

CHAPTER 1

INTRODUCTION TO THE 2006 GUIDELINES

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1 INTRODUCTION TO THE 2006 GUIDELINES

The *2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 Guidelines)* were produced at the invitation of the United Nations Framework Convention on Climate Change (UNFCCC) to update the *Revised 1996 Guidelines* and associated *good practice guidance*¹ which provide internationally agreed² methodologies intended for use by countries to estimate greenhouse gas inventories to report to the UNFCCC. This chapter provides an introduction to the *2006 Guidelines* for a broad range of users, including countries and inventory compilers setting out to prepare inventory estimates for the first time. Sections 1.1 to 1.3 describe the overarching framework of these *Guidelines*, focusing on scope, approach, and structure. Sections 1.4 through 1.5 present step-by-step guidance on how to use the *2006 Guidelines* for compiling a greenhouse gas inventory.

1.1 CONCEPTS

Inventories rely on a few key concepts for which there is a common understanding. This helps ensure that inventories are comparable between countries, do not contain double counting or omissions, and that the time series reflect actual changes in emissions.

Anthropogenic emissions and removals

Anthropogenic emissions and removals means that greenhouse gas emissions and removals included in national inventories are a result of human activities. The distinction between natural and anthropogenic emissions and removals follows straightforwardly from the data used to quantify human activity. In the Agriculture, Forestry and Other Land Use (AFOLU) Sector, emissions and removals on managed land are taken as a proxy for anthropogenic emissions and removals, and interannual variations in natural background emissions and removals, though these can be significant, are assumed to average out over time.

National territory

National inventories include greenhouse gas emissions and removals taking place within national territory and offshore areas over which the country has jurisdiction. There are some special issues that are described in Section 8.2.1 of Volume 1. For example, emissions from fuel use in road transport is included in the emissions of the country where the fuel is sold and not where the vehicle is driven, as fuel sale statistics are widely available and usually much more accurate.

Inventory year and time series

National inventories contain estimates for the calendar year during which the emissions to (or removals from) the atmosphere occur. Where suitable data to follow this principle are missing, emissions/removals may be estimated using data from other years applying appropriate methods such as averaging, interpolation and extrapolation. A sequence of annual greenhouse gas inventory estimates (e.g., each year from 1990 to 2000) is called a time series. Because of the importance of tracking emissions trends over time, countries should ensure that a time series of estimates is as consistent as possible.

Inventory reporting

A greenhouse gas inventory report includes a set of standard reporting tables covering all relevant gases, categories and years, and a written report that documents the methodologies and data used to prepare the estimates. The *2006 Guidelines* provide standardised reporting tables, but the actual nature and content of the tables and written report may vary according to, for example, a country's obligations as a Party to the UNFCCC. The *2006 Guidelines* provide worksheets to assist with the transparent application of the most basic (or Tier 1) estimation methodology.

¹ The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (*1996 Guidelines*, IPCC, 1997), The Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (*GPG2000*, IPCC, 2000), and The Good Practice Guidance for Land Use, Land-use Change and Forestry (*GPG-LULUCF*, IPCC, 2003).

² See the Report of the Fourth Session of the Subsidiary Body for Scientific and Technological Advice (FCCC/SBSTA/1996/20), paragraph 30; decisions 2/CP.3 and 3/CP.5 (UNFCCC reporting guidelines for preparation of national communications by Parties included in Annex I to the Convention, part I: UNFCCC reporting guidelines on annual inventories), decision 18/CP.8, revising the guidelines adopted under decisions 3/CP.5, and 17/CP.8 adopting improved guidelines for the preparation of national communications from Parties not included in Annex I to the Convention, and subsequent decisions 13/CP.9 and decision 15/CP.10.

