



Introduction to GHG Inventories

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Agenda

- Why prepare a GHG inventory?
- Inventory basics
- Reporting requirements



Why prepare a GHG inventory?

What is a GHG inventory?

- Catalogue of greenhouse gas emissions and removals of a country/region
- Disaggregated by sector and gas

Sectors:

- Energy
- Industrial Processes
- Agriculture
- Land Use, Land-Use change, and Forestry
- Waste

Gases:

- CO₂
- CH₄
- N₂O
- HFCs
- PFCs
- SF₆

- Calculated and arranged using standardized approaches
 - Ensures that inventories are comparable and repeatable

Why prepare a GHG Inventory?

- Identify the greatest sources of GHG emissions and removals
- Provide a basis for developing action, plans, strategy
- Quantify benefits of specific activities that result in GHG emissions
- Understand emission trends
- Set goals and targets for future reductions
- Track progress in meeting goals and targets



Under the UNFCCC

- All countries have an obligation to report information, **including GHG inventory information**
- Basis for understanding current emission levels, and the ambition of existing efforts, and progress on both the national and international scale
- Allows for reliable, transparent and comprehensive information on emissions, actions and support



Inventory basics: Activity data, emissions factors and GWP

Calculation basics

Emissions (kg CO₂e) = Activity data x Emission factor x Global warming potential (kg CO₂e/kg compound)

- Activity data
 - e.g. electricity consumption, fuel use in transport and industry, number of cattle, forest areas protected/reafforested, waste disposed of
- Emission factor
 - Converts activity data to emissions of GHG
- Global warming potential
 - Converts GHG emissions to consistent unit (CO₂e)

Activity and emissions factor data

A standard set of guidelines is used to help identify these (2006, updated 2019)

Activity data

- Collection is generally toughest part of an inventory
- Unique data required for each emissions category

Emissions factors:

- Multiple sources of default data where country-specific data not available

- *We will return to this later in the sessions*

Global warming potentials

- Convert all GHG to a consistent unit (CO₂e)
 - Represents the equivalent global warming impact of a kg of the gas to a kg of CO₂
 - Allows for summing together of all emissions
- Published by IPCC
 - Updated in Assessment Reports
 - E.g. Methane
 - 2AR: 21 kg CO₂e/kg
 - 4AR: 25 kg CO₂e/kg
 - 5AR: 28 kg CO₂e/kg



Biennial Transparency Report (BTR) Reporting Requirements for Inventories

The IPCC has specified five indicators of inventory quality:

| | |
|-----------------------|--|
| T ransparency | Assumptions and methods are explained clearly so the inventory can be understood and replicated |
| A ccuracy | Estimates reflect actual emissions and removals, with no systematic overestimation or underestimation |
| C ompleteness | All existing, relevant sources, sinks, and gases across a country's full geographic area are included |
| C onsistency | The same methodological and consistent data sets are used for the base and all subsequent years in estimating emissions and removals, so differences in results between years and categories reflect real differences in emissions |
| C omparability | The methodologies used to develop estimates of emissions and removals, and how the inventory is reported, allow the inventory to be compared to those developed by other countries |

Inventory methodology

| Former Reporting Framework | Enhanced Transparency Framework (2024 Onwards) |
|--|---|
| <p>Use:</p> <ul style="list-style-type: none">• 1996 IPCC Revised Guidelines• 2000 IPCC Good Practice Guidance (GPG)• 2003 IPCC GPG for LULUCF | <p>Use:</p> <ul style="list-style-type: none">• 2006 IPCC Guidelines• Encouraged to use 2013 IPCC Wetlands Supplement• May use 2019 IPCC Refinement |

Gases

| Current Reporting Framework | Enhanced Transparency Framework (2024 Onwards) |
|---|---|
| <p>Required:</p> <ul style="list-style-type: none">• CO₂, CH₄, N₂O <p>Encouraged:</p> <ul style="list-style-type: none">• HFCs, PFCs, SF₆• CO, NMVOC, SO_x, NO_x | <p>Required:</p> <ul style="list-style-type: none">• CO₂, CH₄, N₂O• HFCs, PFCs, SF₆, NF₃* <p>Should report precursor gases:</p> <ul style="list-style-type: none">• CO, NMVOCs, SO_x, NO_x <p>May report: indirect CO₂</p> |

