

ANNEX 1

MAPPING TABLES

Contents

Annex 1 Relating 2019 Refinement to the 2006 IPCC Guidelines.....	A1.3
Chapter 1 Introduction to National GHG Inventories.....	A1.3
Chapter 2 Approaches to Data Collection	A1.4
Chapter 3 Uncertainties	A1.6
Chapter 4 Methodological Choice and Identification of Key Categories	A1.8
Chapter 5 Time Series Consistency	A1.9
Chapter 6 Quality Assurance/Quality Control and Verification	A1.11
Chapter 7 Precursors and Indirect Emissions	A1.13
Chapter 8 Reporting Guidance and Tables	A1.14

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: U – Update, NG – New Guidance, NR – No Refinement, R – Removed.

CHAPTER 1 INTRODUCTION TO NATIONAL GHG INVENTORIES

Refinements undertaken for Chapter 1 involve primarily guidance on establishing GHG inventory arrangements that can support the development, improvement and maintenance of national GHG inventories. The Section 1.1 has been updated by elaboration of concept of anthropogenic emissions and removals related to additional and voluntary estimation and reporting of emissions and removals from natural disturbances in Chapter 2 of Volume 4. A sub-section on the treatment of CO₂, CH₄ and N₂O emissions from combustion of biomass or biomass-based products has also been added. The chapter introduces the concept of institutional arrangements and some examples on the functional roles of organisations in the national inventory compilation process. The chapter describes the use of different data management systems needed for calculating estimates and for aggregating and reporting GHG inventory data.

Sections

- The Section 1.1 is an update of Section 1.1, Chapter 1, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 1.1, Chapter 1, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 1.4a is a new section in the Chapter 1, Volume 1 of the *2019 Refinement*. It should be placed after section 1.4, Chapter 1, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 1.6 is a new section in the Chapter 1, Volume 1 of the *2019 Refinement*. It should be placed after Section 1.5, Chapter 1, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Concepts	U	1.1	1.1
National GHG Inventory Arrangements	NG	-	1.4a
GHG inventory management tools	NG	-	1.6

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
An illustrative example structure for capturing and sharing information on the objectives of the national GHG inventory	NG	-	1.1
Illustrative table constructed around UK GHG inventory objectives	NG	-	1.2
List of common actors and stakeholder types with their general roles and capabilities	NG	-	1.3
Examples of metadata for tracking GHG inventory stakeholders	NG	-	1.4
Illustrative list of datasets used in the GHG inventory	NG	-	1.5
Illustrative workplan for the preparation of a GHG inventory including an indicative timeline	NG	-	1.6
Suggested information in a standardised data structure for collating GHG inventory data	NG	-	1.7

Suggested description of potential, planned and implemented improvements in inventory improvement plan	NG	-	1.8
--	----	---	-----

Figures

Figure Title	Type of Refinement	2006 IPCC Guidelines Figure Number	2019 Refinement Figure Number
Illustrative example of GHG inventory institutional arrangements structuring	NG	-	1.0

Boxes

Box Title	Type of Refinement	2006 IPCC Guidelines Box Number	2019 Refinement Box Number
Linkages of GHG inventory activities with other data collection and reporting	NG	-	1.0a
Illustrative data flow overview diagram example for South Africa	NG	-	1.0b

CHAPTER 2 APPROACHES TO DATA COLLECTION

Chapter 2 contains updated guidance on approaches to data collection and on the development of country specific emission factors. New guidance is also provided for the use of facility data in the inventory compilation process, considering both cases where data comes from facility reporting programmes built for inventory use and those cases where data collection was not originally designed for inventory application.

