# Training on 2006 IPCC Guidelines for preparing National GHG Inventory:





# 2006 IPCC Inventory tool: Solid Waste

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# 4.A – Solid waste disposal



# 4.A – Solid waste disposal

- 4.A.1 Managed waste disposal sites
- 4.A.2 Unmanaged waste disposal sites
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Login	Superuser_PHL
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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	Τίθ	er 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 <sup>-1</sup>	IPCC default factorsFood waste - 0.4Textiles - 0.07Garden - 0.17Disposable nappies - 0.17Paper - 0.07Wood and straw - 0.035							

## Example: SWDS (Tier 1)





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Data Category	Tie	r 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	<b>MSW</b> Population (Philippine) - World Bank (1950 to 2000) - Capita					
Waste generation rate	MSW - IPCC default for Philippines - 190 kg/ca	p/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 uncate	gorised SWDS) = 0				

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

User interface for entering data IPCC Inventory Software	into SWDS within the Version 2.901	There are 6 worksheets within the Solid Waste Disposal 1. Parameters
The latest IPCC software also enables the provision of GHG emissions outcomes for <b>managed waste disposal sites</b> , <b>unmanaged waste disposal sites</b> , <b>and uncategorized waste disposal sites</b> .	eets]	<ol> <li>SWDS Types - Utilization</li> <li>Activity Data</li> <li>Amount Deposited</li> <li>Long term stored C in SWDS</li> <li>Harvested wood products</li> </ol>
Application Database Aventory Year Worl 2006 IPCC Categories • 4 • 4 - Waste • 4.A - Solid Waste Disposal • 4.A.1 - Managed Waste Disposal Sites • 4.A.2 - Unmanaged Waste Disposal Sites • 4.A.3 - Uncategorised Waste Disposal Sites	csheets       Tools       Export/Import       Reports       Window         Parameters       SWDS Types - Utilization       Activity Data         Country/Territory       Philippines         Region       Asia - South-East         Subdivision:       Subdivision 1         Climate Zone       Tropical wet	Amount Deposited Long Term stored C in SWDS Harvested Wood Products
	Main parameters and Waste Types for selected Subdivis	tion Parameters for HWP (Bulk MSW) 1950
	Delay Time (months) Fraction of methane (F) in developed gas	6     % paper in municipal waste     0.00 % €       0.500 €     % wood in municipal waste     0.00 % €
	Conversion Factor, C to CH4	1.333333 Parameters for HWP (Bulk Industrial Waste)
	Waste Type Parameters for selected Subdivisio	% paper in industrial waste     0.00 % €       % wood in industrial waste     0.00 % €
	Save Uncertainties	Waste Type Manager

# 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)**.

6 IPCC Categories 👻 👎	Parameters SWDS Types - Utilization Acti	vity Data Amount Deposit	ted Long Term stored C in SWDS	Harvested Wood Products		
4 - Waste A.A - Solid Waste Disposal 4.A.1 - Managed Waste Disposal Sites	Country/Territory         Philippines           Region         Asia - South-East	<u></u>		corre	Choose the region sponding to the country	
4.A.2 - Unmanaged Waste Disposal Sites 4.A.3 - Uncategorised Waste Disposal Sites	ed Waste Disposal Sites rised Waste Disposal Sites Subdivision: Subdivision 1					
Choose climate zone corresponding to the country	Main parameters and Waste Types for selecters	ed Subdivision	Parameters for HWP (Bulk MSW)	0.00 % 숙	vision allows estimations at subnational level T	
	Delay Time (months)	6 🔃	% paper in municipal waste	0.00 % 4.A - Subdivision	- D	
For the <b>Tier 1 and Tier 2</b> approach, IPCC default values can be utilized	Fraction of methane (F) in developed gas Conversion Factor, C to CH4	1.333333	% wood in municipal waste Parameters for HWP (Bulk Industria	0.00 % E Subdivision 1 Subdivision 2 #	2	
	Waste Type Parameters for selected	% paper in industrial waste % wood in industrial waste	0.00 % 1			

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

Parameters Please enter parameters in the yellow cells.	Country Region	<b>_</b>			The of w and	<b>regio</b> vaste. I dry re	on and For exa egions,	clin amp the	nate z le, if a decay	zone of a country / rates n	a coun y has b nay vai	ntry o ooth ry be	can ir hot a etwee	nflue nd v en th	nce vet re ese	the egio regi	deca ns a ons	ay ra and l	ate hot				
Help on parameter selection can be found in           Starting year	IPCC defa	guidelines ult value 1950	Countr Value 1950	y-specific Referer	c parameter nce and rem	s arks			The qua lack data	e FOD Intities king hi a using	) meth and co storical g surrog	od omp I sta gate	requir osition atistica s like	res data n, collec al data f populat	a on s cted ov for the ion or e	solid ver a full econ	was 50-y 50 ye iomic	ste <b>/ear</b> ears ; indi	dispo per may icato	osal, iod. y es ors.	ino Co tima	clud untr ate t	ing ies his
DOC (Degradable organic carbon)	Waste by com	position 🦛			/						- · ·												
(weight fraction, wet basis)	Range	Default							Мо	del pro	ovides	two	optior	ns to ca	Iculatio	on ca	an be	e ch	oser	ı der	pend	dina	on
Food waste	0.08-0.20	0.15	0.15						the	availa	ble act	ivitv	data										
Garden	0.18-0.22	0.2	0.2		/				N/1			dal	hooor		ata aar	~~~	aitia	n de					
Paper	0.36-0.45	0.4	0.4						- 1010	uiu-pn	ase mo	Juer	basec			npo	SILIO	n ua	ila.				
Wood and straw	0.39-0.46	0.43	0.43						- Si	ngle-p	hase m	lode	el base	ed on bi	JIK was	ste.							
Textiles	0.20-0.40	0.24	0.24																				
Disposable nappies	0.18-0.32	0.24	0.24	/				Baso	d o	n tho	choso	n ro	aion	climate	7000	and		eula	tion	ont	ion	do	fault
Sewage sludge	0.04-0.05	0.05	0.08					Dase	da	ta for	param	ete	s suc	ch as D	C, DC	DCf,	and	k wi	ill be	e se	lect	ed	laun
Industrial waste	0-0.54	0.15	0.15					Тар	1 = 2 4					accor	dingly	•							
					DEFAULT DR	MATTER CONTE	ENT, DOC CO	NTENT, TOT	AL CARBO	ON CONTENT A	ND FOSSIL CARB	ON FRAC	TON OF										
DOCf (fraction of DOC dissimilated)		0.5	0.5		MSW component	Dry matter	DOC c	ontent	DOC c	content	Total carbon	Fos	sil carbon		<b>D</b>			TABLE 3	.3				
и П			,	1		content in % of wet weight	in % of w	et waste i	in % of d	iry waste in	content % of dry weigh	fract t tot	ion in % of al carbon	Deriv	RECOMMI ed from k values o	btained in a	AULT METHAI	measureme	TION RATE	(K) VALUES	dels or use	IER I ed in green	nhouse gas
Methane generation rate constant (k)	Moist and we	et tropical 🛛 💌				Default	Default	Range I	Default	Range <sup>2</sup> D	efault Range	Defau	lt Range	(			invento	ries and ot	her studies)		,		
(vears <sup>-1</sup> )	Range	Default			Paper/cardboard	90	40	36 - 45	44	40 - 50	46 42 - 50	1	0 - 5						Clima	te Zone*	—E		
Food waste	0 17-0 7	04	0.4		Food waste	40	15	8 - 20	30	25 - 50 20 - 50	50         25 - 50           38         20 - 50	- 20	0 - 50	Tvr	ne of Waste		Boreal and (MAT	l Tempera ≤ 20°C)	te			ropical <sup>4</sup> AT > 20°C)	)
Garden	0.15-0.2	0.1	0.17	, ,	Wood	85 <sup>4</sup>	43	39 - 46	50	46 - 54	50 46 - 54	-	-		e of waste		Dry	ALAD	Wet	MAD	Dry	Mo	ist and Wet
Paper	0.06-0.085	0.07	7 0.07	,	Garden and Park waste	40	20	18 - 22	49	45 - 55	49 45 - 55	0	0			Default	Range <sup>2</sup>	Default	Range <sup>2</sup>	Default	Range <sup>2</sup>	<sup>2</sup> Defau	Ilt Range <sup>2</sup>
Wood and straw	0.03-0.05	0.03	0.035		Nappies	40	24	18 - 32	60	44 - 80	70 54 - 90	10	10	Slowly	Paper/textiles	0.04	0.033.5 -	0.06	0.05 -	0.045	0.04 - 0/	06 0.07	0.06 -
Textiles	0.06-0.085	0.00	0.03	,	Rubber and Leathe	r 84	(39) °	(39) °	(47) 3	(47) 3	67 67 75 67 - 85	20	20 95 - 100	degrading	waste Wood/star		0.053.7		0.07*3		<u> </u>		0.085
Disposable nappies	0.15-0.2	0.07	0.07	,	Metal 6	100		-	-	- 1	NA NA	NA	NA	waste	wood/straw waste	0.02	0.036.7	0.03	0.02 - 0.04	0.025	0.02 - 0.0	04 0.035	5 0.03 - 0.0
Sewage sludge	0.17-0.7	0.11	0.11		Glass <sup>6</sup>	100	•	-	-	- 1	NA NA	NA	NA		Other (non -								
	0.11 0.1	0	0.4		Other, inert waste	90	-	-	-	-	3   0 - 5	100	50 - 100	degrading	y 100d) organic putrescible/	0.05	0.04 - 0.06	0.1	0.06 - 0.1 <sup>s</sup>	0.065	0.05 - 0./	08 0.17	0.15 - 0.
Industrial waste	0.15-0.2	0.17	0.17	,	DEFAULT	DOC AND FOSSIL	CARBON CONT	TAB ENT IN INDUS	ILE 2.5 STRIAL W	ASTE (PERCENT	AGE IN WET WAS	TE PRODU	CED) <sup>1</sup>	waste	Garden and park waste								
						Industry type		DO	С	Fossil carbon	Total carbor	n Wate	r content <sup>2</sup>	Rapidly degrading	Food waste/Sewage	0.06	0.05 - 0.08	0.185 <sup>4</sup>	0.1 <sup>3,4</sup> - 0.2 <sup>9</sup>	0.085	0.07 - 0.	.1 0.4	0.17 - 0.7
					Food, beverage	es and tobacco (ot	her than sludg	e) 1	15 04	- 16	40		60 20	waste	sludge					<u> </u> '	$\vdash$	_	
					Wood and woo	od products		4	43	-	43		15	Bulk Wast	e	0.05	0.04 - 0.06	0.09	0.08 <sup>8</sup> -0.1	0.065	0.05 - 0.0	08 0.17	0.15 <sup>11</sup> – 0
					Pulp and paper	(other than sludg	e)	4	40	1	41		10	LL The smile	hle in ferme tien en d			16 line in 6	lie		Linited The	luss in s	And of in the
					Petroleum pro	lucts, Solvents, Pl	astics	(2)	-	80	80	_	0										
					Construction a	nd demolition		(39	9) <sup>-</sup> 4	20	24	_	0										
					Other 4				1	3	4		10										

Moist and Wet (MAP ≥ 1000 mm) Range<sup>2</sup>

0.03 - 0.05

0.15 - 0.2

0.4 0.17 - 0.7<sup>10</sup> 0.08 0.17 0.15<sup>11</sup> - 0.2



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

	isposal d Waste Disposal Sites ged Waste Disposal Sites	arameters SWDS Ty	pes - Utilization Activity	/ Uata Amount De	posited Long Lerms	tored C in SWDS	Manuanted Mond Dro			
A - Solid Waste D -4.A.1 - Manager -4.A.2 - Unmana -4.A.3 - Uncateg	lisposal d Waste Disposal Sites ged Waste Disposal Sites						Harvested Wood Fro			
- 4.A.1 - Manager - 4.A.2 - Unmana - 4.A.3 - Uncateg	d Waste Disposal Sites ged Waste Disposal Sites	Country/Territory	Philippines							
4.A.3 - Uncateg	ged Waste Disposal Sites	Region	Asia - South-East		~					
	orised Waste Disposal Sites	Subdivision:	Subdivision 1	~[	•					
		Climate Zone	Tropical wet		~					
		Main parameters and	Waste Types for selected S	Subdivision	Parameters for	HWP (Bulk MSW)				
		Starting year		1950 📼	% garden in municipal waste 0.00 % 文					
		Delay Time (months)		6 💠	% paper in municipal waste 0.00 % 🜩					
		Fraction of methane (F	-) in developed gas	0.500 🗢	% wood in municipal waste 0.00 % 🜩					
		Conversion Easter Ct	CHA							
		Conversion ractor, C t		Parameters for	HVVP (Bulk Industria	al Waste)				
		Waste Tune	Parameters for selected Su	Indivision	% paper in industrial waste 0.00 % 🖨					
		wate type	, arametera for aelected Su		% wood in indu	% wood in industrial waste 0.00 % 🚖				
		Save	Uncertainties	Waste I	ype Manager					
waste Category		waste Type/Indust			Degradable	organic carbon	Methane			
			гу Туре		Degradable organic carbon	decomposes in SWDS	n Methane generation rate n constant (k)			
۵۷	Class of decomposability A ⊽	Ту	гу Туре гре Д	Use in calculations	Degradable organic carbon DOC (Fraction of wet weight)	organic carbon which decomposes in SWDS DOCf (Fraction)	Methane generation rate constant (k) k			
∆ ⊽ dustrial Waste	Class of decomposability A ⊽ Bulk waste	Ty Bulk Industrial Was	ry Type 🛆 rpe 🛆 te	Use in calculations	Degradable organic carbon DOC (Fraction of wet weight)	decomposes in SWDS DOCf (Fraction)	Methane generation rate constant (k) k			
∆ ⊽ dustrial Waste	Class of decomposability A ⊽ Bulk waste Highly decomposable waste	Ty Bulk Industrial Was Food, beverages an	ry Type Δ te id tobacco	Use in calculations	Degradable organic carbon DOC (Fraction of wet weight) 0.15	organic caroon which decomposes in SWDS DOCf (Fraction) 0.7	Methane generation rate constant (k) k			
∆ ⊽ dustrial Waste	Class of decomposability △ ▽ Bulk waste Highly decomposable waste Less decomposable waste	Ty Bulk Industrial Was Food, beverages an Construction and de	ry Type A te dobacco emolition	Use in calculations	Degradable organic carbon (Fraction of wet weight) 0.15 0.04	organic caroon which decomposes in SWDS DOCf (Fraction) 0.7 0.5	Methane generation rate constant (k) k			
∆ ⊽ dustrial Waste	Class of decomposability △ ▽ Bulk waste Highly decomposable waste Less decomposable waste	Ty Bulk Industrial Was Food, beverages an Construction and de Wood and wood pro	ry Type A te dibacco emolition ducts	Use in calculations	Degradable organic carbon (Fraction of wet weight) 0.15 0.04 0.43	organic caroon which decomposes in SWDS DOCf (Fraction) 0.7 0.5 0.5	Methane generation rate constant (k) k			
∆ ⊽ dustrial Waste	Class of decomposability A マ Bulk waste Highly decomposable waste Less decomposable waste Moderately decomposable w_	Ty Bulk Industrial Was Food, beverages an Construction and de Wood and wood pro Pulp and paper Turvile	ry Type A te dibacco emolition ducts	Use in calculations	Degradable organic carbon (Fraction of wet weight) 0.15 0.04 0.43 0.4	organic carbon which decomposes in SWDS DOCf (Fraction) 0.7 0.5 0.5	Methane generation rate constant (k) k			
dustrial Waste	Class of decomposability △ ▽ Bulk waste Highly decomposable waste Less decomposable waste Moderately decomposable w_ Bulk waste	Ty Bulk Industrial Was Food, beverages an Construction and de Wood and wood pro Pulp and paper Textile Bulk Municipal Woo	ry Type pe te d tobacco emolition ducts te	Use in calculations	Degradable organic carbon DOC (Fraction of wet weight) 0.15 0.04 0.43 0.4 0.43	organic carbon which decomposes in SWDS DOCf (Fraction) 0.5 0.5 0.5 0.5	Methane generation rate constant (k) k			
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dustrial Waste	Class of decomposability △ ▽ Bulk waste Highly decomposable waste Less decomposable waste Moderately decomposable w Bulk waste Highly decomposable waste	Ty Bulk Industrial Was Food, beverages an Construction and de Wood and wood pro Pulp and paper Textile Bulk Municipal Was Food waste Garden and park	ry Type pe te at tobacco smolition ducts te te	Use in calculations	Degradable organic carbon DOC (Fraction of wet weight) 0.15 0.04 0.43 0.43 0.4 0.44 0.24	organic carbon which decomposes in SWDS DOCf (Fraction) 0.7 0.5 0.5 0.5 0.5 0.5 0.7 0.7	Methane generation rate constant (k) k k			
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dustrial Waste	Class of decomposability A ∀ Bulk waste Highly decomposable waste Less decomposable waste Moderately decomposable w Bulk waste Highly decomposable waste Less decomposable waste Moderately decomposable w	Ty Bulk Industrial Was Food, beverages an Construction and de Wood and wood pro Pulp and paper Textile Bulk Municipal Was Food waste Garden and park Wood Disposable nappies Paper and cardboar Textile	ry Type pe te ad tobacco smolition ducts te te ducts ducts te ducts du	Use in calculations	Degradable organic carbon (Fraction of wet weight) 0.15 0.04 0.43 0.44 0.43 0.44 0.24 0.15 0.22 0.43 0.24 0.43 0.24 0.43	organic carbon which decomposes in SWDS DOCf (Fraction) 0.7 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	Methane generation rate constant (k) k k 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5			
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۵۷	Class of decomposability A ⊽	Ту	гу Туре гре Δ	Use in calculations	Degradable organic carbon DOC (Fraction of wet weight)	organic carbon which decomposes in SWDS DOCf (Fraction)	9 1			