Greenhouse gases

The following greenhouse gases are covered in the *2006 Guidelines*³:

- carbon dioxide (CO₂)
- methane (CH₄)
- nitrous oxide (N₂O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF₆)
- nitrogen trifluoride (NF₃)
- trifluoromethyl sulphur pentafluoride (SF₅CF₃)
- halogenated ethers (e.g., C₄F₉OC₂H₅, CHF₂OCF₂OC₂F₄OCHF₂, CHF₂OCF₂OCHF₂)
- and other halocarbons not covered by the Montreal Protocol including CF₃I, CH₂Br₂, CHCl₃, CH₃Cl, CH₂Cl₂⁴

The gases listed above have global warming potentials (GWPs) identified by the IPCC prior to finalisation of the *2006 Guidelines*. A GWP compares the radiative forcing of a tonne of a greenhouse gas over a given time period (e.g., 100 years) to a tonne of CO₂. The *2006 Guidelines* also provide methods for gases for which GWP values were not available prior to finalisation, i.e., C₃F₇C(O)C₂F₅, C₇F₁₆, C₄F₆, C₅F₈ and c-C₄F₈O.

These gases are sometimes used as substitutes for gases that are included in the inventory and countries are encouraged to provide estimates for them.

Other gases

The *2006 Guidelines* also provide information for the reporting of the following precursors: nitrogen oxides (NO_x), ammonia (NH₃), non-methane volatile organic compounds (NMVOC), carbon monoxide (CO) and sulphur dioxide (SO₂) although methods for estimating emissions of these gases are not given here.

Sectors and Categories

Greenhouse gas emission and removal estimates are divided into main sectors, which are groupings of related processes, sources and sinks:

- Energy
- Industrial Processes and Product Use (IPPU)
- Agriculture, Forestry and Other Land Use (AFOLU)
- Waste
- Other (e.g., indirect emissions from nitrogen deposition from non-agriculture sources⁵)

Each sector comprises individual categories (e.g., transport) and sub-categories (e.g., cars). Ultimately, countries will construct an inventory from the sub-category level because this is how IPCC methodologies are set out, and total emissions calculated by summation. A national total is calculated by summing up emissions and removals for each gas. An exception is emissions from fuel use in ships and aircraft engaged in international transport which is not included in national totals, but is reported separately.

In order to calculate a national total it is necessary to choose an approach to include harvested wood products (HWP). Countries can select any of the approaches reflected in Chapter 12 of Volume 4 for the AFOLU Sector to do this.

³ The halogenated gases are typically emitted in smaller amounts than CO₂, CH₄ and N₂O, but may have long atmospheric lifetimes and strong radiative forcing effects.

⁴ For these gases, emissions could be estimated following the methods described in Section 3.10.2 of Volume 3 if necessary data are available, and then could be reported under sub-category 2B10 'Other'.

⁵ Estimates include N₂O emissions from deposition of anthropogenic nitrogen (N) from NO_x/NH₃ wherever deposited and from whatever source (but not allocated to specific sectors). The reason for this is that emission factors for nitrogen deposited are of the same magnitude for agricultural sources as for other nitrogen sources, even when the N is deposited in the ocean.

Reporting is generally organised according to the sector actually generating emissions or removals. There are some exceptions to this practice, such as CO₂ emissions from biomass combustion for energy, which are reported in AFOLU Sector as part of net changes in carbon stocks. Where CO₂ emissions are captured from industrial processes or large combustion sources, emissions should be allocated to the sector generating the CO₂ unless it can be shown that the CO₂ is stored in properly monitored geological storage sites as set out in Chapter 5 of Volume 2.

1.2 ESTIMATION METHODS

As with the *1996 Guidelines* and *IPCC Good Practice Guidance* the most common simple methodological approach is to combine information on the extent to which a human activity takes place (called *activity data* or *AD*) with coefficients which quantify the emissions or removals per unit activity. These are called *emission factors* (*EF*). The basic equation is therefore:

$$\text{Emissions} = AD \bullet EF$$

For example, in the energy sector fuel consumption would constitute activity data, and mass of carbon dioxide emitted per unit of fuel consumed would be an emission factor. The basic equation can in some circumstances be modified to include other estimation parameters than emission factors. Where time lags are involved, due for example to the time it takes for material to decompose in a landfill or leakage of refrigerants from cooling devices, other methods are provided, for example first order decay methods. The *2006 Guidelines* also allow for more complex modelling approaches, particularly at higher tiers.