Sections

- The Section 2.1 is an update of Section 2.1, Chapter 2, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 2.1, Chapter 2, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 2.2 is an update of Section 2.2, Chapter 2, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 2.2, Chapter 2, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 2.3 is a new section in Chapter 2, Volume 1 of the *2019 Refinement*. It should be placed after Section 2.2, Chapter 2, Volume 1 of the *2006 IPCC Guidelines*.
- The Annex 2A.2 is an update of Annex 2A.2, Chapter 2, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Annex 2A.2, Chapter 2, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Introduction	U	2.1	2.1
Collecting data	U	2.2	2.2
Use of Facility Data in Inventories	NG	-	2.3
General guidance on performing surveys	U	2A.2	2A.2

Equations

Equation Title	Type of Refinement	2006 IPCC Guidelines Equation Number	2019 Refinement Equation Number
Total facility emissions from all sources	NG	-	2.1
Emissions calculated by facility-specific emission factors	NG	-	2.2
Facility data integration by emission source	NG	-	2.3
Total facility emissions by industrial classification	NG	-	2.4

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Generic elements of a measurement programme	U	2.1	2.1
Main parameters that effect emissions and removals	NG	-	2.1a
Potential sources of emission factors	U	2.2	2.2
Standard measurement methods for exhaust gas	U	2.3	2.3
Quality goals for facility data	NG	-	2.4
Potential facility GHG reporting requirements	NG	-	2.5

Figures

Figure Title	Type of Refinement	2006 IPCC Guidelines Figure Number	2019 Refinement Figure Number
Steps in data collection	NG	-	2.0a
Outline of data collection steps and decisions	NG	-	2.0b
Process for including data in the EFDB	U	2.1	2.1
Illustration of how to integrate FRD into national activity dataset	NG	-	2.2
Sample decision tree for integration of FRD	NG	-	2.3

Boxes

Box Title	Type of Refinement	2006 IPCC Guidelines Box Number	2019 Refinement Box Number
Example of confidentiality agreement form of the UK in 2013 (DECC and DEFRA were the relevant government departments in 2013)	NG	-	2.0a
Illustrative examples of aggregation of confidential data	NG	-	2.0b
Example of using alternative data to approximate activity data	NR	2.1	2.1
The difference between census and survey data	NR	2.2	2.2
Facility data consideration and use	NG	-	2.3

CHAPTER 3 UNCERTAINTIES

Refinements undertaken for Chapter 3 involve a series of updates in different sections with the aim to provide clear guidance on estimating and reporting uncertainties associated with both annual estimates of emissions and removals, and emission and removal trends over time. The chapter is updated, with a series of examples, in order to address the inventory compiler on the most appropriate estimators that could be used, within typical circumstances and available data, for uncertainty evaluation. Examples of uncertainty calculations in different sectors are also provided.

Sections

- The Section 3.1.1 is an update of Section 3.1.1, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.1.1, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.1.1a is a new section in the Chapter 3, Volume 1 of the *2019 Refinement*. It should be placed after Section 3.1.1, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.1.2 is an update of Section 3.1.2, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.1.2, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.1.3 is an update of Section 3.1.3, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.1.3, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.1.5 is an update of Section 3.1.5, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.1.5, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.1.6 is an update of Section 3.1.6, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.1.6, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.2 is an update of Section 3.2, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.2, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.2.3 is an update of Section 3.2.3, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.2.3, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 3.6 is an update of Section 3.6, Chapter 3, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 3.6, Chapter 3, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Overview of uncertainty analysis	U	3.1.1	3.1.1
Uncertainty assessment as part of inventory management	NG	-	3.1.1a
Overall structure of uncertainty analysis	U	3.1.2	3.1.2
Key concepts and terminology	U	3.1.3	3.1.3
Causes of uncertainty	U	3.1.5	3.1.5
Reducing uncertainty	U	3.1.6	3.1.6
Quantifying uncertainties	U	3.2	3.2
Methods to combine uncertainties	U	3.2.3	3.2.3
Examples	U	3.6	3.6

Equations

Equation Title	Type of Refinement	2006 IPCC Guidelines Equation Number	2019 Refinement Equation Number
Combining uncertainties – Approach 1 – multiplication	U	3.1	3.1
Combining uncertainties – Approach 1 – addition and subtraction	U	3.2	3.2
Combining uncertainties – approach 1 – $AD \cdot EF$	NG	-	3.2a
Combining uncertainties – approach 1 – $EF = a \cdot b \cdot c$	NG	-	3.2b
Approach 1 - Trend uncertainty	NG	-	3.2c
Calculation of Type A Sensitivity	NG	-	3.2d
Calculation of Type B Sensitivity	NG	-	3.2e
Trend uncertainty due to emission factor	NG	-	3.2f
Trend uncertainty due to activity data	NG	-	3.2g