Waste Category			Degradable or	ganic carbon	Degradable organic carbon which decomposes in SWDS	Dry Matter Content	Total Carbon in Dry Matter	Fossil Carb in Total Carl
	♡ Class of decomposability △ ♡		DOC (Fraction of wet weight)	DOC (Fraction of dry weight)	DOCf (Fraction)			(Fraction
Industrial Waste	Bulk waste	Bulk Industrial Waste	0.15		0.5		0.5	
	Highly decomposable waste	Food, beverages and tobacco	0.15	0.38	0.7	0.4	0.38	
	Inert	Petroleum products, Solvents, Plastics			0	1	0.8	
		Rubber	0.39	0.46	0	0.84	0.67	
	Less decomposable waste	Construction and demolition	0.04	0.04	0.5	1	0.24	
_	It is a second s	Wood and wood products	0.43	0.51	0.5	0.85	0.51	
_	Moderately decomposable wa	Pulp and paper	0.4	0.44	0.5	0.9	0.46	(
M. 11. 1944 .	D.H	l extile	0.24	0.3	0.5	0.8	0.5	
Municipal Waste	Bulk waste	Bulk Municipal Waste	0.18	0.20	0.5	0.4	0.20	
<b>1</b>	Highly decomposable waste	Food waste	0.15	0.38	0.7	0.4	0.38	
-	1	Garden and park	0.2	0.49	0.7	0.4	0.49	
_	Inert	Glass			0			
_		Plastic			0		0.75	
-		Plastic	0.20	0.40	0	0.04	0.75	
-	Loss deserves bis wrote	Rubber and leather	0.39	0.46	0.5	0.84	0.67	
-	Moderately, decomposable was	Disperable exercise	0.43	0.5	0.5	0.65	0.5	
-	Moderately decomposable wa	Paper and cardboard	0.24	0.0	0.5	0.4	0.46	
-		Taytile	0.24	0.44	0.5	0.8	0.40	
Other waste	Bulk waste	Clinical waste	0.15	0.23	0.5	0.65	0.5	
Durk waste		Hazardous waste	0.10	0.20	0.5	0.00	0.0	
Sludge	Highly decomposable waste	Industrial sewage sludge	0.09	0.35	0.5			
		Municipal sewage sludge	0.05	0.5	0.5			
stegory, Class and Name of default	t waste types cannot be changed an	d default waste types cannot be deleted.						
stegory, Class and Name of default elected Type of Weight of Waste is	t waste types cannot be changed an a automatically applied in all the relev	d default waste types cannot be deleted. ant worksheets across all the Inventory Years				Sa	ave Und	•
itegory. Class and Name of default slected Type of Weight of Waste in	t waste types cannot be changed an a automatically applied in all the relev	d default waste types cannot be deleted. ant worksheets across all the Inventory Years	Fur	nction	s unde	er Wa	ste Ty	。 pe
itegory, Class and Name of default lected Type of Weight of Waste it	I waste types cannot be changed an a automatically applied in all the relev	d default waste types cannot be deleted. ant worksheets across all the Inventory Years	Fur Ma	nction: nager	s unde	er Was	ste Ty	• • • • • • • • • • • • • • • • • • •
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tegory. Class and Name of default lected Type of Weight of Waste in <b>tions und</b> €	t wate types cannot be changed an a automatically applied in all the relev	d default waste types cannot be deleted. ant worksheets across all the Inventory Years	Fur Ma 1. S the	nctions nager Select pa wet wei	<b>s unde</b> aramete ght or d	er Was ers rela	ste Ty ated to ght	• • • • • • • • • • • • • • • • • • •
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tegory. Class and Name of default lected Type of Weight of Waste in tions unde meters	e wate types cannot be changed an s automatically applied in all the relev	d default waste types cannot be deleted. ant worksheets across all the Inventory Years	Fur Ma 1. s the 2. M DOO	nctions nager Select pa wet wei lanage p C, DOCf	s unde aramete ght or d parame , Dry M	ers rela Iry weig ters as atter C	ste Ty ated to ght sociate	<b>pe</b> eithe ed wi <sup>r</sup> , Tota
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tions unde meters ect waste type s from the dr ect default I	er Waste types cannot be changed an a atomatically appled in all the relev pes use in call lefined DOC a ropdown PCC methan	d default waste types cannot be deleted. art worksheets across all the Inventory Years culation and DOCf	Fur Ma 1. S the 2. M DOO Car in To defa	nctions nager Select pa wet wei lanage p C, DOCf bon in D otal Car ault – Ti	aramete ght or d parame , Dry M Dry Matt bon by er 1 an	ers relatives as atter Carando selection of the first and selection of the first as a ter and selection of the first as a ter and selection of the first and the first and the first as a ter a ter and the first as a ter a	ste Ty ated to ght sociate ontent Fossil ing IPC 2	eithe ed wi , Tota Carb
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OK

#### **Selecting remaining parameters**

#### CH<sub>4</sub> generated <sub>T</sub>



CH₄ generated <sub>T</sub>

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

Cancel

Category Sheet

OK



<ul> <li>IPCC Inventory Software - PHL_SolidWaste - [Wo</li> <li>Application Database Inventory Year</li> </ul>	rksheets] Worksheets Tools Export/Import Reports Window Help	
2006 IPCC Categories	Parameter SWDS Types - Utilization Activity Data Amount Deposited Long Term stored C	in SWDS Harvested Wood Products
□ 4 - Waste □ 4.A - Solid Waste Disposal	Country/Territory Philippines	
<ul> <li>4.A.1 - Managed Waste Disposal Sites</li> <li>4.A.2 - Unmanaged Waste Disposal Sites</li> </ul>	Region Asia - South-East	
4.A.3 - Uncategorised Waste Disposal Sites	Subdivision: Subdivision 1 ~ +	
	Climate Zone Tropical wet	
	Main parameters and Waste Types for selected Subdivision Parameters for HWP (E	Bulk MSW)
	Starting year 1950 🜩 % garden in municipal	waste 0.00 % 🜩
	Delay Time (months) 6 🗢 % paper in municipal w	vaste 0.00 % 🜩
	Fraction of methane (F) in developed gas 0.500	vaste 0.00 % 💠
	Parameters for HWP (B	Julk Industrial Waste)
	X Waste Type Parameters for selected Subdivision	aste 0.00 % 🖶
Uncertainties	% wood in industrial wa	aste 0.00 % 🚖
A A Salid Waster Diseased	Spre Uncertainties Waste Type Manager	
gory 4.A - Solid Waste Disposal		
		These parameters
ivity Data Uncertainties		HWP within the bu
		whore national by
sion Factors Uncertainties	Lineartainties regarding activity data	
s	Uncertainties regarding activity data	utilizing the Waste
ower -5.00 % 🜩 Upper +5.00 % 🜩	and emission factors for solid waste	spreadsheets is ad

disposal can be entered by clicking the "Uncertainties" button.

ssential for computing te option. In instances ste data are lacking, position option in the 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.

copenhagen climate centre

## 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 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
- Managed Managed anaerobic, Managed poorly – semi-aerobic, Managed well – semi-aerobic, Managed poorly – active aeration and Managed well– active aeration
- 8. 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.

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

#### **Selecting remaining parameters**

#### CH<sub>4</sub> generated <sub>T</sub>



CH₄ generated <sub>T</sub>

#### Selecting parameters – Bulk waste data

	IPCC defa	ault value	Count	ry-specific parameters			
			Value	Reference and remarks	-		
tarting year		1950	1950				
OOC (Degradable organic carbon)	Bulk waste da	ata only 🛛 🔻					
(weight fraction, wet basis)	Range	Default					
Bulk MSW	0.08-0.17	0.13	0.13				
ndustrial 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,	i i						
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				
thane generation rate constant (k)	Moist and we	et tropical 💌					Similar to waste compositions optic
(years <sup>-1</sup> )	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				
Deley time (menthe)		e	6				
Delay time (months)		0	0				
Fraction of methane (F) in developed gas		0.5	0.5				
Conversion factor, C to CH <sub>4</sub>		1.33	1.33				
Ovidation factor (OV)		0					
		0	0			14	loop opting for the bulk wests approach
Parameters for carbon storage							men oping for the bulk waste approac
% paper in industrial waste		0%	0%			р	oportion of DOC originating from harves
% wood in industrial waste		0%	0%			to	tal DOC of the waste, before determining
For Harwested Wood Products						st	ored carbon
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				

t's crucial to estimate the wood products within the the quantities of long-term

### 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).

	Parameters S Worksheet	SWDS Types - I	Utilization Activ	rity Data Am	ount Deposited	Long Term sto	ored C in SV/DS	Harvested Woo	d Products						
	Sector:	Waste													2000
	Category:	Methane e	missions from Soli	d Waste Dispo	sal Sites			$\backslash$							000000000
In a manner similar	Subcategory Sheet:	Activity Da	ta												
to the previous	Data	C. Individual of 1			Music	in al Manta		· Coloridated	form Decidation			Tetal Wests asias to	SMDC		
section users have	Subdivision	Subdivision 1		✓ Waste €		apai waste		te Calculated	from Population ~	Waste Type /	Amounts % of	total waste going to	S₩D5 ~		
the ability to input									Composition	of waste going to	solid waste dispo	osal sites.			
dete aubdivision		Dopulation	waste per	Total Wasta	W to SMDS	Total to		Cordon and	Disperable	Deportand					
	Year	(Capita)	capita (kalcaphr)	(Gg)	(%)	SWDS	Food waste	park	nappies	cardboard	Textile	Wood	Inert	Total	
wise and waste			(kg/cap/yi)	10.000	5.3	(Gg)									
category-wise,		A	в	C = A*B*	D	E = C *	% of E	% of E	% of E	% of E	% of E	% of E	% of E	%	
including	1007	70710040	100	100-0	~	(D/100)	42.5			12.0	27	0.0	21	100 - 4	
Municipal Waste,	1998	74491920	190	14153 4648	62	8775 14818	43.5			12.9	2.7	9.9	31	100 2	
Industrial Waste	1999	76249060	190	14487.3214	62	8982.13927	43.5			12.9	2.7	9.9	31	100 📝	
Sludge and Other	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 📝	
waste.	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	07001025	190	16389.6375	62	10161.575	43.5	Ê.		12.9	2.7	9.9	31	100 2	
	2006	86261250	190	16389 6375	62	10161 575	43.5	-		12.5	2.7	9.9	31	100 2	!
	2008	91252326	190	17337.941	62	10749.524	43.5			12.9	2.7	9.9	31	100 2	
	2009	92946951	190	17659.920	62	10949.150	43.5			12.9	2.7	9.9	31	100 📝	
Population (Philip	pine)			47000.070		11140.000								100	
	,														
								_							
Users can input a <b>set c</b>	of data dire	ectly		0						wara provia	los Asia	south			
from an Excel sheet into	o the softw	are by	IPC	C softw	are provide	es -					169 - Wald-	soutii-			
selecting the <b>correspon</b>	nding num	ber of	Philip	pine spe	ecific data	given			east region	n specific sl	nares give	n in the			
rows in the column wit	hin the sof	tware	in th	e IPCC 2	2006 guide	line			IF	PCC 2006 gi	uideline				
intorface	· · · · · · · · · · · · · · · · · · ·														
interface															