Included Gases

| Current Reporting Framework | Enhanced Transparency Framework (2024 Onwards) |
|---|---|
| <p>Required:</p> <ul style="list-style-type: none">• CO₂, CH₄, N₂O <p>Encouraged:</p> <ul style="list-style-type: none">• HFCs, PFCs, SF₆• CO, NMVOC, SO_x, NO_x | <p>Required:</p> <ul style="list-style-type: none">• CO₂, CH₄, N₂O• HFCs, PFCs, SF₆, NF₃* <p>Should report precursor gases:</p> <ul style="list-style-type: none">• CO, NMVOCs, SO_x, NO_x <p>May report: indirect CO₂</p> |
| <p>Report disaggregated gas-by-gas emissions/removals by mass</p> <p><i>“Parties wishing to report aggregated CO₂e” should use 100-year GWPs from AR2</i></p> | <p>Report disaggregated gas-by-gas emissions/removals by mass</p> <p>Report aggregated CO₂e emissions/removals using 100-year GWPs from AR5</p> |

Notation Keys

Completeness: Estimates are reported for all relevant categories of sources and sinks, and gases... “Where elements are missing their absence should be clearly documented together with a justification for exclusion.”

- 2006 IPCC Guidelines, Volume 1, Chapter 1, Section 1.4 Inventory Quality

Time Series

| Former Reporting Framework | Enhanced Transparency Framework (2024 Onwards) |
|----------------------------|--|
| No time series required | Time series <i>shall</i> start in 1990* |

*Flexibility: minimum time series includes NDC reference year, annual time series from 2020 onwards

Time Series

| Former Reporting Framework | Enhanced Transparency Framework (2024 Onwards) |
|--|--|
| No time series required | Time series <i>shall</i> start in 1990* |
| NC1 should report on GHG estimates from 1994, but may provide data from 1990 | Latest reporting year shall be no more than 2 years prior to NIR submission date** |
| NC2 should report on GHG estimates from 2000 | |

*Flexibility: minimum time series includes NDC reference year, annual time series from 2020 onwards

**Flexibility: latest reporting year = 3 years prior to NIR submission

Cross-Cutting Analyses

Key Category Analysis

| Former Reporting Framework | Enhanced Transparency Framework (2024 Onwards) |
|---|--|
| <i>Encouraged</i> to conduct KCA following IPCC GPG | Identify key categories that cumulatively account for 95% of national emissions* Report level and trend of emissions for each key category, at least for first and last reporting year of time series |

*KCA flexibility: key category threshold of 85% of total emissions

Cross-Cutting Analyses

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|-----------------------|--|---|
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| Uncertainty Analysis | <i>Encouraged</i> to report uncertainty levels, including methodology used | <p>Quantitatively estimate uncertainty for all source/sink categories, at least for first and last reporting year of time series**</p> <p>Qualitatively discuss results</p> |

** Uncertainty flexibility: can use qualitative analyses where quantitative data unavailable

Cross-Cutting Analyses

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| Uncertainty Analysis | <i>Encouraged</i> to report uncertainty levels, including methodology used | <p>Quantitatively estimate uncertainty for all source/sink categories, at least for first and last reporting year of time series**</p> <p>Qualitatively discuss results</p> |
| QA/QC | N/A | All parties <i>shall</i> describe QA/QC procedures and quantitative QC methodology used in accordance with IPCC guidelines*** |

Using Flexibility Provisions

When using flexibility provisions, countries are required to:

- Explain the provision to which flexibility applied
- Identify specific capacity constraints (and if constraints apply to multiple provisions)
- Provide a time-line for improvements in light of capacity constraints

Resources

- ETF Handbook:
 - <https://unfccc.int/sites/default/files/resource/Addendum%20to%20the%20EFT%20Technical%20Handbook%20First%20Edition%20June%202020.pdf>
- Modalities, Procedures and Guidelines (MPG):
 - https://unfccc.int/sites/default/files/resource/CMA2018_03a02E.pdf
 - Decision 18/CMA.1 (starts on page 18)
- UNFCCC Presentation on BTR Transition:
 - https://unfccc.int/sites/default/files/resource/Training%20material%20_key%20commonalities%20and%20differences_rev2.pdf



Questions?