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Approach 1 uncertainty calculation	U	3.2	3.2
Example of an Approach 1 uncertainty analysis for Finland (based on Statistics Finland 2018)	U	3.4	3.4
List of selected parameters for estimating CH ₄ emission factors for enteric fermentation (based on ISPRA 2018)	NG	-	3.6
Statistics of the Monte Carlo assessment for CH ₄ emissions from enteric fermentation, 2009 (based on ISPRA 2018)	NG	-	3.7

Figures

Figure Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Overall structure of a generic uncertainty assessment process	U	3.1	3.1
Uncertainty assessment steps description and decision tree	NG	-	3.1a
Illustration of accuracy and precision	NR	3.2	3.2
Estimated soil organic C stock changes (Tg CO ₂ eq. yr ⁻¹) and 95 percent confidence intervals for Tier 1, 2 and 3 methods as applied in the national greenhouse gas inventory for the United States (US EPA 2017)	NG	3.2a	3.2a
Examples of selected distribution functions (based on ISPRA 2018)	NG	-	3.8a
Probability density function from Monte Carlo assessment (based on ISPRA 2018)	NG	-	3.8b
Sensitivity chart from Monte Carlo assessment (based on ISPRA 2018)	NG	-	3.8c

Boxes

Box Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Example of reducing uncertainty in a category by adopting higher tier methods	NG	-	3.0
Difference between standard deviation and standard error	NG	-	3.0a
Conversion of range to uncertainty	NG	-	3.0b
Example of uncertainty calculation: CH ₄ emissions from manure management	NG	-	3.1a

CHAPTER 4 METHODOLOGICAL CHOICE AND IDENTIFICATION OF KEY CATEGORIES

This chapter includes a series of updates on the approaches to identify *key categories* considering both the level and trend assessment. No major modifications with respect to the *2006 IPCC Guidelines* have occurred but a simplification of the equation to calculate the trend assessment.

Sections

- The Section 4.1 is an update of Section 4.1, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.1, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.1.1 is an update of Section 4.1.1, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.1.1, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.1.2 is an update of Section 4.1.2, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.1.2, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.2 is an update of Section 4.2, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.2, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.3.1 is an update of Section 4.3.1, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.3.1, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.3.3 is an update of Section 4.3.3, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.3.3, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.4 is an update of Section 4.4, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.4, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 4.5 is an update of Section 4.5, Chapter 4, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 4.5, Chapter 4, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Introduction	U	4.1	4.1
Definition	U	4.1.1	4.1.1
Purpose of the key category analysis	U	4.1.2	4.1.2
General rules for identification of <i>key categories</i>	U	4.2	4.2
Approach 1 to identify <i>key categories</i>	U	4.3.1	4.3.1
Qualitative criteria to identify <i>key categories</i>	U	4.3.3	4.3.3
Reporting and Documentation	U	4.4	4.4
Examples of key category analysis	U	4.5	4.5

Equations

Equation Title	Type of Refinement	2006 IPCC Guidelines Equation Number	2019 Refinement Equation Number
Level Assessment (Approach 1)	U	4.1	4.1
Trend Assessment (Approach 1)	U	4.2	4.2

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Suggested aggregation level of analysis for Approach 1	U	4.1	4.1
Spreadsheet for the Approach 1 analysis – Level Assessment	U	4.2	4.2
Spreadsheet for the Approach 1 analysis – Trend Assessment	U	4.3	4.3
Summary of key category analysis	U	4.4	4.4
Key categories ranks	NG	-	4.4a
Example of Approach 1 Level Assessment for Finland's GHG inventory for 2016	U	4.5	4.5
Example of Approach 1 Trend Assessment for Finland's GHG inventory for 2016	U	4.6	4.6
Example of Approach 1 Level Assessment for the Finnish GHG Inventory for 2003 using a subset	R	4.7	4.7
Example of Approach 1 Trend Assessment for the Finnish GHG Inventory for 2003 using a subset	R	4.8	4.8
Example of Approach 2 Level Assessment for Finland's GHG inventory for 2016	U	4.9	4.9
Example of Approach 2 Trend Assessment for Finland's GHG inventory for 2016	U	4.10	4.10
Example of Summary of Key Category Analysis for Finland's GHG inventory for 2016	U	4.11	4.11