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

															1
MSW activity data															
	Entor populat	tion was	0.00	or conito o	nd MSW	wast	0.00	mocrition i	into tho w						
		uut rogio	e pe	er capita a	aivon in t	was bo 2				ellow cells.					
	Industrial way	auit regio sto activit	nai v v da	values alle	yiven in i		uotol	v ctarting i	ennes. In Column						
	IPCC Region		y uc Ite		entereu	sehe		v startinu i							
	I CC Region	2	70	1	50%		110%	0%	130/	10%	30/2	0%	310/	100%	
				I	3370		Com	nosition o	fwaste	noing to s	olid wast	e dispos		10070	
		Watte					com		n waste i	going to s			Plaetice		
		ner		Total	% to								other		
Year	Population	capita		MSW	SWDS	Fo	bod	Garden	Paper	Wood	Textile	Nannies	inert	Total	
	ropulation	- Supra						Curuon	1 upor		Textile	Tuppice		locui	
	millions	kg/cap/	yr	Gg	%	Ģ	%	%	%	%	%	%	%	(=100%)	
1989	60.127343	2	70	16234.38	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1990	61.558898	2	70	16620.9	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1991	63.039751	2	70	17020.73	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1992	64.543525	2	70	17426.75	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1993	66.083321	2	70	17842.5	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1994	67.650283	2	/0 70	18265.58	59%		44%	0%	13%	0 10%	3%	0%	31%	100%	
1995	69.250468	2	/0 70	8697.63	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1996	70.944969			19155.14	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1997	72.718837	L L		19634.09	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1998	74.491918	L K	<u> </u>	20112.82	59%		44%	0%	13%	10%	3%	0%	31%	100%	
2000	70.249004	l f		20007.20	50%		44%	0%	13%	10%	3%	0%	210/	100%	
2000	11.930223		0	21040.72	59%		44%	0%	13%	10%	3%	0%	51%	100%	]
	$\rightarrow$														
The	e IPCC o	ffers r	eg	jional c	lefault	s			N	<b>ASW</b> GENERA	TION AND TR	I ABLE 2.1 EATMENT DAT	A - REGIONAL	DEFAULTS	
for	waste o	genera	atic	on per	capit	a			М	SW Generati	on Fracti	on of F	raction of	Fraction of	Fraction of other
(ka	(can/vk)	and th	e	nercen	tane o	of	R	Region Rate <sup>1, 2, 3</sup> MSW disposed MSW (tonnes/can/yr) to SWDS incinera				MSW cinerated	MSW	MSW managemen	
(19					lage (			sia		conness cups yr	,		cilicrateu	compositeu	unspecifica
was	ste alspo	sea to	0.0	WU5.				Eastern Asia		0.37	0.5	55	0.26	0.01	0.18
								South-Central	Asia	0.21	0.1	74	-	0.05	0.21
		$\mathbf{N}$						South-East As	sia	0.27	0.5	59	0.09	0.05	0.27
							Α	frica <sup>5</sup>		0.29	0.0	59	-	-	0.31
							E	urope							
								Eastern Europ	be	0.38	0.9	90	0.04	0.01	0.02
	Populat	ion (P	hil	lippine				Northern Euro	ope	0.64	0.4	17	0.24	0.08	0.20
	World Poply					Southern Euro	ope	0.52	0.8	35	0.05	0.05	0.05		
	- V	vortal	Dd	пк				western Euro	pe	0.56	0.4	•/	0.22	0.15	0.15
								Caribbean		0.49		22	0.02		0.15
								Central Amer	ica	0.49	0.0	50	-	-	0.13
								South Americ	a	0.26	0.5	54	0.01	0.003	0.46
								North America		0.65 0.5		58	0.06	0.06	0.29
								ceania <sup>6</sup>		0.69	0.8	35	-	-	0.15

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.



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

															1
MSW activity data															
	Entor populat	tion was	0.00	or conito o	nd MSW	wast	0.00	mocrition i	into tho w						
		oult rogio	e pe		aivon in t	was bo 2				ellow cells.					
	Industrial way	auit regio sto activit	nai v v da	values alle	yiven in i		uotol	v ctarting i	ennes. In Column						
	IPCC Region		y uc Ite		entereu	sehe		v startinu i							
	I CC Region	2	70	1	50%		110%	0%	130/	10%	30/2	0%	310/	100%	
				I	3370		Com	nosition o	fwaste	noing to s	olid wast	e dispos		10070	
		Watte					com		n waste i	going to s			Plaetice		
		ner		Total	% to								other		
Year	Population	capita		MSW	SWDS	Fo	bod	Garden	Paper	Wood	Textile	Nannies	inert	Total	
Tour	ropulation	- Supra						Curuon	i upoi	Incou	Textile	Tuppice		locui	
	millions	kg/cap/	yr	Gg	%	Ģ	%	%	%	%	%	%	%	(=100%)	
1989	60.127343	2	70	16234.38	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1990	61.558898	2	70	16620.9	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1991	63.039751	2	70	17020.73	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1992	64.543525	2	70	17426.75	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1993	66.083321	2	70	17842.5	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1994	67.650283	2	/0 70	18265.58	59%		44%	0%	13%	0 10%	3%	0%	31%	100%	
1995	69.250468	2	/0 70	8697.63	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1996	70.944969			19155.14	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1997	72.718837	L L		19634.09	59%		44%	0%	13%	10%	3%	0%	31%	100%	
1998	74.491918	L K	<u> </u>	20112.82	59%		44%	0%	13%	10%	3%	0%	31%	100%	
2000	70.249004	l f		20007.20	50%		44%	0%	13%	10%	3%	0%	210/	100%	
2000	11.930223		0	21040.72	59%		44%	0%	13%	10%	3%	0%	51%	100%	]
	$\rightarrow$														
The	e IPCC o	ffers r	eg	jional c	lefault	s			N	<b>ASW</b> GENERA	TION AND TR	I ABLE 2.1 EATMENT DAT	A - REGIONAL	DEFAULTS	
for	waste o	genera	atic	on per	capit	a			М	SW Generati	on Fracti	on of F	raction of	Fraction of	Fraction of other
(ka	(can/vk)	and th	e	nercen	tane o	of	R	Region Rate <sup>1, 2, 3</sup> MSW disposed MSW (tonnes/can/yr) to SWDS incinera				MSW cinerated	MSW	MSW managemen	
(19					lage (			sia		conness cups yr	,		cilicrateu	compositeu	unspecifica
was	ste alspo	sea to	0.0	WU5.				Eastern Asia		0.37	0.5	55	0.26	0.01	0.18
								South-Central	Asia	0.21	0.1	74	-	0.05	0.21
		$\mathbf{N}$						South-East As	sia	0.27	0.5	59	0.09	0.05	0.27
							Α	frica <sup>5</sup>		0.29	0.0	59	-	-	0.31
							E	urope							
								Eastern Europ	be	0.38	0.9	90	0.04	0.01	0.02
	Populat	ion (P	hil	lippine				Northern Euro	ope	0.64	0.4	17	0.24	0.08	0.20
	World Poply					Southern Euro	ope	0.52	0.8	35	0.05	0.05	0.05		
	- V	vortal	Dd	пк				western Euro	pe	0.56	0.4	•/	0.22	0.15	0.15
								Caribbean		0.49		22	0.02		0.15
								Central Amer	ica	0.49	0.0	50	-	-	0.13
								South Americ	a	0.26	0.5	54	0.01	0.003	0.46
								North America		0.65 0.5		58	0.06	0.06	0.29
								ceania <sup>6</sup>		0.69	0.8	35	-	-	0.15

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.



## 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.

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.

		Waste	Total		
Vear	CDP	generation	industrial waste	% to swps	Total to
Teal	301	Gg/\$m	Waste	34403	31103
	\$ millions	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

## Assessed waste generations

				Amount d	eposited	data	Country	Philippines					
				Countries wi Enter those of	th good inver data onto this	ntory data: s sheet.							
							An	nounts depo	osited in SW	DS			
			Year	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
Year	2000			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
MSW generation (Food waste)	5402.154	Gg		4,266	0	1,265	971	265	0	0	9,806	3,040	1,010
Population	77.95822	millior	ns	4,368	0	1,295	994	271	0	0	10,042	3,113	1,036
Waste per capita	270	kg/ca	p/yr	4,473	0	1,326	1,018	278	0	0	10,282	3,187	1,208
Percentage to SWDS	59%			4,579	0	1,358	1,042	284	0	0	10,527	3,263	1,241
Composition of food waste	43.50%		_	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
L			2000	→ 5,402	0	1,602	1,229	335	0	0	12,419	3,850	1,673
		L	0004	E E40	0	4.000	4.050	240	0	0	40.004	2 0 0 0	4 570

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



copenhagen climate centre

### entered into the software

	Parameters S	SWDS Types - Utilization Activity	Data Amount Deposited	Long Term stored C in SWDS	Harvested Wood Products				
	Sector: Category: Subcategory Sheet: Data	Waste Methane emissions from Solid W 4.A - Solid Waste Disposal Waste Types and Amounts Dep	aste Disposal Sites osited to SWDS						2000
Similar to the	Subdivision	Subdivision 1	V Waste Categ	ory Municipal Waste	~				
users have the	Year	Food waste (Gg)	Garden and park	Disposable nappies (Gg)	Paper and cardboard (Gg)	Textile (Gg)	Wood (Gg)	Inert (Gg)	Total to SWDS (Gg)
ability to check	1985	3548.60183	0	0	1052.34399	220.25804	807.61283	2528.88866	8157.70537
data based on	1996	3635.4331	0	0	1078.09395	225.64757	827.37443	2590.76841	8357.31747
subdivision-wise	1997	3726.33152	0	0	1105.05004	231.28954	848.06166	2655.5466	8566.27935
and waste 🖌	1998	3817.18946	0	0	1131.99411	236.929	868.73967	2720.29593	8775.14818
category-wise,	1999	3907.23058	0	0	1158.69597	242.51776	889.23179	2784.46317	8982.13927
including	2000	3994.81307	0	0	1184.6687	247.95391	909.16435	2846.87828	9183.47832
Municipal Waste,	2001	4080.27952	0	0	1210.01393	253.25873	928.61534	2907.78541	9379.95293
Industrial Waste.	2002	4165.31657	0	0	1235.23181	258.53689	947.9686	2968.38652	9575.44038
Sludge, and Other	2003	4250.2398	0	0	1260.41594	263.80799	967.29595	3028.90652	9770.6662
Waste.	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	TABLE 3.1 (UPDATED) SWDS classification and Methane Correction Factors (MCF)							
categorization of solid	Type of Site	Methane Correction Factor (MCF) Default Values	Remarks					
waste disposal sites	Managed – anacrobic	1.0ª	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 firres) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leaveling of the waste					
aligns more closely with the <b>2019 refinement of</b>	Managed well – semi-aerobic	0.5 <sup>b</sup>	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					
the IPCC guidelines,	Managed poorly – semi-aerobic	0.7°	system and gas ventilation system. When semi-acrobic managed SWDS type is managed under one of the following condition, it is regarded a poor management; (i) condition of sunk of leachat drainage system; (ii) closing of valve of drainage o atmosphere-unopening of drainage exit; (iii) cappin of gas ventilation exit					
default Methane Correction Factor (MCF)	Managed well – active-acration	0.4 <sup>de.f</sup>	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 drving of waste.					
values provided in the 2019 refinement for	Managed poorly – active-aeration	0.7 <sup>f.g.h</sup>	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.					
SWDS that have been newly added.	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 *	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.					



1

## Step 4: Selecting MCF and OX

		.9								For Tier 1 and	d Tier 2 app	proach, IPCC default
	SWDS Types - M	ICF and OX Methane G	enerated Methane Emiss	sions						MCE and OX (	n i Nagu da neg	4
	Worksheet	Washe							2000			
4. A. 1 –	Category:	Methane emissions from	Solid Waste Disposal Sites						2000			
	Subcategory:	4.A.1 - Managed Waste	Disposal Sites	dation Factors								
Managed	Data	SWDS Types - Methane	Conection ractors and Oxi								TABLE 3.1 (UP	DATED) CORRECTION FACTORS (MCF)
	Subdivision	Subdivision 1	~							5405 CLA	Mothene Correction	CORRECTION FACTORS (MCF)
Waste					SWDS					Type of Site	Factor (MCF)	Remarks
<b>D</b> <sup>1</sup>		Managed – anae	robic Mana	ged poorly - semi-aerobic	Managed well – semi-aerobic	Managed poori	iy – active aeration	Managed well – a	ctive aeration		Default Values	These must have controlled placement of waste (i.e.
Sites	Year 1997 1998	MCF (Fraction) ( 1	OX M( Fraction) (Frac 0	F OX tion) (Fraction)	MCF OX (Fraction) (Fraction) 0.5 0.5	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)	Managed – anaerobic	1.0 <sup>a</sup>	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)
	1999	1	0		0.5	0						levelling of the waste.
	2000	1	0		0.5	0			3	Managed well – semi-aerobic	0.5	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 eas ventilation system.
4. A. 2 –	SWDS Types - N Worksheet Sector: Category: Subcategory:	MCF and OX Methane G Waste Methane emissions from 4.A.2 - Unmanaged Wa	Senerated Methane Emis n Solid Waste Disposal Sites iste Disposal Sites	sions					2000	Managed poorly – semi-aerobic	0.7°	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.
Unmanag ed Waste	Sheet: Data Subdivision	SWDS Types - Methan Subdivision 1	e Correction Factors and O	idation Factors	SWDS				-	Managed well – active-aeration	0.4 <sup>d,e,f</sup>	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
			Unm	anaged – shallow		Unm	nanaged – deep					drainage system to avoid the blockage of air penetration, and (i) cover material; (ii) air injection or
Disposal	Vea		MCF	C	x	MCF		ох				gas extraction system without drying of waste.
Sites	1997 1998 1999 2000		(Fraction)	(Frac 0.4 0.4 0.4	0 0 0 0	(Fraction)	0.8 0.8 0.8 0.8	(Fraction)		Managed poorly – active-aeration	$0.7^{\mathrm{f.g.h}}$	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.
	2001			0.4	0		0.8			Unmanaged – deep (>5 m waste) ar	nd 0.8*	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.
	SWDS Types - M	ICF and OX Methane G	enerated Methane Emiss	sions						Unmanaged - shallow (<5 m waste)	0.4 *	All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres
4. A. 3 –	Worksheet Sector: Category:	Waste Methane emissions from	Solid Waste Disposal Sites						2000	Uncategorised SWDS	0.6ª	Only if countries cannot categorise their SWDS into above four categories of managed and unmanaged SWDS, the MCF for this category can be used.
Uncatego	Subcategory: Sheet:	4.A.3 - Uncategorised V SWDS Types - Methane	/aste Disposal Sites Correction Factors and Oxi	dation Factors						Sources: "IPCC (2000); <sup>b</sup> Matsufuji et al. ( Stegmann (2013); <sup>b</sup> Raga & Cossu (2014);	1996); <sup>e</sup> Yamada <i>et al.</i> (2013); <sup>d</sup> I <sup>h</sup> Ritzkowski <i>et al.</i> (2016)	Hrad et al. (2013); "Ishigaki et al. (2003); <sup>f</sup> Ritzkowski &
rised	Subdivision	Subdivision 1	~		SWDS					OX	TABLE 3.2 OXIDATION FACTOR (O	ζ) FOR SWDS
Waste					Uncategorised SWDS					Type of Site		Oxidation Factor (OX)
Diaman		Year		MCF (Fraction)		OX (Fraction)				Managed <sup>1</sup> unmanaged and un	categorised SWDS	Default Values
Disposal	1997				0.6			0 3		Managed covered with CH <sub>4</sub> ox	idising material <sup>2</sup>	0.1
Sites	1999				0.6			0 2		<sup>1</sup> Managed but not covered with our	ated material	
Siles	2000				0.6			0 2		<sup>2</sup> Examples: soil, compost	and a second sec	

	Methane This worksh Enter either Then enter t Totals on ea	In Correction Factor (MCF)         scheet calculates a weighted average MCF from the estimated distribution of site types         her IPCC default values or national values into the yellow MCF cells in row 12         er the approximate distribution of waste disposals (by mass) between site types in the columns below.         each row must add up to 100% (see "distribution check" values)												C	Calculated va	lues for MCF
			MS	W					Indust	trial					MSW	Industrial
	Un- managed,	Un- managed,	Managad	Managed, semi-	Uncate-	Distri- bution	Un- managed,	Un- managed,		Managed, semi-	Uncate-	Distri- bution	Deference ( remarks			
	MCE	MCE	MCF	MCE	MCF	Спеск	MCE	MCE	MCF	MCE	MCE	Спеск	References / remarks			
IPCC default	0.4	0.8	1	0.5	0.6		0.4	0.8	1	0.5	0.6				Weighted	Weighted
Country-specific value	0.4	0.8		0.5	0.6		0.4	0.8	1	0.5	0.6				average MCF for MSW	average MCF for Industrial Waste
	Die	tribution of	Meete by	Maata Manag	amont Tre		Die	tribution of l	Neete by V	Veete Mener	amont Turn					
"Fixed" Country	Dis	stribution of	waste by	waste manag	lement typ		Dis	tribution of	waste by v	vaste manag	ement Type					
specifc value	25%	30%	25%	5%	15%	Total	20%	30%	25%	5%	20%	Total				
Year		%	%	%	%	(100%)	%	%	%	96	%	(100%)			wt. fraction	wt. fraction
1995	23%	30%	25%	5%	15%	00%	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 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.