Though this simple equation is widely used, the *2006 Guidelines* also contain mass balance methods, for example the stock change methods used in the AFOLU sector which estimates CO₂ emissions from changes over time in carbon content of living biomass and dead organic matter pools.

Carbon dioxide from the combustion or decay of short-lived biogenic material removed from where it was grown is reported as zero in the Energy, IPPU and Waste Sectors (for example CO₂ emissions from biofuels^{6,7}, and CO₂ emissions from biogenic material in Solid Waste Disposal Sites (SWDS)). In the AFOLU Sector, when using Tier 1 methods for short lived products, it is assumed that the emission is balanced by carbon uptake prior to harvest, within the uncertainties of the estimates, so the net emission is zero. Where higher Tier estimation shows that this emission is not balanced by a carbon removal from the atmosphere, this net emission or removal should be included in the emission and removal estimates for AFOLU Sector through carbon stock change estimates. Material with long lifetime is dealt with in the HWP section.

IPCC methods use the following concepts:

Good Practice: In order to promote the development of high quality national greenhouse gas inventories a collection of methodological principals, actions and procedures were defined in the previous guidelines and collectively referred to as *good practice*. The *2006 Guidelines* retain the concept of *good practice* including the definition introduced with *GPG2000*. This has achieved general acceptance amongst countries as the basis for inventory development and says that inventories consistent with *good practice* are those which *contain neither over- nor under-estimates so far as can be judged, and in which uncertainties are reduced as far as practicable*.

Tiers: A *tier* represents a level of methodological complexity. Usually three tiers are provided. Tier 1 is the basic method, Tier 2 intermediate and Tier 3 most demanding in terms of complexity and data requirements. Tiers 2 and 3 are sometimes referred to as *higher tier* methods and are generally considered to be more accurate.

Default data: Tier 1 methods for all categories are designed to use readily available national or international statistics in combination with the provided default emission factors and additional parameters that are provided, and therefore should be feasible for all countries.

Key Categories: The concept of *key category*⁸ is used to identify the categories that have a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level of emissions and removals, the trend in emissions and removals, or uncertainty in emissions and removals. *Key Categories* should be the priority for countries during inventory resource allocation for data collection, compilation, quality assurance/quality control and reporting.

⁶ CO₂ emissions from the use of biofuels should be reported as an information item for QA/QC purposes.

⁷ In these guidelines peat is assumed *not* to be a biofuel.

⁸ Chapter 4 of Volume 1 provides more details of *key categories* and approaches to identifying *key categories* for national inventories.

Decision Trees: Decision trees for each category help the inventory compiler navigate through the guidance and select the appropriate tiered methodology for their circumstances based on their assessment of *key categories*. In general, it is *good practice* to use higher tier methods for *key categories*, unless the resource requirements to do so are prohibitive.

1.3 STRUCTURE OF THE GUIDELINES

Volumes: The *2006 IPCC Guidelines* contain 5 volumes, one for each sector (Volumes 2-5) and one for general guidance applicable to all sectors (Volume 1).

- Volume 1: General Guidance and Reporting
- Volume 2: Energy
- Volume 3: Industrial Processes and Product Use (IPPU)
- Volume 4: Agriculture, Forestry and Other Land Use (AFOLU)
- Volume 5: Waste

This five-volume structure means the cross referencing will be required between two volumes at most: Volume 1 (General Guidance and Reporting), and the relevant sectoral volume.

Chapters: Volume 1 contains chapters that provide detailed cross-cutting guidance by topic as described in more detail in Section 1.5. Volumes 2-5 contain chapters that provide methodological guidance for specific emission and removal categories, along with specific recommendations for uncertainty, QA/QC, time series consistency, and reporting. The volume and chapter structure is presented in Table 1 in the Overview of the *2006 Guidelines*.

