

ANNEX 1

MAPPING TABLES

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Annex 1 Relating 2019 Refinement to the 2006 IPCC Guidelines

This annex provides a road map for relating sections, equations, tables, figures and boxes in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Type of Refinement: E – Elaboration, U – Update, NG – New Guidance.

CHAPTER 2

Sections

Section Title	Type of Refinement	2006 Guidelines Section Number	2019 Refinement Section Number
Introduction	E	2.1	2.1
Municipal Solid Waste (generation and management)	U	2.2.1	2.2.1
Municipal Solid Waste (composition)	U	2.3.1	2.3.1
Sludge (composition)	NG	2.3.2	2.3.2

Tables

Table Title	Type of Refinement	2006 Guidelines Table Number	2019 Refinement Table Number
MSW generation and treatment data – Regional defaults	U	2.1	2.1
MSW composition data by percentage – Regional defaults	U	2.3	2.3
Default value and uncertainty of carbon content, nitrogen content and DOC of domestic and industrial sludge (percent of dry matter)	NG	-	2.4A
MSW generation and management data – by countries and regional averages	U	2A.1	2A.1
Waste composition by countries and regional averages	NG	-	2A.2

Boxes

Box Title	Type of Refinement	2006 Guidelines Box Number	2019 Refinement Box Number
Sludge pathway	NG	-	2.1A

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CHAPTER 3**Sections**

Section Title	Type of Refinement	2006 Guidelines Section Number	2019 Refinement Section Number
Methodological issues (First Order Decay)	NG	3.2.1.1	3.2.1.1
Choice of emission factors and parameters: Fraction of degradable organic carbon which decomposes (DOC_f)	E	3.2.3	3.2.3
Choice of emission factors and parameters: Methane correction factor (MCF)	E	3.2.3	3.2.3
Uncertainties associated with parameters	U	3.7.2.2.	3.7.2.2
Information on Nitrous Oxide Emission from Solid Waste Disposal Site	NG	-	Appendix 3A
Information on Estimation of CH_4 Emission from Solid Waste Disposal Site Managed by Active Aeration Using Locally Available Measured Data	NG	-	Appendix 3B

Equations

Equation Title	Type of Refinement	2006 Guidelines Equation Number	2019 Refinement Equation Number
MCF for managed SWDS (active aeration)	NG	-	3B.1

Tables

Table Title	Type of Refinement	2006 Guidelines Table Number	2019 Refinement Table Number
Fraction of degradable organic carbon which decomposes (DOC_f) for different waste types	NG	-	3.0
SWDS classification and Methane Correction Factors (MCF)	U/NG	3.1	3.1
Estimates of uncertainties associated with the default activity and parameters in the FOD method for CH_4 emissions from SWDS	U/NG	3.5	3.5

30 **Boxes**

Box Title	Type of Refinement	2006 Guidelines Box Number	2019 Refinement Box Number
Information on calculation of MCF for new category of aerobic management of SWDS (Managed poorly-semi-aerobic, Managed well-active aeration, Managed poorly-active aeration)	NG	-	Box 3.0A
Information on effect of DOC leaching from SWDS	NG	-	Box 3.0B

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CHAPTER 5**Sections**

Section Title	Type of Refinement	2006 Guidelines Section Number	2019 Refinement Section Number
Introduction	E	5.1	5.1
Choice of emission factors: Oxidation factor	U	5.4.1.3.	5.4.1.3
Choice of emission factors: CH ₄ emission factor	E	5.4.2	5.4.2
Choice of emission factors: N ₂ O emission factor	E	5.4.3	5.4.3

Tables

Table Title	Type of Refinement	2006 Guidelines Table Number	2019 Refinement Table Number
Default data for CO ₂ emission factors for incineration and open burning of waste	U	5.2	5.2
CH ₄ emission factors for pyrolysis/melting and gasification/melting plant of MSW	E/NG	-	5.3A
CH ₄ emission factors for pyrolysis of waste in laboratory scale	E/NG	-	5.3B
CH ₄ emission factors for gasification of waste in laboratory scale	E/NG	-	5.3C
N ₂ O emission factor for pyrolysis/melting and gasification/melting plant of MSW	E/NG	-	5.4A

Boxes

Box Title	Type of Refinement	2006 Guidelines Box Number	2019 Refinement Box Number
Pyrolysis	NG	-	5.0A
Gasification	NG	-	5.0B
Plasma	NG	-	5.0C
Information of methane emission factors in laboratory scale	NG	-	5.2
Combined system	NG	-	5.3

41 **CHAPTER 6**42 **Sections**

Section Title	Type of Refinement	2006 Guidelines Section Number	2019 Refinement Section Number
Introduction	E, U	6.1	6.1
Methodological issues	U	6.2.1	6.2.1
Choice of method (CH ₄ emissions from domestic wastewater)	U	6.2.2.1	6.2.2.1
Choice of emission factors (CH ₄ emissions from domestic wastewater)	E, U	6.2.2.2	6.2.2.2
Choice of activity data (CH ₄ emissions from domestic wastewater)	U, NG	6.2.2.3	6.2.2.3
Uncertainties (CH ₄ emissions from domestic wastewater)	U	6.2.2.5	6.2.2.5
Choice of method (CH ₄ emissions from industrial wastewater)	U	6.2.3.1	6.2.3.1
Choice of emission factors (CH ₄ emissions from industrial wastewater)	U, NG	6.2.3.2	6.2.3.2
Methodological issues (N ₂ O emissions from domestic wastewater)	E, U, NG	6.3.1	6.3.1
Choice of method (N ₂ O emissions from domestic wastewater)	E, U, NG	6.3.1.1	6.3.1.1
Choice of emission factors (N ₂ O emissions from domestic wastewater)	E, U, NG	6.3.1.2	6.3.1.2
Choice of activity data (N ₂ O emissions from domestic wastewater)	E, U, NG	6.3.1.3	6.3.1.3
Uncertainties (N ₂ O emissions from domestic wastewater)	U	6.3.3	6.3.3
N ₂ O emissions from industrial wastewater	NG	-	6.4 (and all subsections)
Abiogenic (fossil) CO ₂ emissions from wastewater treatment and discharge	NG	-	Annex 6A.1
Summary data for pit latrine use, no sanitation facility, and groundwater use by country	E, U, NG	-	Annex 6A.2
Derivation of the maximum CH ₄ producing potential (Bo) for domestic wastewater	E	-	Annex 6A.3
Calculation of MCF for methane emissions from sewage discharges	E, U, NG	-	Annex 6A.4
Estimation of default emission factors for N ₂ O in domestic wastewater treatment plants	E, U, NG	-	Annex 6A.5