	А	В	
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

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.

TABLE 3.1 SWDS CLASSIFICATION AND METHANE CORRECTION FACTORS (MCF)									
Type of Site Methane Correction Factor (MCF) Default Values									
Managed – anaerobic <sup>1</sup>	1.0								
Managed – semi-aerobic <sup>2</sup>	0.5								
Unmanaged <sup>3</sup> – deep ( >5 m waste) and /or high water table	0.8								
Unmanaged <sup>4</sup> – shallow (<5 m waste)	0.4								
Uncategorised SWDS <sup>5</sup>	0.6								

Anarrobic 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.

<sup>2</sup> 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 vertilation system.

<sup>3</sup> 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.

<sup>4</sup> Unmanaged shallow solid waste disposal sites; All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres.

<sup>5</sup> 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 a from all SWDS	amount of methane recovered										
	Amount of Methane Recovered from SWDS	References / remarks	Fraction recovered methane	Methane oxidised (OX)	References/remarks							
IPCC default	0			0								
Year	Gg			Fraction								
1900	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 -       Worsteet         Managed       Waste Category:       Methane emissions from Sold Waste Disposal Sites         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subcategory:       Methane emissions from Sold Waste Disposal Sites       3         Subdivision       Subdivision       North of reaction start (M)       13       exp2=exp{k*((13-M)/12))         Manual deposited       MCF       Decomposable DOC (DDOCm)       DDOCm decomposed       DDOCm accumulated in SWDS       DDOCm decomposed (Gg)         Year       W       MCF       D = W * DOC * DOC * MCF       B = D * exp2       C = D * (1-exp2)       H = B + (Hy(-1) * exp1)       E = C + H(y-1) * (1-exp1)         1996	2000 DOCF 0.7 iraction 0.5 CH4 generated (Gg) Q = E * 16/12 * F 87 59.30324
Managed       Data       Subdivision       SWDS Type       Managed - anaerobic       Waste Category       Municipal Waste       Waste Type       Food waste       DOC       0.15         Waste       Disposal       k       0.4       Half-life time (h=ln(2)/k)       1.7329679513;       exp1=exp(-k)       0.67032004603;       Month of reaction start (M)       13       exp2=exp(-k*((13-M)/12))       1       CH4 F         Disposal       Amount deposited       MCF       Decomposable DOC (DDOCm) deposited       DDOCm decomposed (Gg)       DDOCm decomposed 	DOCF 0.7 raction 0.5 CH4 generated (Gg) Q = E * 16/12 * F 87 59.30324
Waste       k       0.4       Half-life time (h=h(2)/k)       1.7328679513?       exp1=exp(k)       0.67032004603?       Month of reaction start (M)       13       exp2=exp(k*((13-M)/12))       1       CH4 F         Disposal       Amount deposited (Gg)       MCF (Fraction)       Decomposable DOC (DDOCm) deposited (Gg)       DDOCm accumulated in SWDS in deposition year (Gg)       DDOCm accumulated in SWDS at the end of year       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year (Gg)       DDOCm accumulated in SWDS at the end of year       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year       DDOCm accumulated in SWDS at the end of year       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year       DDOCm accumulated in SWDS at the end of year       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year       DDOCm accumulated in SWDS at the end of year       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year       DDOCm accumulated in SWDS at the end of year       DDOCm decomposed (Gg)       DDOCm accumulated in SWDS at the end of year       DDOCm accumulated in	CH4 generated (Gg) Q = E * 16/12 * F 37 59.30324
Virustice Disposal         Amount deposited (Gg)         MCF (Fraction)         Decomposable DOC (DDOCm) deposited (Gg)         DDOCm decomposed position year (Gg)         DDOCm decomposed in deposition year (Gg)         DDOCm decomposed at the end of year (Gg)           1996         908.85827         1         95.43012         95.43012         0         276.29713         88.954           1997         931.5828         1         97.8162         97.8162         0         289.91769         93.307           1999         97.68.0765	CH4 generated (Gg) Q = E * 16/12 * F 37 59:30324
Cisposal Sites         (Gg)         (Fraction)         Objection (Gg)         deposition year (Gg)         Indeposition year (Gg)	(Gg) Q = E * 16/12 * F 87 59.30324
Year         W         MCF         D = W * DOC * DOC f * MCF         B = D * exp2         C = D * (1-exp2)         H = B + (H(y-1) * exp1)         E = C + H(y-1) * (1-exp1)           1996         908.85827         1         95.43012         95.43012         0         276.29713         88.954           1997         931.58288         1         97.8162         97.8162         0         283.02371         91.089           1998         954.29736         1         100.20122         100.20122         0         289.91769         933.077           1999         976.80765         1         104.95284         102.5648         0         290.90244         95.580           2000         999.70237         1         104.95284         104.95284         0         203.9255         97.925	Q = E * 16/12 * F 87 59.30324
1996         908.85827         1         95.43012         95.43012         0         276.29713         88.994           1997         931.58288         1         97.8162         97.8162         0         283.02371         91.089           1998         954.29736         1         100.20122         0         289.91769         93.307           1999         976.60765         1         100.26648         102.5648         0         296.9024         95.580           2000         989.7027         1         104.96294         104.96294         0         209.925         97.925	87 59.30324
1998         957.3020         1         0.0102         0.0102         0         289.9176         31.863           1998         954.29736         1         100.20122         0         289.91769         93.307           1999         976.80765         1         102.5648         102.5648         0         296.90244         95.580           2000         999.70237         1         104.96264         104.96284         0         209.9925         97.807	63 60 72642
1999         976.80765         1         102.5648         102.5648         0         296.90244         95.580           2000         999.7027         1         104.96264         104.96284         0         209.9025         97.807	24 62 20483
2000 000 70007 1 104 0004 104 0004 0 2005 07 007	05 63.72003
	78 65.25519
Worksheet Sector: Waste Category: Methane emissions from Solid Waste Disposal Sites Subcategory: 4.0.2. Unmanaged Waste Disposal Sites Sheet: 1 e Generated across SWDS Typ 2 Vaste Types 3 (4)	200
Data       Subdivision 1       SWDS Type       Unmanaged - shallow       Waste Category       Municipal Waste       Waste Type       Food waste       > DOC       0.15	DOCF 0.7
d Waste k 0.4 Half-life time (h=ln(2)/k) 1.73286795135 exp1=exp(-k) 0.670320046035 Month of reaction start (M) 13 exp2=exp(-k*((13-M)/12)) 1 CH4	Fraction 0.5
VISPOSAL Amount deposited (Gg) MCF (Fraction) Decomposable DOC (DDOCm) deposited (Gg) (Gg) DDOCm not reacted in deposition year (Gg) (Gg) DDOCm decomposed in deposition year (Gg) (Gg) (Gg) (Gg) (Gg) (Gg) (Gg) (Gg)	CH4 generated (Gg)
Sites         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
<b>1997</b> 931.58288 0.4 39.12648 39.12648 0 113.20948 36.4	3585 24.29057
<b>1998</b> 954.29736 0.4 40.08049 0 115.95708 337.3	3229 24.88193
1333 376,80/65 0.4 41.02592 0 118,76038 38.2 2000 999 70227 0.4 41.02592 0 118,76038 38.2	3202 25.48801 5211 26.10209
2000         356,70527         0.4         41,94554         0         121,5534         351           2001         1020,06988         0.4         42,84294         42,84294         0         124,32262         40,07	7372 26.71581
SW/DS Types - MCF and OX Methane Generated Methane Emissions	
Worksheet Sector: Waste	200
A. 3 - Category: Methane emissions from Solid Waste Disposal Sites Subcategory: 3 - Uncategorised Waste Disposal Sites	
A. 3 - Category: Methane emissions from Solid Waste Disposal Sites Subcategory: 3. Uncategorised Waste Disposal Sites Sheet: 1 ane Generated across SWDS 2 d Waste Types Data Subdivision Subdivision 1 v SWDS Type Uncategorised SWDS v Waste Category Municipal Waste v Waste Type Food waste v DOC 0.15	DOCF 0.7
A. 3 -       Category: Methane emissions from Solid Waste Disposal Sites         Subcategory: A 3 - Uncategorised Waste Disposal 2 d Waste Types       3         A. 3 -       A 3 - Uncategorised Waste Disposal 2 d Waste Types         Sheet: Data       3         Subdivision       Subdivision 1 v         SWDS Type       Uncategorised SWDS v         Waste Category       Municipal Waste v         Waste Type       Doc 0.15         rised       k         0.4       Half-life time (h=ln(2)/k)         1.73286795135       exp1=exp(k)         0.670320046035       Month of reaction start (M)         13       exp2=exp(k*((13-M)/12))	DOCF 0.7
<ul> <li>A. 3 - Category: Methane emissions from Solid Waste Disposal Sites</li> <li>Subcategory: A 3 - Uncategorised Waste Disposal 2 d Waste Types</li> <li>Sheet: A 3 - Uncategorised Waste Disposal 2 d Waste Types</li> <li>Data</li> <li>Subdivision Subdivision 1 v SWDS Type Uncategorised SWDS v Waste Category Municipal Waste v Waste Type Food waste v DOC 0.15</li> <li>k 0.4 Half-life time (h=h(2)/k) 1.7328679513 exp1=exp(k) 0.67032004603 Month of reaction start (M) 13 exp2=exp(k*((13-M)/12)) 1 CH4</li> <li>Waste</li> <li>Mount deposited MCF (Gg)</li> <li>MCF (Gg)</li> <li>MCF (Gg)</li> </ul>	DOCF 0.7 Fraction 0.5 CH4 generated (Gg)
A. 3 -       Category:       Methane emissions from Solid Waste Disposal Sites         Subcategory:       A: Uncategorised Waste Disposal 2 d Waste Types       3         Category:       A: Uncategorised Waste Disposal 2 d Waste Types       3         Data       Subdivision       Subdivision 1        SWDS Type         Data       Subdivision       Subdivision 1        SWDS Type         Vaste       A. 4       Half-life time (h=ln(2)/k)       1.7328679513!       exp1=exp(+k)       0.67032004603!       Month of reaction start (M)       13       exp2=exp(+k*((13-M)/12))       1       CH4         Waste       Amount deposited       MCF       Decomposable DOC (DDOCm)       DDOCm not reaction year (Gg)       DDOCm decomposed in deposited in deposition year (Gg)       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year (Gg)       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year (Gg)       DDOCm decomposed (Gg)       DDOCm decomposed (Gg)       DDOCm decomposed (Gg)       DDOCm decomposed in deposition year (Gg)       DDOCm decomposed (Gg)       C = D * (1-exp2)       H = B + (H(y-1) * exp1)       E = C + H(y-1) * (1-exp1)	DOCF 0.7
A. 3 -       Category:       Methane emissions from Solid Waste Disposal Sites         Subcategory:       A: 3 - Uncategorised Waste Disposal 2 d Waste Types       3       4         Incategory:       A: 3 - Uncategorised Waste Disposal 2 d Waste Types       3       4         Data       Subcivision       Subdivision 1        SWDS Type       Uncategorised SWDS        Waste Category       Municipal Waste        Waste Type       DOC 0.15         rised       k       0.4       Half-life time (h=ln(2)/k)       1.7328679513!       exp1=exp(+k)       0.67032004603!       Month of reaction start (M)       13       exp2=exp(+k*((13-M)/12))       1       CH4         Vaste       Amount deposited (Gg)       MCF       Decomposable DOC (DDOCm)       DDOCm not reacted in deposition year (Gg)       DDOCm accumulated in SWDS       DDOCm decomposed in deposition year (Gg)       DDOCm decomposed (Gg)       DDOCm	DOCf         0.7           f Fraction         0.5           CH4 generated (Gg)           Q = E * 16/12 * F           9227         21.8615
A. 3 -       Category:       Methane emissions from Solid Waste Disposal Sites         Subcategory:       13 - Uncategorised Waste Disposal       2 d Waste Types       3       4         Icategory:       13 - Uncategorised Waste Disposal       2 d Waste Types       3       4         Data       Subcategory:       1	DOCf         0.7           # Fraction         0.5           CH4 generated (Gg)           Q = E * 16/12 * F           9227         21.8615           9061         22.3937
A. 3 -       Category:       Methane emissions from Solid Waste Disposal Sites         Subcategory:       A: 3 - Uncategorised Waste Disposal       A: 3 - Uncategorised Waste Disposal         Sheet:       1 and Generated across SWDS       2 d Waste Types       3         Data       Subcategory:       1 and Generated across SWDS       2 d Waste Types       4         Vaste       Vaste       Vaste Type       Vaste Type       Doc 0.15         k       0.4       Half-life time (h=ln(2)/k)       1.7328679513!       exp1=exp(+k)       0.67032004603!       Month of reaction start (M)       13       exp2=exp(+k*((13-M)/12))       1       CH4         Vaste       Amount deposited       MCF       Decomposable DOC (DDOCm)       DDOCm not reacted in deposition year (Gg)       DDOCm accumulated in SWDS at the end of year (Gg)       DDOCm decomposed (Gg)       DD(M decomposed (Gg)       DDOCm decomposed (Gg)       DD(M decompose	DOCf         0.7           Fraction         0.5           CH4 generated (Gg)           Q = E * 16/12 * F           9227         21.8615           9061         22.3937           0882         22.9392