Figures

Figure Title	Type of Refinement	2006 IPCC Guidelines Figure Number	2019 Refinement Figure Number
Decision Tree to choose a Good Practice method	NR	4.1	4.1

CHAPTER 5 TIME SERIES CONSISTENCY

Refinements undertaken for Chapter 5 involve a series of updates in most sections of this chapter as well as provision of new guidance on splicing techniques, most noticeable in relation to non-linear trend analysis. The chapter has maintained most of its original outline. Some of the significant updates are the provision of guidance to deal with time series consistency in cases wherein new emissions factors become available from the IPCC Guidelines, treatment of country-specific categories, maintaining time-series consistency with changes in data sources for different years of the time series and examples to illustrate the application of splicing techniques already provided in the chapter (e.g. overlap and interpolation methods). The chapter has new guidance on a number of time series consistency issues such as ensuring time series consistency when using facility level data, guidance on types of surrogate datasets by IPCC sector that could be used to apply the surrogate method as well as the application of the non-linear trend analysis method with a practical example.

Sections

- The Section 5.2.1 is an update of Section 5.2.1, Chapter 5, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 5.2.1, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 5.2.2 is an update of Section 5.2.2, Chapter 5, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 5.2.2, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 5.2.3 is an update of Section 5.2.3, Chapter 5, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 5.2.3, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 5.3.1 is an update of Section 5.3.1, Chapter 5, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 5.3.1, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 5.3.3 is an update of Section 5.3.3, Chapter 5, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 5.3.3, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 5.3.3.5a is a new Section in the Chapter 5, Volume 1 of the *2019 Refinement*. It should be placed after Section 5.3.3.5, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 5.4 is an update of Section 5.4, Chapter 5, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 5.4, Chapter 5, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Recalculations due to methodological changes and refinements	U	5.2.1	5.2.1
Adding new categories	U	5.2.2	5.2.2
Tracking increases and decreases due to technological change and other factors	U	5.2.3	5.2.3
Issues with data availability	U	5.3.1	5.3.1
Splicing techniques	U	5.3.3	5.3.3
Non-linear trend analysis	NG	5.3.3.5	5.3.3.5a
Reporting and documentation of trend information	U	5.4	5.4

Equations

Equation Title	Type of Refinement	2006 IPCC Guidelines Equation Number	2019 Refinement Equation Number
Recalculated emission or removal estimate computed using the overlap method	NR	5.1	5.1

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Examples of surrogate data by sector	U	-	5.0
Summary of splicing techniques	U	5.1	5.1
Category-specific documentation of recalculations	U	5.2	5.2

Figures

Figure Title	Type of Refinement	2006 IPCC Guidelines Figure Number	2019 Refinement Figure Number
Consistent overlap	NR	5.1	5.1
Inconsistent overlap	NR	5.2	5.2
Linear interpolation	NR	5.3	5.3

Boxes

Box Title	Type of Refinement	2006 IPCC Guidelines Box Number	2019 Refinement Box Number
Recalculation in the Agriculture, Forestry and Other Land Use (AFOLU) Sector	U	5.1	5.1
Time series consistency when using facility level data from new legislation (e.g. data from emissions trading scheme or other national data reporting programmes)	NG	-	5.1a
Case study of overlap method for methane emissions from charcoal production in Godonia	NG	-	5.1b
Case study of interpolating data for carbon dioxide emissions from fossil liquid incineration in Godonia	NG	-	5.2a
Case study of non-linear interpolation of data direct soil N ₂ O emissions from manure on non-federal grasslands	NG	-	5.2b

CHAPTER 6 QUALITY ASSURANCE/QUALITY CONTROL AND VERIFICATION

Chapter 6 contains updated guidance on quantification of emissions estimates based on atmospheric concentration measurements. This update is based on the latest scientific literature. Key features of the updates include a description of the elements needed for GHG emissions inventory verification using atmospheric measurements including the role of inverse modelling and satellite observations. The guidance presents a series of national examples wherein practical application of atmospheric measurements for verification of national emission inventory estimates has been undertaken. The chapter also presents new guidance on the use and reporting of models. This new guidance applies to complex models, generally Tier 3 approaches. A step-by-step approach to report on the use of models in emission inventories is presented along with a checklist for ensuring *good practice* in the use of complex, higher tier models in national greenhouse gas inventories.

