# ANNEX 1

# MAPPING TABLES

# Contents

# 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 industrial sludge (dry matter) | NG | - | 2.4A |
| MSW generation and management data- by country and regional averages | U | 2A.1 | 2A.1 |
| Waste composition by country and region | NG | - | 2A.2 |

### Boxes

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

## CHAPTER 3

### Sections

| Section Title | Type of Refinement | 2006 Guidelines Section Number | 2019 Refinement Section Number |
|---|---|---|---|
| Methodological issues (First Order Decay) | NG | 3.2/3.2.1.1 | 3.2/3.2.1.1 |
| Methodological issues (Fraction of degradable organic carbon which decomposes (DOCf)) | E | 3.2/3.2.3 | 3.2/3.2.3 |
| Uncertainty assessment | U | 3.7.2/3.7.2.2. | 3.7.2/3.7.2.2 |

First-order Draft

## 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 $DOC_f$ | U/NG | 3.5 | 3.5 |

## Boxes

| Box Title | Type of Refinement | 2006 Guidelines Box Number | 2019 Refinement Box Number |
|---|---|---|---|
| Calculation of MCF for new category of aerobic management of SWDS (managed poorly-semiaerobic, managed well-active aeration, managed poorly-active aeration) | NG | - | Box3.0a |
| Nitrous oxide emission from SWDS | NG | - | Box 3.0b |
| Effect of DOC leaching from SWDS | NG | - | Box 3.0c |

# 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/CH4 emission factor | E | 5.4.2 | 5.4.2 |
| Choice of emission factors/N2O emission factor | E | 5.4.3 | 5.4.3 |

## Tables

| Table Title | Type of Refinement | 2006 Guidelines Table Number | 2019 Refinement Table Number |
|---|---|---|---|
| Table 5.2 Default data for $CO_2$ emission factors for incineration and open burning of waste | U | 5.2 | 5.2 |
| Table 5.3a $CH_4$ emission factors for pyrolysis of waste | E/NG | - | 5.3A |
| Table 5.3b $CH_4$ emission factors for gasification of waste | E/NG | - | 5.3B |
| Table 5.4a $N_2O$ emission factor of $N_2O$ pyrolysis and gasification/melting facility of MSW | E/NG | - | 5.4A |

# CHAPTER 6

## Sections

| Section Title | Type of Refinement | 2006 Guidelines Section Number | 2019 Refinement Section Number |
|---|---|---|---|
| Introduction | E, U | 6.1 | 6.1 |
| 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 emission factors ($CH_4$ emissions from industrial wastewater) | U, NG | 6.2.3.2 | 6.2.3.2 |
| Methodological issues ($N_2O$ emissions from domestic wastewater) | E, U, NG | 6.3.1 | 6.3.1 |
| Choice of method ($N_2O$ emissions from domestic wastewater) | E, U, NG | 6.3.1.1 | 6.3.1.1 |
| Choice of emission factors ($N_2O$ emissions from domestic wastewater) | E, U, NG | 6.3.1.2 | 6.3.1.2 |
| Choice of activity data ($N_2O$ emissions from domestic wastewater) | E, U, NG | 6.3.1.3 | 6.3.1.3 |
| Uncertainties ($N_2O$ emissions from domestic wastewater) | U | 6.3.3 | 6.3.3 |
| $N_2O$ emissions from industrial wastewater | NG | - | 6.4 (and all subsections) |
| Derivation of the maximum $CH_4$ producing potential ($B_O$) for domestic wastewater | E | - | Annex |
| Abiogenic (fossil) CO2 emissions from wastewater treatment and discharge | NG | - | Annex |

## 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 | NG | 6.1 | 6.1A |
| Total $CH_4$ emissions from domestic wastewater | NG | 6.1 | 6.1B |
| Organically degradable material 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 |
| Direct $N_2O$ emissions from domestic wastewater treatment plants | U | 6.9 | 6.9 |
| Indirect $N_2O$ emissions from domestic wastewater effluent | U | 6.7 | 6.7 |
| Total nitrogen in domestic wastewater | NG | - | 6.10 |
| Total nitrogen in domestic wastewater effluent | U | 6.8 | 6.8 |
| Direct $N_2O$ emissions from industrial wastewater treatment plants | NG | - | 6.11 |
| Indirect $N_2O$ 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 IPCC Guidance 2006 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 Eq. 6.1)

Equation 6.3C was introduced to improve estimation of $CH_4$ emissions from septic tanks, depending on regularity of sludge removal

Equation 6.9 was updated to reflect the calculation of direct $N_2O$ emissions from domestic wastewater treatment and expanded to cover all wastewater treatment plants

Equation 6.7 was updated to reflect the calculation of indirect $N_2O$ 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 $N_2O$ emissions from industrial wastewater treatment

## Tables

| Table Title | Type of Refinement | 2006 Guidelines Table Number | 2019 Refinement Table Number |
|---|---|---|---|
| $CH_4$ and $N_2O$ emission potentials for wastewater and sludge treatment and discharge systems | U | 6.1 | 6.1 |
| Default MCF values for domestic wastewater | U | 6.3 | 6.3 |
| Default uncertainty ranges for domestic wastewater | U | 6.7 | 6.7 |
| Default maximum $CH_4$ producing capacity ($B_O$) for industrial wastewater | NG | - | 6.2A |
| Default MCF values for industrial wastewater | U | 6.8 | 6.8 |
| $N_2O$ methodology default data | U | 6.11 | 6.11 |
| Default EF values for domestic wastewater | NG | 6.11 | 6.12 |
| Default factors for domestic wastewater | NG | - | 6.13 |
| Examples of industrial wastewater data | NG | - | 6.14 |
| Default uncertainty ranges for industrial wastewater | NG | - | 6.15 |
| Summary of literature investigating fossil organic carbon in wastewater | NG | - | 6A-1 |

## Figures

| Figure Title | Type of Refinement | 2006 Guidelines Figure Number | 2019 Refinement Figure Number |
|---|---|---|---|
| Updated 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 $N_2O$ emissions from domestic wastewater | NG | - | 6.4 |
| Nitrogen in domestic wastewater treatment | NG | - | 6.5 |
| Decision tree for $N_2O$ emissions from industrial wastewater | NG | - | 6.6 |