ANNEX 2

WORKSHEETS

Contents

Sector	**Waste**			
Category	**Domestic Wastewater Treatment and Discharge**			
Category Code	**4D1**			
Sheet	**1 of 6 Estimation of Organically Degradable Material in Domestic Wastewater (Updated)**			
STEP 1				
Region or City	A	B	C	D
	Population (P) cap	Degradable organic component (BOD) (kg BOD/cap/yr) [1]	Correction factor for industrial BOD discharged in sewers (I)[2]	Organically degradable material in wastewater (TOW) (kg BOD/yr)
				D = A x B x C
			Total	

[1] g BOD/cap/day x 0.001 x 365 = kg BOD/cap/yr

[2] Correction factor for additional industrial BOD discharged into sewers, (for collected the default is 1.25, for uncollected the default is 1.00) (see page 6.14 of the 2006 IPCC Guidelines).

Sector	**Waste**				
Category	**Domestic Wastewater Treatment and Discharge**				
Category Code	**4D1**				
Sheet	**2 of 6 Estimation of Organically Degradable Material in Domestic Wastewater by Income Group and Treatment Discharge Pathway or System (New)**				
STEP 1					
		A	B	C	D
Income group	**Type of treatment or discharge pathway**	Organically degradable material in wastewater (TOW) (kg BOD/yr)	Fraction of population income group (U_i) (fraction)	Degree of utilization (T_{ij}) (fraction)	Total organics in wasteater by income group and pathway (TOW_{ij}) (kg BOD/yr)
		Sheet 1 of 6			D = A x B x C
Rural					
Urban high income					
Urban low income					
				Total	

Sector	**Waste**
Category	**Domestic Wastewater Treatment and Discharge**
Category Code	**4D1**
Sheet	**3 of 6 Estimation of Organic Component Removed as Sludge from Aerobic Treatment Plants (New)**

Type of treatment or discharge	A Amount of sludge removed from wastewater treatment (S_{mass}) (tonnes sludge/yr)	B Sludge factor[1] (K_{rem}) (kg BOD/kg sludge)	C Conversion factor of tonnes into kg 1000	D Organic component removed as sludge ($S_{aerobic}$) (kg BOD/yr) D = A x B x C
			Total	

[1] See Table 6.12 for default values.

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Sector	Waste			
Category	Domestic Wastewater Treatment and Discharge			
Category Code	4D1			
Sheet	4 of 6 Estimation of Organic Component Removed as Sludge from Septic Systems (New)			
	A	B	C	D
Type of treatment or discharge	Total organics in septic systems (TOW_{septic}) (kg BOD/yr)	Fraction of population managing septic in compliance[1] (F) (kg BOD/kg sludge)	Faction of organics removed in sludge[2] (0.5) (fraction)	Organic component removed as sludge (S_{septic}) (kg BOD/yr)
	Sheet 2 of 6			D = A x B x C
			Total	

[1] Default value is 0.5.

[2] Default value is 0.5.

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Sector	**Waste**		
Category	**Domestic Wastewater Treatment and Discharge**		
Category Code	**4D1**		
Sheet	**5 of 6 Estimation of CH_4 Emission Factor for Domestic Wastewater (Updated)**		
STEP 2			
Type of treatment or discharge	A Maximum methane producing capacity (B_0) (kg CH_4/kgBOD)	B Methane correction factor for each treatment system (MCF_j)	C Emission factor (EF_j) (kg CH_4/kg BOD)
			C = A x B
add as needed			

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Sector		**Waste**				
Category		**Domestic Wastewater Treatment and Discharge**				
Category Code		**4D1**				
Sheet		**6 of 6 Estimation of CH_4 Emissions from Domestic Wastewater for Each Income Group and Treatment Discharge Pathway (Updated)**				
STEP 3						
		A	B	C	D	E
Income group	**Type of treatment or discharge pathway**	Total organics in wasteater by income group and pathway (TOW_{ij}) (kg BOD/yr)	Sludge removed (S_{ij}) (kg BOD/yr)	Emission Factor (EF_j) (kg CH_4/kg BOD)	Methane recovered and flared (R_{ij}) (kg CH_4/yr)	Net methane emissions (CH_4) (kg CH_4/yr)
		Sheet 2 of 6	Sheet 3 and 4 of 6	Sheet 5 of 6		E = [(A - B) x C - D]
Rural						
Urban high income						
Urban low income						