Sections

- The Section 6.1 is an update of Section 6.1, Chapter 6, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 6.1, Chapter 6, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 6.7.2.1 is an update of Section 6.7.2.1, Chapter 6, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 6.1, Chapter 6, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 6.10.1 is an update of Section 6.10.1, Chapter 6, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 6.10.1, Chapter 6, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 6.10.2 is an update of Section 6.10.2, Chapter 6, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 6.10.2, Chapter 6, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 6.12 is a new Section in the Chapter 6, Volume 1 of the *2019 Refinement*. It should be placed after Section 6.11, Chapter 6, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Introduction	U	6.1	6.1
National level activity data	U	6.7.2.1	6.7.2.1
Comparisons of national estimates	U	6.10.1	6.10.1
Comparisons with atmospheric measurements	U	6.10.2	6.10.2
Use and reporting of models	NG	-	6.12

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Strengths, problems and prospects of using atmospheric measurements for verification of GHG emissions	NG	-	6.2
Implementation steps and share of responsibilities between partners	NG	-	6.3
Summary of the key steps implemented in national examples	NG	-	6.4
General outline of national inventory comparison to global/regional inverse modelling products	NG	-	6.5
General guidance related to models in Volumes 1 & 4 of the <i>2006 IPCC Guidelines</i>	NG	-	6.6

Figures

Figure Title	Type of Refinement	2006 IPCC Guidelines Figure Number	2019 Refinement Figure Number
A decision tree for checking the conditions for using the inverse model estimates in the National Inventory verification	NG	-	6.1
Schematic of typical model development/selection process	NG	-	6.2

Boxes

Box Title	Type of Refinement	2006 IPCC Guidelines Box Number	2019 Refinement Box Number
Definitions of QA/QC and verification	U	6.1	6.1
Evaluation of data quality on external data in the transportation sector	NR	6.3	6.3
Comparison – verification actions on inventory compiler side	NG	-	6.5
UK methane (CH ₄) and nitrous oxide (N ₂ O) inverse modelling	NG	-	6.6

CHAPTER 7 PRECURSORS AND INDIRECT EMISSIONS

This chapter includes a series of updates that include improvements in the explanation of the methodology for indirect N₂O emissions from the atmospheric deposition of nitrogen in NO_x and NH₃, detailed methodological guidance on treatment of CO₂ inputs to the atmosphere from emissions of carbon-containing compounds, an update on the background science on precursors and indirect emissions. The chapter also incorporates updated guidance on non-biogenic sources of CO₂ from the atmospheric oxidation of CH₄, CO, and NMVOCs, examples of NMVOCs from the different source categories as well as data on carbon content of various materials (percent carbon by mass, PC) and percent of total solvent NMVOC emissions (by mass, PU). The authors of Chapter 7 concluded that there is no coherent treatment of indirect emissions across sectors. However, the conclusion was that it would have been beyond the scope of the *2019 Refinement* to introduce a rigorous framework across all sectors with respect to treatment of indirect emissions.

Sections

- The Section 7.1 is an update of Section 7.1, Chapter 7, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 7.1, Chapter 7, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 7.2.1 is an update of Section 7.2.1, Chapter 7, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 7.2.1, Chapter 7, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 7.2.1.5 is an update in Section 7.2.1.5, Chapter 7, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 7.2.1.5, Chapter 7, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 7.3.1 is an update of Section 7.3.1, Chapter 7, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 7.3.1, Chapter 7, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Introduction	U	7.1	7.1
Inventory of precursors	U	7.2.1	7.2.1
Carbon emitted in gases other than CO ₂	U	7.2.1.5	7.2.1.5
Methodology	U	7.3.1	7.3.1

Equations

Equation Title	Type of Refinement	2006 IPCC Guidelines Equation Number	2019 Refinement Equation Number
N ₂ O emissions from atmospheric deposition of NO _x and NH ₃	U	7.1	7.1