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

(1)

2

(3)

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

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**

Carte								
Sector:	Waste							200
Category:	Methane emissions	from Solid Waste Di	sposal Sites					
Subcategory	: 4.A 1 Managed W	Vaste Disposal Sites		6				
Data	Menerate	d across SWDS Type	es te Types	(3	5)	4		
Subdivision	Subdivision 1	SWDS Type	Managed - anaerobic	Waste Category	Municipal Waste 🗸	Waste Type Food waste	V DOC 0.15 DO	Cf 0.7
	11-15-15-15-15-15-15-15-15-15-15-15-15-1			10040000		12		0.5
<b>K</b> <u>0.4</u>	Hart-Ire time	e (n=In(2)/k) 1./3	328679513: exp1=exp(-k) 0.67032	2004603: Month	of reaction start (M)	13 exp2=exp(-k ((13-M	(/12)) 1 CH4 Hacti	on <u>0.5</u>
			Decomposable DOC (DDOCm)	DDOCm not	DDOCm decomposed	DDOCm accumulated in SWDS		
	Amount deposited	MCF (Erection)	deposited	reacted in	in deposition year	at the end of year	DDOCm decomposed	CH4 generated
	(09)	(riacion)	(Gg)	(Gg)	(Gg)	(Gg)	(89)	(09)
Year	w	MCF	D = W * DOC * DOCf * MCF	B = D * exp2	$C = D^{*}(1-exp2)$	$H = B + (H(v_{-1}) * exp1)$	F = 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 3030
1997	931 58288	1	97.8162	97 8162	0	283.02371	91.08963	60.7264
1998	954 29736	1	100 20122	100 20122	0	289 91769	93 30724	62 2049
1999	976 80765	. 1	102 5648	102 5648	0	296 90244	95 58005	63 7200
2000	998 70327	1	104 86384	104 86384	0	303.8835	97.88278	65 255
2001	1020.06988	1	107 10734	107 10734	0	310.80654	100 1843	66 789
2001	1020.00000		107.10734	107.107.04		010.00004	100.1040	00.7000
CUDCT	MOT LOV Hat	Concerta in						
SWUS Types -	- MCF and UX Metha	ane Generated Me	ethane Emissions					
Vvorksheet	Wante							20
Sector.	Waste	from Solid Wanto D	innonal Sites					20
Subcategory.	<ul> <li>A 2 - Llomanage</li> </ul>	d Waste Disposal Sit						
Sheet:	- Generate	ed across SWDS Typ	Waste Types					
Data				(3)		4		
Subdivision	Subdivision 1	SWDS Type	Unmanaged - shallow	Waste Category	Municipal Waste V	Waste Type Food waste	V DOC 0.15 D	OCF 0.7
k 0.4	Halt-life time	e (h=ln(2)/k) 1./	3286/9513t exp1=exp(-k) 0.6/03	20046035 Month	n of reaction start (M)	13 exp2=exp(-k*((13-k	()/12)) 1 CH4 Fract	tion 0.5
				DDOCm not	DDOOR deserved	DDOG		
	Amount deposited	MCF	Decomposable DOC (DDOCm) deposited	DDOCm not reacted in	DDOCm decomposed in deposition year	DDOCm accumulated in SWDS at the end of year	DDOCm decomposed	CH4 generated
	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Go)	DDOCm decomposed in deposition year (Gg)	DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg)	CH4 generated (Gg)
	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	Amount deposited (Gg) W	MCF (Fraction) MCF	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF	DDOCm not reacted in deposition year (Gg) B = D * exp2	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2)	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1)	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1)	CH4 generated (Gg) Q = E * 16/12 * F
Year 1997	Amount deposited (Gg) W 931.58288	MCF (Fraction) MCF 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2)	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585	CH4 generated (Gg) Q = E * 16/12 * F 24.290
Year 1997 1998	Amount deposited (Gg) W 931.58288 954.29736	MCF (Fraction) MCF 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2)	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881
Year 1997 1998 1999	Amount deposited (Gg) W 931.58288 954.29736 976.80765	MCF (Fraction) MCF 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488
Year 1997 1998 1999 2000	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327	MCF (Fraction) MCF 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102
Year 1997 1998 1999 2000 2001	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 40.08049 41.02592 41.94554 42.84294	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.7150
Year 1997 1998 1999 2000 2001	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715
Year 1997 1998 1999 2000 2001 SWDS Types	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet	Amount deposited (Gg) 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 ane Generated M	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector:	Amount deposited (Gg) 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category:	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions           Xisposal Sites	DDOCm not reacted in deposition year (Gg) B = D * exp2 39,12648 40,08049 41,02592 41,94554 42,84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission y: 43 - Uncategor	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Subcategory Sheet:	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission 3 - Uncategor ane Generat	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions           Disposal Sites           2           d Waste Types	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C = O * (1-exp2) C = O * (0 C = O * (0) C =	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory: Subcategory: Subcategory: Data	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission y: 13 - Uncategor ane Generatu	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions           Naposal Sites           2           d Waste Types	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.9.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (Hy-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43595 37.3229 38.23202 39.15311 40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Sheet: Data Subdivision	Amount deposited (G9) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission Y: 13 - Uncategor ane Generat	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites Od Waste Types Uncategorised SWDS	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.9.12648 40.08049 41.02592 41.94554 42.84294	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg)           E = C + H(y-1) * (1-exp1)           36.43585           37.3229           38.23202           39.15311           40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 20 20 20 20 20 20 20
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Sheet: Data Subdivision	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission y: 1 ane Generate Subdivision 1	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites 2 d Waste Types Uncategorised SWDS	DDOCm not reacted in deposition year (Gg) B = D * exp2 39,12648 40,08049 41,02592 41,94554 42,84294 42,84294 Waste Category	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 113.20948 115.96708 118.76098 121.5534 124.32262	DDOCm decomposed (Gg)           E = C + H(y-1) * (1-exp1)           36.43585           37.3229           38.23202           39.15311           40.07372	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715 26.715 26.715 26.715 26.715 26.715 26.715 26.715 26.715 21 21 21 21 21 21 21 21 21 21 21 21 21
Year 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Sheet: Data Subcategory Sheet: Data	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission y: 1 3 - Uncategor ane Generatu Subdivision 1 Half-life tim	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.94554           42.84294           ethane Emissions           Disposal Sites           Q           Uncategorised SWDS           Y3286795133;           exp1=exp(-k;)           0.6703	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294 24.94254 42.84294 Waste Category 320046035 Mont	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 113.20948 115.96708 118.76098 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(-k*((13-	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.2302 39.15311 40.07372 DOC 0.15 C M)/12)) 1 CH4 Frac	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715 26.715 20000 0.7 20000 0.7
Vear 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Sheet: Data Subclivision k 0.4	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission 3 - Uncategor ane Generate Subdivision 1 Half-life tim	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites 2 d Waste Types Uncategorised SWDS ✓ 73286795135 exp1=exp(+k) 0.6705 Decomposable DOC (DDOC=)	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294 30.08049 41.02592 41.94554 42.84294 30.08049 40	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*((13- 13) = 2000 m accumulated in SMDS	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372 DOC 0.15 D MJ/12)) 1 CH4 Frac	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715 21 20000 0.7 0.5
Vear 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Sheet: Data Subdivision k 0.4	Amount deposited (G9) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission Subdivision 1 Half-life tim Amount deposited	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Naposal Sites 2 d Waste Types Uncategorised SWDS 7328679513! exp1=exp(+k) 0.6703 Decomposable DOC (DDOCm) deposited	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.9.12648 4.0.08049 4.1.02592 4.1.94554 4.2.84294 3.004603 Waste Category 32004603 Mont DDOCm not reacted in	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (Hy-1) * exp1) 113.20948 115.96708 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*((13- DDOCm accumulated in SWDS at the end of year	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43505 37.3229 38.23202 39.15311 40.07372 DOC 0.15 D M)/12)) 1 CH4 Frac DDOCm decomposed	CH4 generated (Gg) Q = E + 16/12 + F 24.290 24.881 25.488 26.102 26.715
Vear 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategory Subcategory Subcategory Subcategory Subcategory Subcategory Subcategory Subcategory Subcategory	Amount deposited (G9) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission Y: 13 - Uncategor ane Generatu Subdivision 1 Half-life tim Amount deposited (Gg)	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.02592           41.94554           42.84294           ethane Emissions           Disposal Sites           Q           d Waste Types           Uncategorised SWDS           73286795135           exp1=exp( <b>k</b> )           0.6703           Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.9.12648 40.08049 41.02592 41.94554 42.84294 32046035 Waste Category 320046035 Mont reacted in deposition year	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*'((13- DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372 DOC 0.15 D MJ/12)) 1 CH4 Frac DDOCm decomposed (Gg)	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.100 26.715 26.715 200Cf 0.7  cH4 generated (Gg)
Vear 1997 1998 1999 2000 2001 SwDS Types Worksheet Sector: Category: Subcategory: Subcategory: Sheet: Data Subdivision k 0.4	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission 3 - Uncategor ane Generato Subdivision 1 Half-life tim Amount deposited (Gg)	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites 2 d Waste Types Uncategorised SWDS ~ T328679513; exp1=exp(-k) 0.6700 Decomposable DOC (DDOCm) deposited (Gg)	DDOCm not reacted in deposition year (Gg) B = D * exp2 39,12648 40,08049 41,02592 41,94554 42,84294 42,84294 Waste Category 320046035 Mont reacted in deposition year (Gg)	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 113.20948 115.96708 118.76098 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*((13-10)) DDOCm accumulated in SWDS at the end of year (Gg)	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36 43585 37.3229 38 2302 39 15311 40.07372 DOC 0.15 D M)/12)) 1 CH4 Frac DDOCm decomposed (Gg)	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 26.715 20 20 20 20 CH4 generated (Gg)
Vear 1997 1998 1999 2000 2001 SWDS Types Worksheet Sector: Category: Subcategor Sheet: Data Subdivision k 0.4	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission 3 - Uncategor ane Generat Subdivision 1 Half-life tim Amount deposited (Gg) W	MCF (Fraction)           MCF           0.4           0.5           SWDS Type           MCF           MCF	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites 2 d Waste Types Uncategorised SWDS ✓ T3286795135 exp1=exp(k) 0.6703 Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF	DDOCm not reacted in deposition year (Gg) B = D * exp2 39.12648 40.08049 41.02592 41.94554 42.84294 2004603 Waste Category 32004603 Mont DDOCm not reacted in deposition year (Gg) B = D * exp2	DDOCm decomposed in deposition year (G9) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*((13- DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1)	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.2302 39.15311 40.07372 DDOC 0.15 D M)/12)) 1 CH4 Frac DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1)	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 20 00Cf 0.7 tion 0.5 CH4 generated (Gg) Q = E * 16/12 * F
Vear 1997 1998 1999 2000 2001 2001 SWDS Types Worksheet Sector: Category: Subcategory Sheet: Data Subdivision k 0.4	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission Subdivision 1 Half-life tim Amount deposited (Gg) W 558.94973	MCF (Fraction) MCF 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Naposal Sites 2 d Waste Types Uncategorised SWDS Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 3 35.21383	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.12648 40.08049 41.02592 41.94554 42.84294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.24294 3.2521383 3.2521383	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C C C C C C C C C C C C C C C C C C	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (Hy-1) * exp1) 113.20948 115.96708 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*((13- DDOCm accumulated in SWDS at the end of year (Gg) H = B + (Hy-1) * exp1) 2 101.88854	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43505 37.3229 38.23202 39.15311 40.07372 DOC 0.15 D M)/12)) 1 CH4 Frac DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 32.79227	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.100 26.715 26.715 2000F 0.7 tion 0.5 CH4 generated (Gg) Q = E * 16/12 * F 21.86
Year 1997 1998 1999 2000 2001 SwDS Types Worksheet Sector: Category: Subcategor Sheet: Data Subdivision k 0.4 Year 1997 1998	Amount deposited (G9) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission Y 1 are Generat Subdivision 1 Half-life tim Amount deposited (G9) W 558.94973 572.57842	MCF           (Fraction)           MCF           0.4           0.5           WOS Type           MCF           (Fraction)           MCF           0.6           0.6	Decomposable DOC (DDOCm) deposited (Gg)           D = W * DOC * DOCf * MCF           39.12648           40.08049           41.02592           41.02592           41.94554           42.84294           ethane Emissions           Xaposal Sites           Q           dWaste Types           Uncategorised SWDS           V3286795135           exp1=exp(+k)           0.6700           deposited (Gg)           D = W * DOC * DOCf * MCF           3           35.21383           36.07244	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.9.12648 40.08049 41.02592 41.94554 42.84294 Waste Category 320046035 Mont reacted in deposition year (Gg) B = D * exp2 3.35.21383 4.36.07244	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C C = D * (1-exp2) C DDOCm decomposed in deposition year (Gg) C = D * (1-exp2)	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262 Waste Type Food waste 13 exp2=exp(+*((13- DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 0 101.88854 2 104.37037	DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 36.43585 37.3229 38.23202 39.15311 40.07372 DOC 0.15 D MJ/12)) 1 CH4 Frac DDOCm decomposed (Gg) E = C + H(y-1) * (1-exp1) 32.79227 33.59061	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.100 26.715 26.715 200Cf 0.7  CH4 generated (Gg) Q = E * 16/12 * F 21.86 22.393
Year           1997           1998           1999           2000           2001           2001           SwDS Types           Worksheet           Sector:           Category:           Subdivision           k         0.4           Year           1998           1999	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission 3 - Uncategor ane Generat Subdivision 1 Half-life tim Amount deposited (Gg) W 558.94973 572.57842 586.08459	MCF (Fraction)           MCF           0.4           0.6           0.6           0.6	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites 2 d Waste Types Uncategorised SWDS Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 3 35.2138 3 36.07244 3 6.07244 3 6.9233	DDOCm not reacted in deposition year (Gg) B = D * exp2 39,12648 40,08049 41,02592 41,94554 42,84294 42,84294 42,84294 42,84294 42,84294 42,84294 42,84294 42,84294 42,84294 42,84294 40,00046035 Mont DDOCm not reacted in deposition year (Gg) B = D * exp2 3 35,21383 4 36,92343 3 6,92343	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C = D * (1-exp2) C = D * (1-exp2) Municipal Waste A for reaction start (M) DDOCm decomposed in deposition year (Gg) C = D * (1-exp2)	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 113.20948 115.96708 118.76098 121.5534 124.32262 Waste Type Food waste 13 exp2-exp(+*((13-1)) DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp 1) 101.88854 D 104.37037 104.37037	DDOCm decomposed (Gg)           E = C + H(y-1) * (1-exp1)           36.43585           37.3229           38.23202           39.15311           40.07372           ODOC         0.15           MJ/12))         1           CH4 Fract           DDOCm decomposed (Gg)           E = C + H(y-1) * (1-exp1)           32.79227           33.59061           34.40882	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 25.488 26.102 26.715 20 20 20 20 CH4 generated (Gg) Q = E * 16/12 * F 21.861 22.393 22.933
Year           1997           1998           1999           2000           2001           SWDS Types           Worksheet           Sector:           Category:           Subcitegory:           Worksheet:           Data           Subcitegory:           K:         0.4           Year           1997           1998           2000	Amount deposited (Gg) W 931.58288 954.29736 976.80765 998.70327 1020.06988 - MCF and OX Meth Waste Methane emission 3 - Uncategor ane Generate Subdivision 1 Half-life tim Amount deposited (Gg) W 558.94973 572.57842 586.08459 599.22136	MCF (Fraction)           MCF           0.4           0.6           0.6           0.6	Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 39.12648 40.08049 41.02592 41.94554 42.84294 ethane Emissions Disposal Sites 2 d Waste Types Uncategorised SWDS ✓ 3286795135 exp1=exp(+k) 0.6703 Decomposable DOC (DDOCm) deposited (Gg) D = W * DOC * DOCf * MCF 5 35.21383 3 6.07244 3 36.07244 3 36.775095	DDOCm not reacted in deposition year (Gg) B = D * exp2 3.12648 40.08049 41.02592 41.94554 42.84294 Waste Category 320046035 Mont DDOCm not reacted in deposition year (Gg) B = D * exp2 3.52.1383 4.36.07244 3.36.07234	DDOCm decomposed in deposition year (Gg) C = D * (1-exp2) C O O O O O O O O O O O O O O O O O O	DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 113.20948 115.96708 118.76098 121.5534 124.32262 Waste Type Food waste 13 exp2-exp(+*((13- DDOCm accumulated in SWDS at the end of year (Gg) H = B + (H(y-1) * exp1) 101.88854 104.37037 106.88488 109.38806	DDOCm decomposed (Gg)           E = C + H(y-1) * (1-exp1)           36.43595           37.3229           38.23202           39.15311           40.07372           DOC           0.15           DOC           MJ/12))           1           CH4 Frac           DDOCm decomposed (Gg)           E = C + H(y-1) * (1-exp1)           32.79227           33.59061           34.40832           35.2378	CH4 generated (Gg) Q = E * 16/12 * F 24.290 24.881 26.102 26.715 26.715 20 00CF 0.7 