Annexes: Annexes are intended to include additional often detailed information beyond what is necessary for a Tier 1 estimate, for example extended data tables.

Appendices: The *2006 IPCC Guidelines* present some technical material in appendices, where emissions or removals are poorly understood and where there is insufficient information available to develop reliable, globally applicable, default methods for a particular source or sink. Countries may use appendices as a basis for further methodological development, but a national inventory can be considered complete without the inclusion of estimates for these sources.

Worksheets: Worksheets are tools designed to provide easy calculation of Tier 1 methodologies. Worksheets are not provided for higher tiers, although they can also be used where the higher tier method is similar to Tier 1 (e.g., where national data is used instead of default data). Some more complex approaches are provided in spreadsheets in the attached CD.

Reporting Tables: The reporting tables are intended to give sufficient detail required for transparent reporting of national greenhouse gas inventories and follow a disaggregated category list. They include summary tables, sectoral tables, background tables and trend tables. The background tables include summary activity data for increased transparency and to facilitate comparison of data across countries. Reporting tables also include results of a *key category* analysis and uncertainty assessment. Reporting also includes memo items (emissions to be reported but not included in national totals) and information items for increased transparency.

1.4 INVENTORY QUALITY

These *guidelines* provide guidance on ensuring quality on all steps of the inventory compilation – from data collection to reporting. They also provide tools to focus resources on the areas where they will most benefit the overall inventory and encourage continuous improvement. Experience has demonstrated that using a *good practice* approach is a pragmatic means of building inventories that are consistent, comparable, complete, accurate and transparent – and maintaining them in a manner that improves inventory quality over time. Indicators of inventory quality are:

Transparency: There is sufficient and clear documentation such that individuals or groups other than the inventory compilers can understand how the inventory was compiled and can assure themselves it meets the *good practice* requirements for national greenhouse gas emissions inventories. Documentation and reporting guidance is provided in Chapter 8, Reporting Guidance and Tables, of Volume 1 and in the respective chapters of Volume 2-6 (see also Volume 1, Chapter 6, QA/QC and Verification).

Completeness: Estimates are reported for all relevant categories of sources and sinks, and gases. Geographic areas within the scope of the national greenhouse gas inventory are recommended in these *Guidelines*. Where elements are missing their absence should be clearly documented together with a justification for exclusion (see Volumes 2-5).

Consistency: Estimates for different inventory years, gases and categories are made in such a way that differences in the results between years and categories reflect real differences in emissions. Inventory annual trends, as far as possible, should be calculated using the same method and data sources in all years and should aim to reflect the real annual fluctuations in emissions or removals and not be subject to changes resulting from methodological differences. (See Chapter 2: Approaches to Data Collection, Chapter 4: Methodological Choice and Identification of Key Categories, and Chapter 5: Time Series Consistency in Volume 1.)

Comparability: The national greenhouse gas inventory is reported in a way that allows it to be compared with national greenhouse gas inventories for other countries. This comparability should be reflected in appropriate choice of key categories (see Volume 1, Chapter 4), and in the use of the reporting guidance and tables and use of the classification and definition of categories of emissions and removals presented in Table 8.2 of Chapter 8, and Volumes 2-5.

Accuracy: The national greenhouse gas inventory contains neither over- nor under-estimates so far as can be judged. This means making all endeavours to remove bias from the inventory estimates (see especially Chapter 2, Approaches to Data Collection, and Chapter 3, Uncertainties, in Volume 1 and Volumes 2-5).

Uncertainty assessment (details provided in Chapter 3 of Volume 1) is an important component of *good practice* in national greenhouse gas inventory development. The uncertainty analysis characterises the range and likelihood of possible values for the national inventory as a whole as well as for its components. Awareness of the uncertainty of parameters and results provides inventory compilers with insight when evaluating suitable data for the inventory during the data collection and compilation phases. Uncertainty assessment also helps identify the categories that contribute most to the overall uncertainty, which helps the inventory compiler prioritise future inventory improvements.