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Sector	**Waste**			
Category	**Industrial Wastewater Treatment and Discharge**			
Category Code	**4D2**			
Sheet	**1 of 3 Total Organic Degradable Material in Wastewater for each Industry Sector**			
STEP 1				
	A	B	C	D
Industry Sectors	Total industry product (P_i) (t $_{product}$/yr)	Wastewater generated (W_i) (m^3/t $_{product}$)	Chemical Oxygen Demand (COD_i) (kg COD/m^3)	Total organic degradable material in wastewater for each industry sector (TOW_i) (kg COD/yr)
				D = A x B x C
Industrial sector 1				
Industrial sector 2				
Industrial sector 3				
add as needed				
			Total	

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Sector	Waste		
Category	**Industrial Wastewater Treatment and Discharge**		
Category Code	**4D2**		
Sheet	**2 of 3 Estimation of CH_4 Emission Factor for Industrial Wastewater**		
STEP 2			
	A	B	C
Type of treatment or discharge	Maximum Methane Producing Capacity (B_0) (kg CH_4/kg COD)	Methane Correction Factor for the Treatment System (MCF_j)	Emission Factor (EF_j) (kg CH_4/kg COD)
			C = A x B
add as needed			

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Sector	**Waste**					
Category	**Industrial Wastewater Treatment and Discharge**					
Category Code	**4D2**					
Sheet	**3 of 3 Estimation of CH_4 Emissions from Industrial Wastewater**					
STEP 3						
		A	B	C	D	E
Industrial sector	Type of treatment or discharge pathway	Total organic degradable material in wastewater for each industry sector (TOW_i) (kg COD/yr)	Sludge removed in each industry sector (S_i) (kg COD/yr)	Emission factor for each treatment system (EF_i) (kg CH_4/kg COD)	Recovered CH_4 in each industry sector (R_i) (kg CH_4/yr)	Net methane emissions (CH_4) (kg CH_4/yr)
		Sheet 1 of 3		Sheet 2 of 3		E = [(A – B) x C] – D
Industrial sector 1						
Industrial sector 2						
Industrial sector 3						
add as needed						
					Total	

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Sector	**Waste**					
Category	**Domestic Wastewater Treatment and Discharge**					
Category Code	**4D1**					
Sheet	**1 of 4 Estimation of Nitrogen in Domestic Wastewater (New)**					
	STEP 1					
	A	B	C	D	E	F
Type of treatment or discharge pathway	Population served by the treatment pathway, *k* ($P_{treatment}$) (people/year)	Per capita protein consumption (Protein) (kg/person/ year)	Fraction of nitrogen in protein (F_{NPR}) (kg N/kg protein)	Fraction of non-consumed protein and additional nitrogen from household products ($F_{NON-CON}$) (-)	Fraction of industrial and commercial co-discharged protein ($F_{IND-COM}$) (-)	Total nitrogen in domestic wastewater (treated) by treatment pathway (TN_{DOM_k}) (kg N/year)
						F = (A x B x C x D x E)
					Total	

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Sector	**Waste**			
Category	**Domestic Wastewater Treatment and Discharge**			
Category Code	**4D1**			
Sheet	**2 of 4 Estimation of Nitrogen in Effluent from Domestic Wastewater (New)**			
Type of treatment or discharge pathway	A	B	C	D
	Total nitrogen in domestic wastewater	Fraction of wastewater treated exclusively by each wastewater treatment type k	Fraction of total wastewater nitrogen removed during wastewater treatment per treatment type k	Total nitrogen in effluent
	(TN_{DOM})	(FWT_k)	($N_{REM,k}$)	($N_{EFFLUENT,DOM}$)
	(kg N/year)	(kg/person/ year)	(-)	(kg N/year)
	Sheet 1 of 4			D = [A x (B x (1 - C))]
			Total	

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Sector	**Waste**
Category	**Domestic Wastewater Treatment and Discharge**
Category Code	**4D1**
Sheet	**3 of 4 Estimation of N_2O Emissions from Domestic Wastewater Treatment Plants for each Income Group and Treatment Discharge Pathway (New)**