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Non-Biogenic sources of CO ₂ from the atmospheric oxidation of CH ₄ , CO, and NMVOCs	NG	-	A7.1
Examples of NMVOCs from the different source categories	NG	-	A7.2
Carbon content of various materials (percent carbon by mass, PC) and percent of total solvent NMVOC emissions (by mass, PU)	NG	-	A7.3

CHAPTER 8 REPORTING GUIDANCE AND TABLES

This chapter includes a series of updates such as the clarification on the use of *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, new F-gases under gases included in the *2019 Refinement*, use of Global Warming Potentials (GWPs) as well as update of classifications and definition of categories of emissions and removals to incorporate new gases and categories. The chapter also includes new guidance on reporting tables for new categories and gases included in the *2019 Refinement*.

Sections

- The Section 8.2.2 is an update of Section 8.2.2, Chapter 8, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 8.2.2, Chapter 8, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 8.3 is an update of Section 8.3, Chapter 8, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 8.3, Chapter 8, Volume 1 of the *2006 IPCC Guidelines*.
- The Section 8.5 is an update of Section 8.5, Chapter 8, Volume 1 of the *2006 IPCC Guidelines* and should be used instead of the Section 8.5, Chapter 8, Volume 1 of the *2006 IPCC Guidelines*.

Section Title	Type of Refinement	2006 IPCC Guidelines Section Number	2019 Refinement Section Number
Gases Included	U	8.2.2	8.2.2
Introduction to reporting tables	U	8.3	8.3
Classification and definition of categories	U	8.5	8.5

Tables

Table Title	Type of Refinement	2006 IPCC Guidelines Table Number	2019 Refinement Table Number
Classification and definition of categories of emissions and removals	U	8.2	8.2
Formulae for chemical compounds (8A.1)	U	-	-
Summary Table (8A.2)	U	A	A
Short summary (8A.2)	U	B	B
Energy Sectoral Table (8A.2)	U	1	1
Energy Background Table (8A.2)	U	1.3 (1B)	1.3 (1B)
IPPU Sectoral Table (8A.2)	U	2	2
IPPU Background Table: 2A Mineral Industry, Chemical Industry (8A.2)	U	2.1	2.1
IPPU Background Table: 2B (2B9 - 2B10) Chemical Industry HFCs, PFCs, SF ₆ , NF ₃ and other halogenated gases	U	2.2	2.2
IPPU Background Table: Metal Industry (8A.2)	U	2.3	2.3
IPPU Background Table: 2C (2C3, 2C4, 2C7) Metal Industry HFCs, PFCs, SF ₆ and other halogenated gases (8A.2)	U	2.4	2.4
IPPU Background Table: 2E Electronics Industry HFCs, PFCs, SF ₆ , NF ₃ and other halogenated gases (8A.2)	U	2.6	2.6
IPPU Background Table: Product Uses as Substitutes for Ozone Depleting Substances, HFCs, PFCs and other halogenated gases (8A.2)	U	2.7	2.7

IPPU Background Table: 2G (2G1, 2G2, 2G4) Other Product Manufacture and Use – PFCs, SF ₆ and other halogenated gases (8A.2)	U	2.8	2.8
IPPU Background Table: Greenhouse gases without CO ₂ equivalent conversion factors (8A.2)	U	2.11	2.11
IPPU Background Table: Allocation of CO ₂ emissions from Non-Energy Use of fossil fuels: IPPU and other sectors (8A.2)	U	2.12	2.12
AFOLU Sectoral Table	U	3	3
AFOLU Background Table: Emissions in Wetlands (3B4)	U	3.3	3.3
Waste Background Table: CO ₂ , CH ₄ , N ₂ O emissions (8A.2)	U	4.1	4.1
Trends of CO ₂ (8A.2)	U	6A	6A
Trends of CH ₄ (8A.2)	U	6B	6B
Trends of N ₂ O (8A.2)	U	6C	6C
Trends of HFCs (8A.2)	U	6D	6D
Trends of PFCs (8A.2)	U	6E	6E
Trends of SF ₆ (8A.2)	U	6F	6F
Trends of other gases (8A.2)	U	6G	6G

Boxes

Box Title	Type of Refinement	2006 IPCC Guidelines Box Number	2019 Refinement Box Number
Reporting emissions of precursors	U	8.1	8.1