The *2006 Guidelines* encourage continuous improvement and rigor through QA/QC and verification activities. A number of concepts and tools in Chapter 6 in Volume 1 are provided to support efficient inventory management, checking and continuous improvement. These activities will ensure that the best use of limited resources can be made and a quality consistent with *good practice* is achieved for each inventory.

Regular communication and consultation with providers of data is recommended throughout the inventory activities (from data collection to final reporting). This communication will build working relationships between data supplier and inventory compilers that will benefit the inventory both in terms of efficiency and quality. This activity will also help to keep the inventory compilers informed of the development of new datasets and even provide opportunities to influence the planning and specifications of data provider's data collection activities.

1.5 COMPILING AN INVENTORY

Compiling a greenhouse gas inventory is a step-by-step process. This section provides guidance on these steps for the *inventory compiler*, i.e., the person, persons or institutions who put together or compose the inventory from materials gathered from several sources. Compilation includes the collection of data, estimation of emissions and removals, checking and verification, uncertainty assessment and reporting.

Before undertaking estimates of emissions and removals from specific categories an inventory compiler should become familiar with the material in Volume 1 *General Guidance and Reporting*. This Volume provides *good practice guidance* on issues that are common to all the estimation methods covered by the sector-specific guidance provided in Volumes 2 to 5 and reporting instructions.

Summary of Volume 1:

- **Data collection:** Collection of data is a fundamental part of inventory preparation. Chapter 2 of Volume 1 provides guidance on initiating and maintaining a data collection program. It covers evaluating existing sources of data, and planning new emission measurements and surveys, extensive reference is made to guidance provided by other organisations. The chapter links the data collection process to the other general issues.
- **Uncertainty assessment:** Estimates of uncertainty are needed for all relevant source and sink categories, greenhouse gases, inventory totals as a whole, and their trends. Chapter 3, Uncertainties, provides practical guidance for estimating and combining uncertainties, along with a discussion of the conceptual underpinnings of inventory uncertainty. Uncertainty issues related to specific category of emissions and removals are addressed in Volumes 2-5.

- **Key category analysis:** *Good practice guidance* on how to identify *key categories* of emissions and removals is provided in Chapter 4, Methodological Choice and Identification of Key Categories. The *key category* concept is used, together with the decision trees in Volumes 2-5, to guide users in their methodological choice for each category. These decision trees are the critical link between methodological choice in the sector-specific volumes and the identification of *key categories* in Volume 1.
- **Time series consistency:** Ensuring the time series consistency of inventory estimates is essential for establishing confidence in reported inventory trends. Chapter 5, Time Series Consistency, provides methods for ensuring time-series consistency in cases where it is not possible to use the same method and/or data over the entire period. This chapter also provides *good practice guidance* on when to recalculate estimates for previous years and methods for accounting for changes in emissions and removals over time.
- **Quality Assurance (QA) and Quality Control (QC):** A QA/QC system is an important part of inventory development. Chapter 6, QA/QC and Verification, describes the general QA/QC aspects to consider when compiling an inventory of emissions and removals. *Good practice guidance* on sector specific quality control checks are addressed in Volumes 2-5. Chapter 6 also describes techniques for verifying inventories using external data.
- **Precursors and indirect N₂O emissions:** Volume 1 also includes cross-sectoral guidance on dealing with precursors and indirect emissions of N₂O from deposition of nitrogen compounds (resulting from NO_x and NH₃ emissions) in Chapter 7, Precursors and Indirect Emissions.
- **Reporting:** Chapter 8, Reporting Guidance and Tables, specifically addresses issues related to reporting, including definitions of national territory, gases and reporting categories. Notation keys are introduced to account for completeness and transparency in reporting. The definitions of categories of sources and sinks take into account the structure of the sector guidance in Volume 2-5. The sectoral and summary reporting tables to be applied for reporting emissions and removals of each category are included in Chapter 8. Reporting tables on uncertainties, *key category* analysis, and emission trends have also been developed and are included in Chapter 8.