STEP 3

Income group	**Type of treatment or discharge pathway**	A	B	C	D	E	F
		Fraction of population in income group *i* in inventory year	Degree of utilisation of treatment/ discharge pathway or system, *j*, for each income group, *i*	Emission factor for treatment/discharge pathway or system, *j*	Total nitrogen in domestic wastewater (treated)	Conversion factor of kg N_2O-N into kg N_2O	N_2O emissions from domestic wastewater treatment plants in inventory year
		(U_i)	(T_{ij})	(EF_j)	(TN_{DOM})	44/28	($N_2O\ Plants_{DOM}$)
		(fraction)	(fraction)	(kg N_2O-N/kg N)	(kg N/year)		(kg N_2O/yr)
					Sheet 1 of 4		F = A x B x C x D x E
Rural							
Urban high income							
Urban low income							
						Total	

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Sector	**Waste**			
Category	**Domestic Wastewater Treatment and Discharge**			
Category Code	**4D1**			
Sheet	**4 of 4 Estimation of N_2O Emissions from Domestic Wastewater Effluent (New)**			
Type of treatment or discharge pathway	A	B	C	D
	Nitrogen in effluent ($N_{EFFLUENT,DOM}$) (kg N/year)	Emission factor ($EF_{EFFLUENT}$) (kg N_2O-N/kg N)	Conversion factor of kg N_2O-N into kg N_2O 44/28	Total N_2O emissions (kg N_2O/year)
	Sheet 2 of 4	See Table 6.15		D = A x B x C
			Total	

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Sector	**Waste**			
Category	**Industrial Wastewater Treatment and Discharge**			
Category Code	**4D2**			
Sheet	**1 of 4 Estimation of Nitrogen in Industrial Wastewater (New)**			
STEP 1				
	A	B	C	D
Industry Sectors	Total industry product (P_i) ($t_{product}$/yr)	Wastewater generated (W_i) ($m^3/t_{product}$)	Total nitrogen (TN_i) (kg N/m^3)	Total nitrogen in industrial wastewater (treated) (TN_{INDi}) (kg N/year) D = (A x B x C)
Industrial sector 1				
Industrial sector 2				
Industrial sector 3				
add as needed				
			Total	

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Sector	Waste			
Category	Industrial Wastewater Treatment and Discharge			
Category Code	4D2			
Sheet	2 of 4 Estimation of Nitrogen in Effluent from Industrial Wastewater (New)			
	A	B	C	D
Type of treatment or discharge pathway	Total nitrogen in industrial wastewater	Fraction of wastewater treated exclusively by each wastewater treatment type k	Fraction of total wastewater nitrogen removed during wastewater treatment per treatment type k	Total nitrogen in effluent
	(TN_{INDi})	(FWT_k)	($N_{REM,k}$)	($N_{EFFLUENT,IND}$)
	(kg N/year)	(kg/person/ year)	(-)	(kg N/year)
	Sheet 1 of 4			D = [A x (B x (1 - C))]
			Total	

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Sector	**Waste**				
Category	**Industrial Wastewater Treatment and Discharge**				
Category Code	**4D2**				
Sheet	**3 of 4 Estimation of N_2O Emissions from Industrial Wastewater Treatment Plants (New)**				
STEP 3					
Type of treatment	A	B	C	D	E
	Degree of utilisation of treatment/discharge pathway or system, *j*, for each industry, *i* ($T_{i,j}$) (fraction)	Emission factor for treatment/discharge pathway or system, *j* (EF_j) (kg N_2O-N/kg N)	Nitrogen in wastewater from industry, *i* (treated) (TN_{INDi}) (kg N/year)	Conversion factor of kg N_2O-N into kg N_2O 44/28	N_2O emissions from industrial wastewater treatment plants in inventory year ($N_2O\ Plants_{IND}$) (kg N_2O/year)
			Sheet 1 of 4		E = (A x B x C x D)
Industrial sector 1					
Industrial sector 2					
Industrial sector 3					
add as needed					
				Total	

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Sector	**Waste**			
Category	**Industrial Wastewater Treatment and Discharge**			
Category Code	**4D2**			
Sheet	**4 of 4 Estimation of N_2O Emissions from Industrial Wastewater Effluent (New)**			
STEP 4				
Type of treatment or discharge pathway	A	B	C	D
	Nitrogen in effluent ($N_{EFFLUENT,IND}$) (kg N/year)	Emission factor ($EF_{EFFLUENT}$) (kg N_2O-N/kg N)	Conversion factor of kg N_2O-N into kg N_2O 44/28	Total N_2O emissions (kg N_2O/year)
	Sheet 2 of 4	See Table 6.15		D = A x B x C
add as needed				
			Total	

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