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

me Parameters					
per analitetere					DOOF
				abic	DOCI
waste Category		waste i ype / industry i ype		organic carbon	decomposes in SWDS
<b>۵</b> 7	Class of decomposability A ▽	Туре 🛆	Use in calculations	DOC (Fraction of wet weight)	DOCf (Fraction)
ustrial 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			
nicipal Waste	Bulk waste	Bulk Municipal Waste			
	Highly decomposable waste	Food waste	Solution	0.15	0.7
		Garden and park	S	0.2	0.7
	Less decomposable waste	Wood		0.43	0.5
	Moderately decomposable w	Disposable nappies	S	0.24	0.5
		Paper and cardboard	Sec.	0.4	0.5
		Textile	$\sim$	0.24	0.5

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



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

(1)

(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

**Methane Emissions** 

4. A. 2 – Unmanag ed Waste Disposal Sites





## **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**.

	Param	Parameters SWDS Types - Utilization Activity Data Amount Deposited Long Term stored C in SWDS Harvested Wood Products								
	Sector Cates Subc Shee	sheet or: gory: sategory: st:	Waste Methane emissions frr 4.A - Solid Waste Dis Long≹erm stored C in	om Solid Waste Disposal Site posal SWDS	es					2000
Similar to the	Subo	division	Subdivision 1	✓ Wa:	ste Category Municipal Wa	aste 🗸				
users have the		Yer	Food waste (Gg / Year)	Garden and park (Gg / Year)	Ulsposable 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)
ability to check		1984	86.99842	0	0	114.66459	14.39974	94.59829	310.66104	7311.3098
data based on		1985	89.10807	0	0	117.44512	14.74892	96.89223	318.19435	7629.50415
subdivision-wise		1986	91.21688	0	0	120.22455	15.09797	99.18525	325.72464	7955.22879
and waste		1987	93.33895	0	0	123.02145	15.44921	101.4927	333.3023	8288.53109
category-wise		1988	95.51857	0	0	125.89421	15.80997	103.86272	341.08547	8629.61655
including		1989	97.74807	0	0	128.8327	16.17899	106.28698	349.04673	8978.66328
Municipal Waste		1990	100.07533	0	0	131.90005	16.56419	108.81754	357.35712	9336.0204
Industrial Waste		1991	102.48272	0	0	135.07302	16.96266	111.43524	365.95364	9701.97404
Sludge and Other		1992	104.9274	0	0	138.29511	17.36729	114.09347	374.68327	10076.6573
Sludge, and Other		1993	107.43061	0	0	141.59436	17.78162	116.81535	383.62194	10460.27924
waste.		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**.

	Parameters SW Worksheet Sector: Category: Subcategory: Sheet: Data	/DS Types - Utilization Waste Methane emissions 4.A - Solid Waste I Harvested Wood F	on Activity Data s from Solid Waste Di Disposal Products	Amount Deposited	Long Term store	ed C in SWDS	larvested Wood Pro	oducts					2000
Similar to the	Subdivision S	Subdivision 1	~										
previous sections,		L	ong-term stored C		Long-ter	m stored C accur	nulated		CH4 generated			CH4 emitted	
users have the	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)
ability to check	1984	0	114.66459	94.59829	0	2698.59503	2226.3409	0	53.18707	31.46328	0	53.18707	31.46328
data based on	1985	0	117.44512	96.89223	0	2816.04016	2323.23313	0	54.75932	32.55023	0	54.75932	32.55023
subdivision wise	1986	0	120.22455	99.18525	0	2936.2647	2422.41838	0	56.35059	33.65239	0	56.35059	33.65239
SUDUIVISIOII-WISE	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	/3.49/16	45.59602	0	/3.49/16	45.59602
	1997	0	155.81206	128.54495	0	4462.03124	3681.1/5/7	0	75.37956	46.90337	0	75.37956	46.90337
	1998	0	109.61117	131.6/922	0	4621.64241	3812.85499	0	77.30601	48.23/65	0	77.30601	48.23/65
	2000	0	163.37613	134.70331	0	4/60.01804	3347.04U3	0	01 27756	43.03/9	0	01 27756	43.03/3
	2000	U	107.03829	137.00659	0	4302.00683	4000,44088	U	01.27756	50.36259	0	01.27706	00.36203



## 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	Туре
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	Туре	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	Paper and cardboard	0.4	0.5	0.07	Default
waste	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 pa	Entry	
Activity data	Upper	+0.00%
uncertainties	Lower	-0.00%
Emission factors	Upper	+0.00%
uncertainties	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

UN 💮

environment

programme

gef

UN 🎯

environment

programme

copenhagen climate centre

#### 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 as			

#### step 07: Save entered data





environment programme

nt copenhagen e climate centre



#### Activity 01 and 03

Parameters SWDSTyp	pes - Utilization Activity Dat	Amount Deposited	Long Term stored C in SWDS	Harvested Wood Pro	ducts			
Country/Territory	Sri Lanka							
Region	Asia - Eastern	~						×
Subdivision:	Subdivision 2	× +				Uncertai	nties	
Climate Zone	Tropical wet	~			Category	4.A - Solid Waste Disposal		
Main parameters and \	Waste Types for selected Subd	vision	Parameters for HWP (Bulk MSW)		Sheet	Parameters		
Starting year		1950 🜩	% garden in municipal waste	85.00 % 🖨	Activitiy Data	Uncertainties	Upper	+0.00 % 单
Delay Time (months)		6 🜩	% paper in municipal waste	10.00 % 🗢				
Fraction of methane (F	) in developed gas	0.500 🜩	% wood in municipal waste	5.00 % 🜩	Emission Fact Gas	ors Uncertainties		~
Conversion Factor, C t	to CH4	1.333333	Parameters for HWP (Bulk Industr	ial Waste)	Lower	0.00 % 🗢	Upper	+0.00 %
Waste Type	Parameters for selected Subdiv	sion	% paper in industrial waste % wood in industrial waste	75.00 % 🗢	ок			Cancel
Save	Uncertainties	Waste Type Mar	nager					



#### Activity 02

Waste Type Parameters

-  $\Box$   $\times$ 

Waste Category		Waste Type / Industry Type	Degradable organic carbon	Degradable organic carbon which decomposes in SWDS	Methane generation rate constant (k)	
Δ7	Class of decomposability △ 文	Туре 🛆	Use in calculations	DOC (Fraction of wet weight)	DOCf (Fraction)	k
Industrial Waste	Bulk waste	Bulk Industrial Waste	$\leq$	0.15	0.5	0.17
	Rapidly degrading waste	Food, beverages and tobacco	$\searrow$	0.15	0.5	
	Slowly degrading waste	Construction and demolition	$\checkmark$	0.04	0.5	
		Pulp and paper	$\searrow$	0.4	0.5	
		Textile	$\checkmark$	0.24	0.5	
		Wood and wood products	$\searrow$	0.43	0.5	
Municipal Waste	Bulk waste	Bulk Municipal Waste	$\leq$	0.18	0.5	0.17
	Moderately degrading waste	Disposable nappies	$\searrow$	0.24	0.5	0.17
		Garden and park	$\searrow$	0.2	0.5	0.17
	Rapidly degrading waste	Food waste	$\mathbf{\mathbf{\nabla}}$	0.15	0.5	0.4
	Slowly degrading waste	Paper and cardboard	$\searrow$	0.4	0.5	0.07
		Textile	$\checkmark$	0.24	0.5	0.07
		Wood	$\searrow$	0.43	0.5	0.035
Other waste	Bulk waste	Clinical waste	Z	0.15	0.5	
		Hazardous waste	$\mathbf{\mathbf{n}}$		0.5	
Sludge	Rapidly degrading waste	Industrial sewage sludge	$\leq$	0.09	0.5	
		Municipal sewage sludge	$\searrow$	0.05	0.5	0.4



### Activity 04 SWDS types – Utilization

Parameters	SWDS Types - Utili	ization Activity D	ata Amount Depos	sited Long Term s	tored C in SWDS	Harvested Wood Pro	oducts				
Worksheet Sector: Category: Subcatego Sheet: Data	Waste Methane emiss ry: 4.A - Solid Wa SWDS Types	sions from Solid Wa aste Disposal - Utilization	ste Disposal Sites							2	020
Subdivisio	n Subdivision 2	~	Waste Category	Municipal Waste	$\sim$						
	Unma	anaged			Managed			Uncategorised	Distribution Check		^
Year	Unmanaged - shallow (%)	Unmanaged - deep (%)	Managed - anaerobic ?	managed poorly – semi -aerobic	Manageo well - semi- aerobic	Managed poorly – active	wanaged well – active aeration	Uncategoris ed SWDS ?	Total (%)		
2006				1707		ucration		10	0	2	
2007									0	2	
2008									0	2	
2009								-	0	2	
2010									0	2	
2011								-	0	2	
2012									0		
2013								-	0		+
2014									0		$\vdash$
2015	-								0		+
2010									0		$\vdash$
2017								-	0	2	+
2019									0	2	
2020	25	30	25		5			15	100	2	5
2021									0 0	2	
2022								5	0 0	3	
2023									0	2	~



#### Activity data

ector: ategory: abcategor aeet:	Waste Methane e <b>y</b> : 4.A - Solid Activity Da	emissions fro Waste Disp ata	om Solid Was bosal	ste Disposal Site	es											20
ubdivision	Subdivision 2	2	~	Waste Cated	ory Muni	cipal Waste	✓ Total W	aste Calcula	ted from Popula	ation 🗸 ₩	aste Type An	nounts % of 1	Fotal Waste go	ing to SW	DS	
					- Contraction			Composi	tion of waste g	ioing to solid v	vaste disposal	sites.				
Year	Population (Capita)	vvaste per capita (kg/cap/ vr)	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	в	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	0 📝	
2010														θ	0 📝	
2011														θ	0 🛃	
2012														θ	0 📝	
2013														θ	0 📝	
2014														0	0 📝	
2015														0	0 📝	
2016														θ	D 📝	
2017													r	θ	0 📝	-
2018														0	0 🛃	
2019														θ	0 🛃	
2020	115000000	160	18400	75	13800	26.2			18.8	3.5	3.5		48	10	0 🛃	
2021														0	0 🛃	
2022														0	0 🛃	
2023														θ	0 🛃	

.