Volumes 1 and Volumes 2 to 5 are complementary. After the compilers tasked with preparing estimates for specific emission and removal categories have familiarised themselves with the general guidance in Volume 1 they should use the specific sectoral volume(s) appropriate to their categories so that they can apply the requirements in a manner appropriate to their national circumstances. Figure 1.1 illustrates the steps of a typical inventory cycle. Quality control measures should be implemented at each step and should be documented according to the requirements of QA/QC and documentation given in Chapter 6 of Volume 1.

1. The first step for a revised or new greenhouse gas inventory is to identify the *key categories* for the inventory so that resources can be prioritised. Where an inventory already exists, the *key categories* can be identified quantitatively from the previous estimates (see Volume 1 Chapter 4). For a new inventory the compiler will have to make a preliminary assessment based on local knowledge and expertise about large emission sources and inventories in countries with similar national circumstances or, if possible, make preliminary Tier 1 estimates to assist in identifying *key categories*.

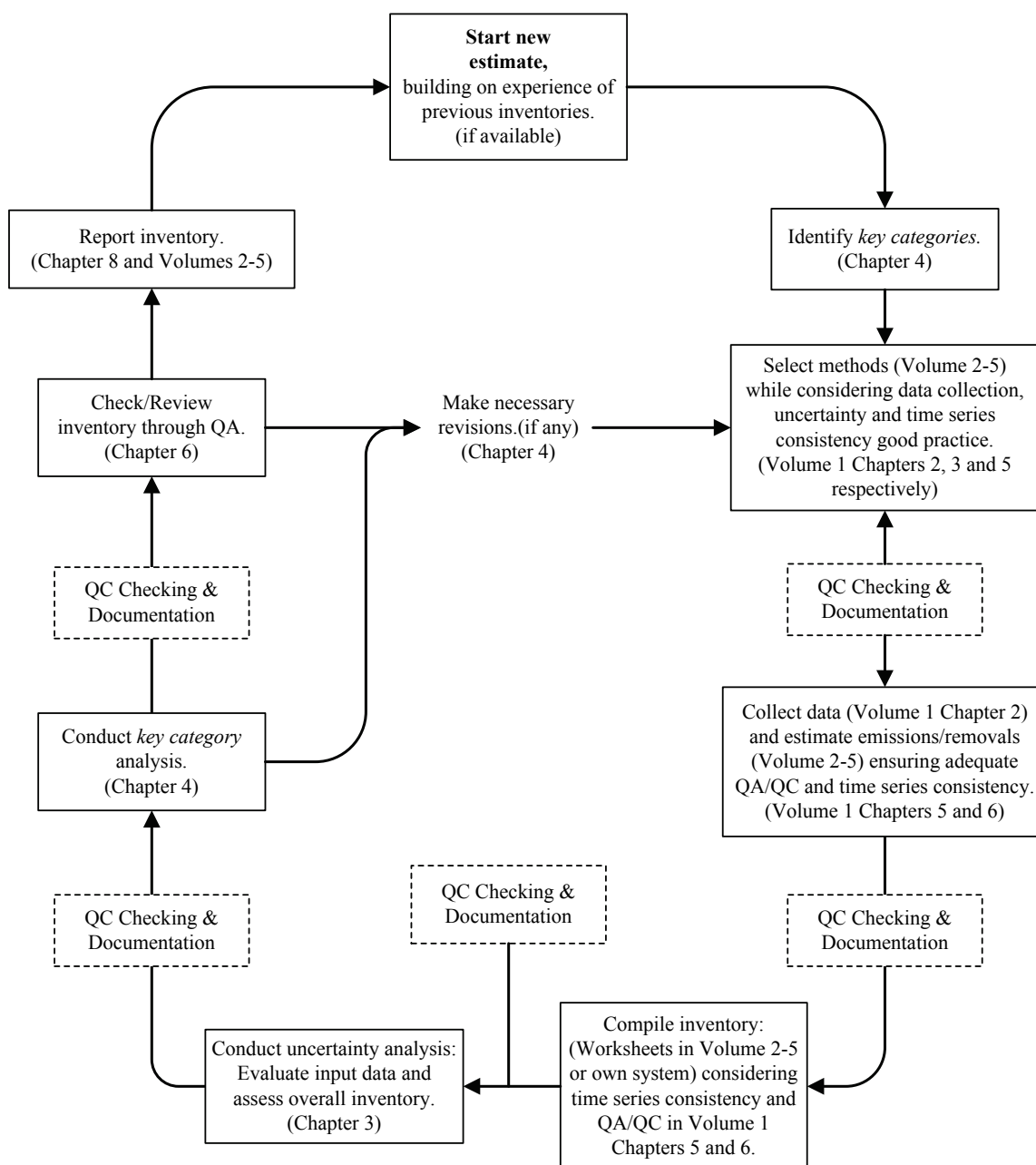
Assessing the *key categories* helps the inventory compiler to focus effort and resources on the sectors that contribute most to the overall inventory or inventory uncertainty and so helps to ensure that the best possible inventory is compiled for the available resources.