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Estimation of default emission factors for N ₂ O in effluent	E, U, NG	-	Annex 6A.6
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Equations

Equation Title	Type of Refinement	2006 Guidelines Equation Number	2019 Refinement Equation Number
Total CH ₄ emissions from domestic wastewater for each income group and treatment/discharge pathway or system	NG	6.1	6.1A
Total CH ₄ emissions from domestic wastewater	NG	6.1	6.1B
Total organics in domestic wastewater by income group and treatment/discharge pathway or system	NG	6.1	6.3A
Organic component removed as sludge from aerobic treatment plants	NG	-	6.3B
Organic component removed as sludge from septic systems	NG	-	6.3C
Total organics in domestic wastewater effluent	NG	-	6.3D
N ₂ O emissions from domestic wastewater treatment plants	U	6.9	6.9
N ₂ O emissions from domestic wastewater effluent	U	6.7	6.7
Total nitrogen in domestic wastewater by treatment pathway	NG	-	6.10
Total nitrogen in domestic wastewater effluent	U	6.8	6.8
N ₂ O emissions from industrial wastewater treatment plants	NG	-	6.11
N ₂ O emissions from industrial wastewater effluent	NG	-	6.12
Total nitrogen in industrial wastewater	NG	-	6.13
Total nitrogen in industrial wastewater effluent	NG	-	6.14

Discussion:

Equation 6.1 in 2006 IPCC Guidelines was divided to Equations 6.1A, 6.1B and 6.3A to emphasize calculation by individual pathways

Equations 6.3B was introduced to allow conversion on sludge (t/yr) to organic component removed as sludge (S in Equation 6.1)

Equation 6.3C was introduced to improve estimation of CH₄ emissions from septic tanks, depending on regularity of sludge removal

Equation 6.3D was introduced to improve estimation of CH₄ emissions from discharge of domestic wastewater to aquatic environments

Equation 6.9 was updated to reflect the calculation of direct N₂O emissions from domestic wastewater treatment and expanded to cover all wastewater treatment plants

Equation 6.7 was updated to reflect the calculation of indirect N₂O emissions from the discharge of domestic wastewater treatment effluent to aquatic environments

Equation 6.10 was introduced to better reflect the calculation of total nitrogen in domestic wastewater

Equation 6.8 was updated to reflect the calculation of nitrogen in effluent from domestic wastewater treatment

Equations 6.11 through 6.14 were introduced to allow for calculation of N₂O emissions from industrial wastewater treatment

Tables

Table Title	Type of Refinement	2006 Guidelines Table Number	2019 Refinement Table Number
CH ₄ and N ₂ O emission potentials for wastewater and sludge treatment and discharge systems	U	6.1	6.1
Default MCF values and resultant EFs for domestic wastewater	U	6.3	6.3
Removal of organic component from wastewater as sludge (K _{REM}) according to treatment type	NG	-	6.12
Wastewater treatment organics removal fractions (TOW _{REM}) according to treatment type	NG	-	6.13
Default uncertainty ranges for domestic wastewater	U	6.7	6.7
Default maximum CH ₄ producing capacity (Bo) for industrial wastewater	NG	-	6.14
Default MCF values for industrial wastewater	U	6.8	6.8
Default EF values for domestic and industrial wastewater	NG	6.11	6.15
Default factors for domestic wastewater	NG	-	6.16
Wastewater treatment nitrogen removal fractions (N _{REM}) according to treatment type	NG	-	6.17
N ₂ O methodology default data	U	6.11	6.11
Examples of industrial wastewater data	NG	-	6.18
Default uncertainty ranges for industrial wastewater	NG	-	6.19
Summary of literature investigating fossil organic carbon in wastewater	NG	-	6A.1
Summary data for pit latrine use, no sanitation facility,	NG	-	6A.2

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and groundwater use by country			
Summary of literature investigating methane emissions from wastewater discharge	NG	-	6A.3
Default N ₂ O emission factors for domestic wastewater treatment plants	NG	-	6A.4A
Emission factors in full-scale domestic wastewater treatment plants	E	-	6A.4B

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65 **Figures**

Figure Title	Type of Refinement	2006 Guidelines Figure Number	2019 Refinement Figure Number
Wastewater treatment systems and discharge pathways	U	6.1	6.1
Percentage of low-income country populations using pit latrines as a primary sanitation facility	NG	-	6.1A
Decision tree for CH ₄ emissions from domestic wastewater	U	6.2	6.2
Decision tree for CH ₄ emissions from industrial wastewater	U	6.3	6.3
Decision tree for N ₂ O emissions from domestic wastewater	NG	-	6.4
Nitrogen in domestic wastewater treatment	NG	-	6.5
Decision tree for N ₂ O emissions from industrial wastewater	NG	-	6.6
Correlation between influent N load and N ₂ O emission	E	-	6A.1

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