#### Amount deposited

Parameters	SWDS Types - Utiliza	ation Activity Data	Amount Deposited	Long Te	erm stored C in SWDS	Harvested Wood Pro	ducts			
Worksheet Sector: Category: Subcategor Sheet: Data	Waste Methane emissio 4.A - Solid Waste Waste Types an	ns from Solid Waste [ e Disposal d Amounts Deposited	Disposal Sites to SWDS							2020
Subdivision	Subdivision 2	×	Waste Categ	gory Mu	unicipal Waste	$\sim$				
Year	Food waste (Gg)	Disposable napp (Gg)	ies Garden and (Gg)	d park	Paper and cardboar (Gg)	d 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	25	94.4 483	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	







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

SWDS Types -	MCF and OX	Methane Generated	Methane Emission	s									
Worksheet Sector: Category: Subcategory Sheet:	Sector: Waste 202   Category: Methane emissions from Solid Waste Disposal Sites 202   Subcategory: 4.A.1 - Managed Waste Disposal Sites 202   Sheet: SWDS Types - Methane Correction Factors and Oxidation Factors 202												
Subdivision	Subdivision 2	~											
	swds											^	
	Manage	d – anaerobic	Managed poorly	v – 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											2		
2009											2		
2010											2		
2011											2		
2012											2		
2013											2		
2014											2		
2015											2		
2016											2		
2017											2		
2018											2		
2019											2		
> 2020		1 0.1	0.7	0.1	0.5	0.1	0.7	0.1	0.4	0.1	2	3	
2021											2		
2022											2		
2023											2		



#### Methane Generated

WDS Types -	MCF and OX	Methane Generated	Methane Emissions							
Sector: Category: Subcategory Sheet:	Waste Methane em : 4.A.1 - Mana Methane Ge	issions from Solid Was aged Waste Disposal S nerated across SWDS	te Disposal Sites Sites 5 Types and Waste Type	es					2	020
Subdivision	Subdivision 2	V SWDS Ty	pe Managed - anaen	obic 🗸	Waste Categor	y Municipal Waste 🗸	Waste Type Food waste	V DOC 0.15	DOCF 0.5	
<b>k</b> 0.4	Half-life	e time (h=ln(2)/k)	1.7328679513! e	exp1=exp(-k) 0.67	0320046035 <b>Mo</b>	nth of reaction start (M)	13 exp2=exp(-k*(	(13-M)/12)) 1 C	H4 Fraction 0.5	
	Amount deposited (Gg)	MCF (Fraction)	Decomposable depo (G	a DOC (DDOCm) osited ∋g)	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)	1
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	9	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	8	69.4	1	65.205	65.205	0	65.205		0	0
2021		0	0	0	0	0	43.70822	21.4967	8 14.33	3119
2022	1	0	0	0	0	0	29.2985	14.4097	2 9.60	)648
2023		0	0	0	0	0	19.63937	9.6591	3 6.43	3942

#### Methane Emissions



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SWE	)STypes - ksheet	MCF and OX	Methane Generat	ed Methane E	missions								
Sec Cato Sub She Dat	tor: egory: ocategory eet:	Waste Methane en : 4.A.1 - Man Methane Er	nissions from Solid laged Waste Dispo nissions	Waste Disposal S sal Sites	Sites							2	020
Sut	division	Subdivision 2	~	SWDS Ty	pe Managed -	anaerobic	~						
			1	Methane gener	ated		Methane r	ecovered	Metha	ne 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	В	C	D	E = A + B + C + D	F	G	Н	l = (E - F - G) * H	J=E-F-G-I		
	2007	0	0	0	0	0			0	0	0	2	
	2008	0	0	0	0	0			0	0	0	2	
	2009	0	0	0	0	0			0	0	0	2	
	2010	0	0	0	0	0			0	0	0	2	
	2011	0	0	0	0	0			0	0	0	2	
	2012	0	0	0	0	0			0	0	0	2	
	2013	0	0	0	0	0			0	0	0	3	
	2014	0	0	0	0	0			0	0	0	3	
	2015	0	0	0	0	0			0	0	0	2	
	2016	0	0	0	0	0			0	0	0	2	
	2017	0	0	0	0	0			0	0	0	3	
	2018	0	0	0	0	0			0	0	0	2	
	2019	0	0	0	0	0			0	0	0	2	
	2020	0	0	0	0	0			0.1	0	0	3	
	2021	23.64866	0	0	0	23.64866	0.0001	0.0005	0	0	23.64806	2	2
	2022	18.10005	0	0	0	18.10005			0	0	18.10005	2	
	2023	14.19752	0	0	0	14.19752			0	0	14.19752	2	~



#### 4.A.2 – Unmanaged Waste Disposal Sites

#### SWDS types – MCF and OX

ector:   Waste     ategory:   Methane emissions from Solid Waste Disposal Sites     ubcategory:   4.A.2 - Unmanaged Waste Disposal Sites     swDs Types - Methane Correction Factors and Oxidation Factors											
division Subdivi	ision 2 v										
		SWE	DS								
	Unmanaged	– shallow	Unmanaged	I – deep							
Year	MCF (Fraction)	OX (Fraction)	MCF (Fraction)	OX (Fraction)							
2008					2						
2009					2						
2010					2						
2011											
2012											
2013											
2014											
2015											
2016											
017											
010											
013	0.4	0	0.0								
020	0.4		0.8								
0027											



#### Methane Generated

WDS Types - Vorksheet Sector: Category: Subcategory: Sheet:	MCF and OX M Waste Methane emis 4.A.2 - Unmar Methane Gen	Methane Generated ssions from Solid Was naged Waste Dispose erated across SWDS	Methane Emissions te Disposal Sites al Sites is Types and Waste Types					202
Data Subdivision k 0.4	Subdivision 2	SWDS Ty	Unmanaged - shallow     v       1.7328679513     exp1=exp(-k)     0.670	Waste Category	Municipal Waste v	Waste Type Food waste	→ DOC 0.15 3-M)/12)) 1 CH4 Fr	DOCf 0.5
	Amount depos (Gg)	ited 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	
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	
2016		0	0 0	) 0	0	0	0	
2017		0	0 0	0	0	0	0	
2018		0	0 0	0	0	0	0	
2019		0	0 0	0	0	0	0	
2020	86	i9.4	0.4 26.082	2 26.082	0	26.082	0	
2021		0	0 0	0	0	17.48329	8.59871	5.7324
2022		0	0 0	0	0	11.7194	5.76389	3.8425
2023		0	0 0	0	0	7.85575	3.86365	2.5757



#### Methane Emissions

SWDS Types - Worksheet	MCF and OX Me	ethane Generated	Methane Emissi	ions								
Sector: Category: Subcategory Sheet: Data	Waste Methane emiss r: 4.A.2 - Unmana Methane Emiss	ions from Solid Was aged Waste Dispos ions	ste Disposal Sites al Sites								2	020
Subdivision	Subdivision 2	~	SWDS Type	Unmanaged - shallow	· ~							
	Methane generated					Methane	recovered	Methar	ne 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	в	С	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	2	
2008	0	0	0	0	0			0	0	0	2	
2009	0	0	0	0	0			0	0	0	2	
2010	0	0	0	0	0			0	0	0	2	
2011	0	0	0	0	0			0	0	0	2	
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	3	
2015	0	0	0	0	0			0	0	0	2	
2016	0	0	0	0	0			0	0	0	2	
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	3	
2020	0	0	0	0	0		0.004	0	0	0		
2021	9.45946	0	0	0	9.45946	0	0.001	0	0	9.45846		2
2022	7.24002	0	0	0	7.24002			0	0	7.24002		
2023	5.6/901	0	0	0	5.6/901			0	0	5.6/901		×



#### 4.A.3 – Uncategorized Waste Disposal Sites

#### SWDS types – MCF and OX

SWDS Types - N	MCF and OX	Methane Generated	Methane Emissions					
Vorksheet Sector: Category: Subcategory: Sheet: Data	Waste Methane emis 4.A.3 - Uncat SWDS Types	sions from Solid Waste egorised Waste Dispos - Methane Correction I	Disposal Sites al Sites Factors and Oxidation Fac	tors				2020
Subdivision	Subdivision 2	~						
				SV	/DS			
				Uncatego	ised SWDS			
	Year		MCF (Fraction	)		OX (Fraction)		
2006					-		3	
2007								
2008							3	
2009								 
2010								
2012							2	
2013							3	
2014							3	
2015							3	
2016							2	
2017					-		2	
2018							3	
2019								
2020				0.6			0 2	7
2021								 
2022							2	
2023								



#### Methane Generated

SWDS Types - Worksheet Sector: Category: Subcategory: Sheet:	MCF and OX Waste Methane em 4.A.3 - Unca Methane Ge	Methane Generated issions from Solid Was ategorised Waste Dispo merated across SWDS	Methane Emissions ste Disposal Sites osal Sites 5 Types and Waste Types					2020
Data Subdivision	Subdivision 2	V SWDS T	Uncategorised SWDS	V Waste Cat	egory Municipal Waste	V Waste Type Food	waste V DOC 0.15	DOCE 0.5
k 0.4	Half-life	e time (h=ln(2)/k)	1.7328679513: exp1=exp(-k)	0.670320046035	Month of reaction star	t (M) 13 exp2=exp	<b>⊳(-k*((13-M)/12))</b> 1	CH4 Fraction 0.5
	Amount deposited (Gg)	MCF (Fraction)	Decomposable DOC (DDOC) deposited (Gg)	m) DDOCm not reacted in deposition ye (Gg)	ar 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
2009		0	0	0	0 (	)	0	0 0
2010		0	0	0	0 (	)	0	0 0
2011		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
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	52	1.64 0	0.6 23	.4738 23.47	738 (	23.47	738	0 0
2021		0	0	0	0 0	15.734	196 7.738	84 5.15923
2022		0	0	0	0 0	10.547	746 5.18	3.45833
2023		0	0	0	0 (	7.070	017 3.477	29 2.31819



#### Methane Emissions

SW	DS Types -	MCF and OX M	ethane Generated	Methane Emiss	sions								
Se Ca Su Sh	rksheet ctor: tegory: bcategory: eet: ata	Waste Methane emiss 4.A.3 - Uncate Methane Emiss	iions from Solid Was gorised Waste Dispo sions	ste Disposal Sites osal Sites								2	020
Su	bdivision	Subdivision 2	~	SWDS Type	Uncategorised SWD	s ~							
				Methane gene	erated		Methane r	recovered	Metha	ine 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	В	С	D	E = A + B + C + D	F	G	н	l = (E - F - G) * H	J = E - F - G - I		
	2007	0	0		0 0	0			0	0	0	2	
	2008	0	0	(	0 0	0			0	0	0	2	
	2009	0	0	(	0 0	0			0	0	0	2	
	2010	0	0	(	0 0	0			0	0	0	2	
	2011	0	0	(	0 0	0			0	0	0	2	
	2012	0	0	(	0 0	0			0	0	0	3	
	2013	0	0		0 0	0			0	0	0	2	
	2014	0	0	(	0 0	0			0	0	0	3	
	2015	0	0	(	0 0	0			0	0	0		
	2016	0	0		0 0	0			0	0	0	2	
	2017	0	0		0 0	0			0	0	0	3	
	2018	0	0		0 0	0			0	0	0	2	
	2019	0	0		0 0	0			0	0	0	3	
	2020	0	0	(	0 0	0			0	0	0	2	
	2021	8.51352	0		0 0	8.51352	0	0.005	0	0	8.50852		2
	2022	6.51602	0	(	0 0	6.51602			0	0	6.51602	2	
	2023	5.11111	0		0 0	5.11111			0	0	5.11111	3	~



## 4. B – Biological Treatment of Solid Waste



## 4.B – Biological treatment of solid waste



# 4.B – Biological treatment of solid waste





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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 pa	rameter	Entry	Note			
Subdivision		Philippines				
Biological treatm	ent system	Composing				
Waste category		Municipal Waste				
Type of waste		Food waste				
Total annual amo biological treatm	unt treated by ent facilities	10.5 Gg				
Emission factor		IPPC default, 4 g CH <sub>4</sub> / kg				
Methane	Flaring	0 Gg				
recovered	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 <sub>4</sub> / kg			
Methane recovered	Flaring	0 Gg			
	Energy use	0 Gg			
*the activity data wood in this activity and wet word. Instrumented only four this activity					

\*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<sub>4</sub> 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<sub>4</sub>



## CH<sub>4</sub> 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_2 021_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<sub>4</sub> 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_2 021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	0.8	2006 IPCC guidelines
Total amount of CH <sub>4</sub> recovered in inventory year, Gg CH <sub>4</sub>	0	Assumed value



## CH<sub>4</sub> EMISSIONS FROM BIOLOGICAL TREATMENT-TIER 01

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

 $CH_4$  Emissions =  $\Sigma$  (10.5 Gg \* 4 g CH4/kg + 10.5 Gg \* 0.8 g CH4/kg) \* 10<sup>-3</sup>

= 0.0504 Gg



## N<sub>2</sub>O EMISSIONS FROM BIOLOGICAL TREATMENT

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

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,  $g N_2 O / kg$  waste treated

i = composting or anaerobic digestion



## N<sub>2</sub>O 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_2 021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	0.6	2006 IPCC guidelines



## N<sub>2</sub>O 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_2 021_Sunday.pdf
Emission Factor on a wet weight basis g CH4/kg waste treated	1	Assumed value



## N<sub>2</sub>O EMISSIONS FROM BIOLOGICAL TREATMENT-TIER 01

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

 $N_2O$  Emissions =  $\Sigma$  (10.5 Gg \* 0.6 g CH4/kg + 10.5 Gg \* 1 g CH4/kg) \* 10<sup>-3</sup>

= 0.0168 Gg





Methane

Emissions

(Gg)

E = (C - F - D)

0.0084

0.0504

0.042 🕜 🖬 ႒ 🗙

2

Energy use

0



facilities.

Finally, users can save the entry by pressing save button

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# 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 treatm	ent 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 <sub>4</sub> / kg	On a dry weight basis							
Methane	Flaring	0 Gg								
recovered	Energy use	0.0001 Gg								
*the activity data	used in this activit	*the activity data used in this activity are not real Just examples only for this activity								







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#### Biological treatment of solid waste

Dat	a												
Ga	s METHANE (CH4)	~											
	Equation 4.1, 4.2												
Subdivision Biological Treatment Waste Type of treated by System Category Waste treatment facilities						Emission Factor (g CH4 / kg waste treated)	Gross Annual Methane Generation (Gg)	Methane recovered (Gg) (Gg) (Gg)					
	۵7	۵7	۵Ţ	۵Ţ	A	В	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	2	2	X
*											2		
Tot	[ otal												
					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







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### 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 subcategories.
- 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.							



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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.							



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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 <sub>4</sub> /Gg Wet waste	Default value for semi continuous incineration has used. Specific to waste type.						
*the activity data wood in this activity and wetweed lust even also only for this activity								

\*the activity data used in this activity are not real. Just examples only for this activity.