2. Once the *key categories* have been identified, the inventory compiler should identify the appropriate method for estimation for each category in the particular country circumstances. The sector-specific decision trees in Volumes 2-5 and the generalised decision tree in Chapter 4 of Volume 1 provide guidance on selecting appropriate methods. The selection of methods will be determined by the classification of a category as *key* or not *key*, and by both the data and the resources available. Guidance on data collection is provided in Chapter 2 of Volume 1.
3. Data collection should follow the selection of the appropriate methods. (See Chapter 2, 5 and 7 in Volume 1). Data collection activities should consider time series consistency and establish and maintain good verification, documentation and checking procedures (QA/QC) to minimise errors and inconsistencies in the inventory estimates. Data on uncertainties should if possible be collected at the same time. Guidance on the collection of new data in a cost effective way and on uncertainties is provided in Chapter 2 and Chapter 3 of Volume 1 respectively. QA/QC activities should continue throughout this process to minimise errors and document data sources, methods and assumptions. The results of the data collection may lead to refinement of the methods chosen.
4. Emissions and removals are estimated following the methodological choice and data collection. Care should be taken to follow the general guidance in Chapter 5, Time Series Consistency in Volume 1 especially if the data are incomplete for some years.

5. Once the inventory estimates are complete, the next step is to perform an uncertainty analysis and key category analysis (see Chapters 3 and 4 in Volume 1). These analyses may identify categories for which a higher tier should be used and additional data collected.
6. Following the completion of the final quality assurance (QA) checks, the final step in the inventory process is to report the inventory (See Chapter 8 in Volume 1). The aim here is to present the inventory in an as concise and clear way as possible to enable users to understand the data, methods and assumptions used in the inventory. Provision of concise relevant background information and explanations in the reports helps to ensure the inventory (including the report) is transparent.

The inventory compiler should base future inventory revisions on previous inventories. Thus an iterative process builds on and improves the inventory each time a new inventory is compiled as illustrated in Figure 1.1. When a revised inventory is compiled, all years estimates should be reviewed for consistency and updated integrating any feasible improvements where necessary. Chapter 5 in Volume 1 gives advice on compiling consistent time series and provides *good practice* approaches for achieving time series consistency.

Figure 1.1 Inventory development cycle



Box 1.1 provides an example on using the *2006 Guidelines* throughout the inventory cycle when estimating emissions from enteric fermentation.

