entry	Note
Methane emission factor	Default, 6500 kg CH_4/ Gg wet waste	

Step 05: Save Entered Data

Step 06: Select the gas as N_2O and enter following data accordingly

Input parameter	Entry	Note
Nitrous Oxide emission factor	Default, 6500 kg CH_4/ Gg wet waste	

Step 07: Save Entered Data

Step 08: Enter following uncertainty data also accordingly in the same worksheet above

Entry parameter		Entry
Activity data uncertainties	Upper	+1.00%
	Lower	-1.00%
Emission factors uncertainties		
Select the gas as Carbon Dioxide and enter following *(*when you are entering data for real GHG inventory calculation, please make sure to add uncertainties for other gases also)*		
	Upper	+1.00%
	Lower	-1.00%

*these values are not real. Just examples only for this activity.

Open Burning of waste – CO_2

Open Burning of Waste

Worksheet

Sector: Waste

Category: Incineration and Open Burning of Waste

Subcategory: 4.C.2 - Open Burning of Waste

Sheet: Emissions from Open Burning

2000

Data

Gas CARBON DIOXIDE (CO2)

Equation 5.1, 5.2, 5.7											Information for UNFCCC CRT					
Subdivision	Waste Category	Type of Waste	Total Amount of Waste open-burned (Wet Weight) (Gg Waste)			Dry Matter Content - dm (Fraction)	Fraction of Carbon in Dry Matter - CF (Fraction)	Fraction of Fossil Carbon in Total Carbon - FCF	Oxidation Factor - OF (Fraction)	Fossil CO2 Emissions (Gg)	*Amount of total waste of fossil origin (Gg Waste)*		*Amount of total waste of biogenic origin (Gg Waste)*		*Biogenic CO2 emissions (Gg)*	
		i		Ai		dmi	CFi	FCFi	OFi	EFi = Ai * dmi * CFi * FCFi * OFi * 44/12		*AFi = Ai * FCFi or specified*		*ABi = Ai * (1-FCFi) or specified*	*EBi = ABi * dmi * CFi * OFi * 44/12*	
Philippines	Municip...	Food wa...	Specified	5		0.9	0.46	0.01	0.58	0.04402	Calculated	0.05	Calculated	4.95	4.35818	
Total																
				5						0.04402		0.05		4.95	4.35818	

Burning of waste – CH_4

Open Burning of Waste

Worksheet

Sector: Waste
Category: Incineration and Open Burning of Waste
Subcategory: 4.C.2 - Open Burning of Waste
Sheet: Emissions from Open Burning

Data

Gas METHANE (CH4)

Equation 5.4						
Subdivision	Waste Category	Type of Waste	Total Amount of Waste open-burned (Wet Weight) (Gg Waste)	Methane Emission Factor (kg CH4/Gg Wet Waste)	Total Methane Emissions (Gg)	
		i	Ai	EFi	ETi = Ai * EFi / 10^6	
District `A`	Municipal...	Paper and...	5	6500	0.0325	
Total						
			5		0.0325	

Burning of waste – N_2O

Open Burning of Waste

Worksheet

Sector: Waste

Category: Incineration and Open Burning of Waste

Subcategory: 4.C.2 - Open Burning of Waste

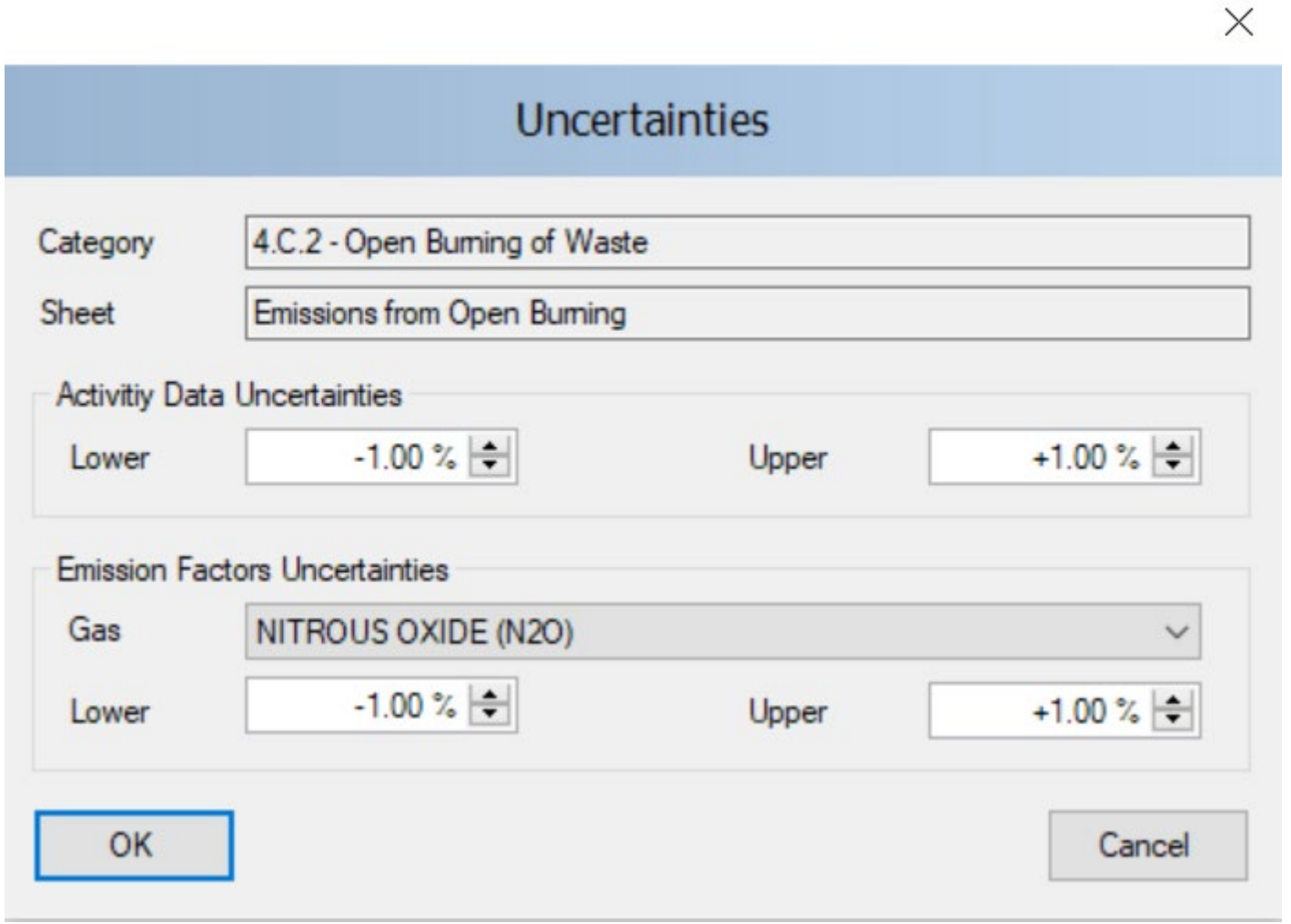
Sheet: Emissions from Open Burning

Data

Gas NITROUS OXIDE (N2O)

Equation 5.5						
Subdivision	Waste Category	Type of Waste	Total Amount of Waste open-burned (Wet Weight) (Gg Waste)	Nitrous Oxide Emission Factor (kg CH4/Gg Wet Waste)	Total Nitrous Oxide Emissions (Gg)	
		i	Ai	EFi	ETi = Ai * EFi / 10^6	
District `A`	Municipal...	Paper and...	5	150	0.00075	
Total						
			5		0.00075	

Uncertainties



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