Step 04: Save entered data



### CO2 EMISSIONS FROM INCINERATION-TIER 01

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

- $SW_i$  = 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<sub>2</sub>
- i = type of waste incinerated/open-burned specified as follows:

 $CO_2$  Emissions =  $\Sigma$  (25 Gg \* 0.4 \* 0.38\* 0.01\* 1) \* 44/12

=0.13933 Gg



### CH<sub>4</sub> 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<sub>4</sub> emission factor, kg CH<sub>4</sub>/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 =  $\Sigma$  (25 Gg \*6kg  $CH_4$  /Gg) \* 10<sup>-6</sup>

= 0.00015 Gg



### N<sub>2</sub>O 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<sub>2</sub>O emission factor (kg N<sub>2</sub>O/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 =  $\Sigma$  (25 Gg \* 50 kg  $N_2O$  /Gg) \* 10<sup>-6</sup>

= 0.00125 Gg



### CO<sub>2</sub> EMISSIONS FROM INCINERATION OF FOSSIL LIQUID WASTE-TIER 01

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

 $CO_2$  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)
- $44/12 = \text{conversion factor from C to CO}_2$

 $CO_2$  Emissions =  $\Sigma$  (25 Gg \* 0.8\* 1) \* 44/12

= 73.333 Gg

#### 4. C. 1. Emissions from Incineration of Waste

#### 1. Waste incineration



Vorksheet ector: Wa ategory: Inc ubcategory: 4.0 heet: En Data	aste cineration and C.1 - Waste Inc nissions from In	Open Burning ineration cineration of	g of Waste Waste			13										20	00
as CARBON DIO	XIDE (CO2)	$\sim$															
				Equation 5	5.1, 5.2						Informa	tion for UNFC	CC CRT				
Subdivision	Waste Category	Type of Waste	Total Ar incinerat (G	mount of Waste ed (Wet Weight) 6g 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 t fossi (Gg V	otal waste of origin Vaste)	Amount of I biogen (Gg V	total waste of nic origin Waste)	Biogenic CO2 emissions (Gg)			
Δ	γ Δγ	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	2		2
otal				25					0.13933		0.25		24.75	13.794			



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Waste incineration	Fossil liqui	dincineration	N2O Emission	s from Incineration	of waste - T	ïer 3								
Sector: Category: Subcategory: Sheet:	Waste Incineration a 4.C.1 - Waste Emissions fro	and Open Burnir Incineration m Incineration o	ng of Waste f Waste										20	00
Gas NITROUS	OXIDE (N2O)	~	>											
				Equation 5.5						Information	for UNFCCC CRT			
Subdivis	sion	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)		
	۵Ţ	۵v		Ai	V	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	2	2
Total				25			0.00125	_	0.25	24.75	0.00001	0.00124		
Waste incineration	Fossil liquid	incineration	N2O Emissions	from Incineration o	f waste - Ti	er 3								

2000 Sector: Waste Category: Incineration and Open Burning of Waste Subcategory: 4.C.1 - Waste Incineration Sheet: Emissions from Incineration of Waste D-Gas METHANE (CH4) V Equation 5.4 Information for UNFCCC CRT Methane Emission Amount of total Amount of total Methane Emissions -Methane Emissions -Waste Factor (kg CH4/Gg Wet Type of Total Methane Emissions waste of fossil waste of incinerated (Wet Fossil Waste Biogenic Waste Subdivision Category (Gg) Waste biogenic origin origin (Gg) Weight) (Gg) Waste) (Gg Waste) (Gg Waste) (Gg Waste) EFi = AFi \* EFi/ EBi = ABi \* EFi /  $\Delta \nabla$ ABi  $\Delta \nabla$ i ∆⊽ ETi = Ai \* EFi / 10^6 AFi EFi 10^6 10^6 Philippines Municipal W... Food waste 25 0.00015 0.25 24.75 0.00015 📝 🛃 🍏 6 0 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.



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## 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 pa	Entry			
Activity data	Upper	+1.00%		
uncertainties	Lower	-1.00%		
Emission factors uncertainties				
Select the gas as Carbon Di (*when you are entering da to add uncertainties for oth	oxide and enter following ta for real GHG inventory cal er gases also)	culation, please make sure		
	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 method at a condition the method to an a constant		

\*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 pa	rameter	Entry
Activity data	Upper	+1.00%
uncertainties	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<sub>2</sub>O 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 <sub>2</sub> 0/ m <sup>3</sup>							
Flue gas volume by amount of incinerated waste type i	0.1 m <sup>3</sup> / Mg							
*the activity data used in this activity are not r	*the activity data used in this activity are not real. Just example only for this activity.							



#### Waste incineration

Waste incineration	Fossilli	quid incin	eration	N2O Emissions	from Incin	eration of v	waste - Tie	er 3	
Worksheet Sector: Category: Subcategory: Sheet:	Waste Incineratio 4.C.1 - Wa Emissions	in and Ope aste Incine from Incin	en Burnin eration neration o	ng of Waste f Waste					
Gas CARBON I	DIOXIDE (C	:02)	~						
				Equation 5.1	, 5.2				
	Waste	Type of	Total A inci	mount of Waste nerated (Wet	Dry Matter Content	Fraction of Carbon	Fraction of Fossil Carbon	Oxidation	Fossil CO2

Subdivision	Waste Catego ry	Type of Waste	Total Am incine VI (Go	otal Amount of Waste incinerated (Wet Weight) (Gg Waste)		Matter Content - dm (Fractio n)	of Carbon in Dry Matter - CF	of Fossil Carbon in Total Carbon - FCF	Oxidation Factor - OF (Fraction)	Fossii CO2 Emissio ns (Gg)
ΔŢ		i 47		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





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#### Uncertainties – waste incineration

	Uncer	tainties	
Category	4.C.1 - Waste Incineration		
Sheet	Emissions from Incineration of	Waste	
Activitiy Da	ta Uncertainties		
Lower	-1.00 % 🚖	Upper	+1.00 % 🖨
Emission Fa	actors Uncertainties		
	CARBON DIOXIDE (CO2)		~
Gas			



#### Fossil liquid incineration

Waste incineration Worksheet Sector: Category: Subcategory: Sheet: Data	aste incineration Fossil liquid incineration N2O Emissions from Incineration of waste - Tier 3   orksheet ector: Waste   ategory: Incineration and Open Burning of Waste   ubcategory: 4.C.1 - Waste Incineration   heet: CO2 emissions from incineration of fossil liquid waste								
			1	Equation 5.3					
Subdi	ivision	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)			
	۵V	Δγ	A	В	С	D = A* (B/100) * (C/100) * 44/12			
Facility `A`		Waste oil	2.5	80	100	7.33333			
*									
Total									
			2.5	1		7.33333			



 $\times$ 

#### Uncertainties – Incineration of fossil liquid waste

Category	4.C.1 - Waste Incineration		
Sheet	CO2 emissions from incineration	of fossil liquid waste	
Activitiy Da	ta Uncertainties		
Lower	-1.00 % ≑	Upper	+1.00 % 🖨
Emission Fa	actors Uncertainties		
Gas	CARBON DIOXIDE (CO2)		~



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#### Waste incineration – $N_2O$

Waste incineration	Fossil liquid incineration N2O Emissions from Incineration of waste - Tier 3								
Worksheet Sector: Category: Subcategory: Sheet:	Waste Incineration and Open Burning of Waste 4.C.1 - Waste Incineration Emissions from Incineration of Waste								
Gas NITROUS OXIDE (N2O) V									
			E	quation 5.5					
Subdivisio	n	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)		
	۵v	۵Ţ	i Av	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	Fos	sil liquid in	cineration	N2O Emission	ns from Incineratio	on of waste - Tier	3		
Worksheet Sector: Category: Subcategory: Sheet: Data	orksheet ector: Waste ategory: Incineration and Open Burning of Waste ubcategory: 4.C.1 - Waste Incineration heet: N2O Emissions from Incineration of waste - Tier 3 Data								
				Equation	5.6				
Subdivision	,	Waste Categor y	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)		
	۵Ţ	۵V	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.







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Sector: Category: Subcategory: Sheet:	Waste Incineration ar 4.C.2 - Open E Emissions from	nd Open Burning Burning of Waste n Open Burning	of Waste										20
Data Gas METHAN	IE (CH4)	~											
			Eq	ation 5.4					Inforn	nation for UNFCCC Cl	RT		
Subdiv	vision	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 Emis (Gg)	sions	Amount of total waste of fossil origin (Gg Waste)	Amount of total waste of biogenic origin (Gg Waste)	Methane Emission - Fossil Waste (Gg)	is Methar Biog	ne Emissions - jenic Waste (Gg)	
	۵⊽	ΔV	i ∆⊽	Ai	EFi	ETi = Ai * EFi / 1(	0^6	AFi	ABi	EFi = AFi * EFi / 10^6	EBi = A	ABi * EFi / 10^6	
Philippines		Municipal W	ood waste	25	6500		0.1625	0.25	24.75	5 0.001	63	0.16088	
lotal			1	25			0.1025	0.25	24.7	5 0.001	63	0.16088	
							Defau	ılt or					
en Burning of Waste							isers-d	lefined					
Worksheet USERS-defined													
ctor: Wa	ste		ategory: Incineration and Open Burning of Waste parameter										20
tegory: Wa bcategory: AC	ste neration and Op 2 - Open Burnin	en Burning of W	aste				paran	neter					20
tegory: Inci bcategory: 4.C eet: Emi	ste neration and Op .2 - Open Burnin ssions from Ope	en Burning of W Ig of Waste n Burning	aste			L	paran	neter					200
ector: Wa ttegory: Inci bcategory: 4.C veet: Emi sta as NITROUSOXIE	ste neration and Op .2 - Open Burnin ssions from Oper DE (N2O)	en Burning of W ig of Waste n Burning	aste			L	paran	neter					200
actor: Wa tegory: Inci tegory: 4.C teet: Emi sta as NITROUSOXIL	ste neration and Op .2 - Open Burnin ssions from Oper DE (N2O)	en Burning of W Ig of Waste n Burning	laste	Equation 5.5		L	paran	neter		Information for UNF	CCC CRT		200
ector: Wa stegory: Inc. ibcategory: 4.C weet: Emi ata as NITROUS OXII Subdivision	ste neration and Op .2 - Open Bumin ssions from Oper DE (N2O) Wast Catego	te Burning of W Ig of Waste n Burning Type o Waste	f Total Am of Waste -burned (Gg Wa	Equation 5.5 ount open Wet t) (Fractio ste)	ter Waste open- dm burned (Dry n) Weight) (Gg Waste)	of Nitrous Oxid Emission Fact (kg N2O/Gg D Waste)	paran or otal Nit Emissio (Gg)	rous ons ons	Amount of tal waste of tossil origin Gg Waste) ((	Information for UNF Amount of tal waste of Sg Waste)	CCC CRT Ius Oxide issions - sil Waste (Gg)	Nitrous Oxide Emissions - Biogenic Waste (Gg)	20
ector: Wa stegory: Inc. sbcategory: 4.C seet: Emi ata as NITROUS OXII Subdivision	ste neration and Op .2 - Open Bumin ssions from Opel DE (N2O) Wast Catego	en Burning of W Ig of Waste n Burning Type o ory Maste A T i 4	f Total Am of Waste -burned Weigi (Gg Wa	Equation 5.5 ount open Wet tt) ste) Content - (Fractio	ter dm burned (Dry Weight) (Gg Waste) Admi = Aj * dm	of Nitrous Oxid Emission Fact (kg N2O/Gg D Waste) ni EFi	paran e fotal Nit or Cital Nit Emissio (Gg) ETi = Ad EFi / 10	rous ons off to off to frous to frous	Amount of to tal waste of to ossil origin bic Gg Waste) (( AFi	Information for UNF Amount of tal waste of ogenic origin Gg Waste) ABi EFi = EF	CCC CRT issions - sii Waste (Gg) AFi * dmi *	Nitrous Oxide Emissions - Biogenic Waste (Gg) EBi = ABi * dmi * EFi / 10^6	20
ctor: Wa tegory: Inc bcategory: 4.C eet: Emi ata as NITROUSOXII Subdivision	ste neration and Op .2 - Open Bumin ssions from Oper DE (N2O) Wast Catego A V Municipi	en Burning of W Ig of Waste n Burning Type o Waste A V i 4 al Food was	f Total Am of Waste -burned Weigj (Gg Wa	Equation 5.5 ount open Dry Matt Content - (Fractio ste) dmi 25	ter dm N) Admi = Ai * dn 0.4	of Nitrous Oxid Emission Fact (kg N2O/Gg D Waste) ni EFi 10	paran or Oxid Emissio (Gg) ETi = Ad EFi / 10	rous e ons dmi * 0.0015	Amount of tal waste of tossil origin Gg Waste) AFi 0.25	Information for UNF Amount of tal waste of ogenic origin Gg Waste) ABi EFi = EF 24.75	CCC CRT bus Oxide issions - sil Waste (Gg) AFi * dmi * ii / 10^6 0.00002	Nitrous Oxide Emissions - Biogenic Waste (Gg) EBi = ABi * dmi * EFi / 10^6 0.00149	20







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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<sub>2</sub> and enter following data accordingly

Entry	Note
District 'A'	
Municipal waste	
Paper & cardboard	
5 Gg	
0.9	Default value has used. Specific to waste type.
0.46	Default value has used. Specific to waste type.
0.01	Default value has used. Specific to waste type.
Default, 0.58	
	EntryDistrict 'A'Municipal wastePaper & cardboard5 Gg0.90.460.01Default, 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<sub>4</sub> and enter following data accordingly

Input parameter	Entry	Note
Methane emission factor	Default, 6500 kg CH <sub>4</sub> / Gg wet waste	

#### Step 05: Save Entered Data

#### Step 06: Select the gas as N<sub>2</sub>O and enter following data accordingly

Input parameter	Entry	Note				
Nitrous Oxide emission factor	Default, 6500 kg CH <sub>4</sub> / Gg wet waste					

Step 07: Save Entered Data



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

Entry pa	Entry	
Activity data	Upper	+1.00%
uncertainties	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.







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#### Open Burning of waste – $CO_2$

Open Burning of V Worksheet Sector: Category: Subcategory: Sheet: Data Gas CARBON	Waste Waste Incine 4.C.2 Emissi	e ration and C - Open Burn ions from Op E (CO2)	Dpen Burning ning of Waste ben Burning	g of Waste												2	000
					Equation 8	5.1, 5.2, 5.7						Informa	tion for UNFC	CC CRT			
Subdivisio	on	Waste Category	Type of Waste	Total Amou burned (G	unt of Waste ope I (Wet Weight) Sg Waste)	en- 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 t fossii (Gg V	total waste of Amount of total waste of il origin biogenic origin Waste) (Gg Waste)		total waste of nic origin Waste)	Biogenic CO2 emissions (Gg)		
	۵Ţ	۵V	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		
M Philippines		Municip	Food wa	Specified	5	0.9	0.46	0.01	0.58	0.04402	Calculated	0.05	Calculated	4.95	4.35818	2	🤈 🗙
*			1									į į					
lotal					5					0.04402		0.05		4.95	4.35818		




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## Burning of waste – $CH_4$

Open E	Burning of V	Vaste					
Worksh Secto Categ Subca Sheet	neet or: jory: ategory: ::	Waste Incinerati 4.C.2 - O Emission	ion and Open pen Burning of s from Open B	Burning of Wa f Waste urning	aste		
Gas	METHAN	E (CH4)	~	]			
				Equati	on 5.4		
	Subdivisi	ion	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)
		۵Ţ	ΔŢ	i ∆⊽	Ai	EFi	ETi = Ai * EFi / 10^6
► D	District "A"		Municipal	Paper and	5	6500	0.0325
Total					-		0.0005





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## 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 NITRO	DUS OXIDE (N2O) V
	Equation 5.5

	Subdivision	Waste Category	Typ Wa	e of ste	Total Amount of Waste open-burned (Wet Weight) (Gg Waste)	Nitrous Oxide Emission Factor (kg CH4/Gg Wet Waste)	Total Nitrous Oxide Emissions (Gg)	
	Δγ	۵Ţ	i	۵Ţ	Ai	EFi	ETi = Ai * EFi / 10^6	
•	District 'A'	Municipal	Paper	and	5	150	0.00075	
Tot	tal							
					5		0.00075	



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## Uncertainties

 $\times$ 

Category	4.C.2 - Open Burning of Waste						
Sheet	Emissions from Open Burning						
Activitiy Da	ta Uncertainties						
Lower	-1.00 % ≑	Upper	+1.00 % 🜩				
Emission E	actor I locatointica						
Gas	NITROLIS OXIDE (N2O)		~				
		1221111					
Lower	-1.00 % 💌	Upper	+1.00 % 룩				



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