BOX 1.1

USING THE FLOW DIAGRAM (FIGURE 1.1) AND THE 2006 GUIDELINES – LIVESTOCK EXAMPLE

Inventory compilers tasked with preparing estimates for specific emission and removal categories need to familiarise themselves with guidance in two Volumes: the relevant guidance in a sectoral volume (e.g., Volume 4, Agriculture, Forestry and Other Land Use), and the general guidance in Volume 1. Along with the diagram (see Figure 1.1) this box describes how the guidance in the two Volumes is used for estimating methane emissions from Enteric Fermentation:

Start with your previous inventory where available and prioritise categories for estimation.

- The inventory compiler can begin with the overall results of the previous national inventory, particularly the key category assessment, as a preliminary step to selecting methods and data (Chapter 4 of Volume 1).

Familiarise yourself with general and sector specific QA/QC requirements.

- Prior to collecting all the data and estimating emissions, the inventory compiler should consult the general guidance in implementing Quality Control (QC) procedures in Chapter 6 of Volume 1 (QA/QC and Verification) along with the specific QC procedures for enteric fermentation described in Chapter 10 of Volume 4. QC procedures should be implemented at every step of the inventory cycle. This will include regular checking and clear documentation of data sources methods and assumptions.

Choose appropriate methods based on category importance and data availability.

- The inventory compiler should consult the decision tree and methodological guidance in Chapter 10 of Volume 4 to select an appropriate method. In this example, enteric fermentation is a key category, which indicates that normally Tier 2 or 3 should be selected.
- The general guidance in Chapter 2 (Approaches to Data Collection) of Volume 1 and Chapter 10 of Volume 4 will guide the inventory compiler in choosing appropriate emission factor, activity data and other estimation parameters. This may include identifying or choosing from existing data or collection and classification of new data.

Collect the data necessary for the latest year and a consistent time series and uncertainty estimation.

- The next step involves collection of the needed data for all years. The availability of data may sometimes restrict use of higher tier methods for key categories.
- Chapter 5 (Time Series Consistency) of Volume 1 should be used if preparing estimates for more than one year. This guidance is particularly relevant if the selected method is different from the one used in previous inventories or the sources of data or their classification have changed. This can imply the need for recalculations of previous estimates or splicing of data series. Chapter 10 of Volume 4 should be consulted for source-specific guidance on time-series consistency.
- In estimating uncertainties, inventory compilers should also refer to the general guidance on uncertainty in Chapter 3 of Volume 1 - paying particular attention to guidance on concepts and methods – and the uncertainty section of the enteric fermentation livestock chapter for source-specific information (for example default uncertainties). Ideally, the inventory compiler should collect activity data, emission factors, and uncertainty information at the same time because this is the most efficient strategy.

Estimate emissions/removals consistent with the guidance.

- The next step is to estimate methane emissions from enteric fermentation for all relevant years. Relevant guidance for this step includes the specific guidance for enteric fermentation in Volume 4, Chapter 10 relating to completeness, reporting and documentation, and time series consistency sections.
- The enteric fermentation emissions and uncertainty data are used subsequently as input into the compilation of the overall inventory, the estimation of category-specific and overall uncertainty, and the key category assessment. The results of these steps may require changes or revisions to the original estimate of emissions of enteric fermentation.

BOX 1.1 (CONTINUED)

Check and review the estimates.

- Following the Quality Assurance (QA) guidance in Volume 1, the inventory compiler should arrange for review of the estimate and documentation by technical experts not involved in the preparation of the inventory. External reviewers may suggest improvements or identify errors that would require a recalculation of the enteric fermentation estimate.

Report the estimates.

- The *IPCC Guidelines* provide guidance on reporting information on enteric fermentation in two places: the enteric fermentation chapter of Volume 4, and the reporting tables in Chapter 8 of Volume 1. The inventory compiler should consult both chapters for a complete description of reporting guidance.

Note: In the case of an initial inventory effort, with no previous key category analysis, a qualitative assessment of enteric fermentation could be used. See Chapter 2 and Chapter 4 of Volume 1. In this example, it can be concluded that methane from enteric fermentation is key in most inventories and should therefore be considered initially key.

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