Scope, Context, BOGs
IPCC TFI Expert Meeting on Use of Atmospheric Observation Data in Emission Inventories

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WMO HQ, Geneva - Switzerland

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Outline

- Expert meeting Scope
- Context:
  - National Greenhouse Gas Inventories
  - IPCC Categorization
  - IPCC Methods
- Verification:
  - Comparisons with atmospheric measurements
  - Latest guidance in the 2019 Refinement
- BOG discussion

Expert Meeting Scope

assessing the use of Atmospheric Observation Data, and models, in the verification of national greenhouse gas (GHG) inventories (NGHGI)

NGHGI

National Greenhouse Gas Inventories are composed by a time series of annual estimates of GHG emissions and removals, from anthropogenic sources/sinks as categorized.

IPCC categories

IPCC categorisation of sources/sinks designed to cover:

- All anthropogenic emissions and removals only

- Each and every anthropogenic source/sink of GHG emissions while avoiding double counting.

IPCC methods

IPCC methods are generally based on bottom-up calculation of estimates through the quantification of processes and activities that cause GHG emissions and removals (i.e., activity data) at the level of source/sink category and the application of associated emission/removal factors.

Here emission/removal factors is a generic expression that includes the numerous parameters that characterize emission sources, sinks and associated processes, technologies and practices.

Verification

Verification of NGHGI estimates may occur at level of:

- **Activity data *(AD)***
- **Emission Factor (EF)**
- **GHG estimates *(as inferred through the IPCC method from AD and EF)***

through comparison with independent datasets/methods (including those based on some recognized techniques of flux measurement as chambers and stack measurements)

Verification

2019 Refinement (page 6.12 – Volume 1) In contrast to the other methods described in this chapter, **comparisons with atmospheric measurements are not established as a standard tool for verification to be applied by an inventory compiler**. Still, considerable scientific progress in this area needs to be noted and inventory compilers may wish to take advantage of the potential of this approach, as it gives independent data for verification

Comparisons with atmospheric measurements

Key steps to allow comparison of atmospheric measurements with NGHGI's sources/sinks *(2019 Refinement, Volume 1, Box 6.5)*:

1. Confirm that observation-based and inventory estimates represent the same time period and sources/areas *(temporal and spatial gridding of the inventory and observation-based estimates)*.
2. Determine what data were used and how compare to the emission inventory (categories' definitions)
3. Assess how the estimation procedure treats anthropogenic and natural emissions, to confirm that the estimates compare with emissions included in the inventory
4. Confirm that seasonal variability of the emissions and other effects have been considered in the comparison
5. Assess the uncertainties of the estimated emissions, and note whether the discrepancy is statistically significant

Comparison with Regional/Global products

2019 Refinement, Volume 1

TABLE 6.5 (NEW)
GENERAL OUTLINE OF NATIONAL INVENTORY COMPARISON TO GLOBAL/REGIONAL INVERSE MODELLING PRODUCTS

Defining target gases and time periods	• Based on inverse modelling data available at the time of report preparation, select available gases (CO_2, CH_4, N_2O, HFCs) and periods overlapping between inventory data and inverse model results. Use advice from the modellers on the degree of uncertainty the product is providing for a particular country's emissions.
Data acquisition	• Download gridded emission data files (including prior emissions, inverse model estimated emissions and emission uncertainty data), file format descriptions and release notes. Check if the data can be read with available software.
Remapping to make national total (if national estimate is not provided in the inverse model product)	• Prepare remapping table. Calculate area fraction of the national land in each grid cell of the emission data grid. • Calculate national total emission for each time step, by summing grid emissions multiplied by fraction of national land. Make national total for each year. • If data necessary for remapping emission uncertainties is available with inverse modelling results, remap emission uncertainty.
Using multiple products	• When the number of available inverse modelling products is more than one, remapping to make national total can be made for all the available products. It is recommended to include in the report national total estimates for each inverse modelling product, along with average and standard deviation of the emissions across the set of inverse modelling products.
Analysing differences between inverse model estimates and inventory	• When significant differences between inverse model estimates and inventory are found, check if activity data and emission factors used in inventory can be updated to more recent version, if available. Report differences to inverse modellers, request providing a feedback.
Documenting the results of the comparison	• Outline the dataset (datasets) used in the report, cite the product release version, reference the release date, and version of the release note. Provide a description of the remapping procedure used in the remapping. Prepare comparison table showing the national emissions for all gases and years by inventory and emissions with emission uncertainties estimated with inverse models, average value and standard deviation across a set of inverse modelling products.

BOGs Discussion

4 BOGs to discuss same methodological elements for 4 different portions of anthropogenic GHG fluxes:

BOG 1 – Focus on combustion CO_2

BOG 2 – Focus on fugitive CH_4

BOG 3 – AFOLU N_2O, CH_4, CO_2

BOG 4 – F-gases

Each BOG to report to closing plenary

BOGs Discussion (1)

- ✓ Assess and critique recent estimation techniques that utilise atmospheric observations as well as other new and operational systems, platforms, instruments/sensors and methods/models for their potential to be used for the verification of national inventory sectoral emission estimates, consistent with the guidance provided in the 2019 Refinement;

BOGs Discussion (2)

- ✓ Assess and evaluate successful examples of:
  - ➢ comparisons between atmospheric observations and national inventories that are consistent with good practice provided in the 2019 Refinement that have led to implemented or planned improvements in national inventories;
  - ➢ available examples where emission factors derived from atmospheric observations have been incorporated into a bottom-up inventory framework

BOGs Discussion (3)

- ✓ Assess the possibility that emerging datasets from atmospheric observations could be used to test and verify particular IPCC EF default values and associated uncertainties.

BOGs Discussion (4)

- ✓ Discuss the use of gridding (spatial and temporal) of NGHGIs to allow comparison with atmospheric observation data.

BOGs Discussion (5)

- ✓ Discuss terminology and classifications of sources/sinks and associated natural and anthropogenic GHG fluxes to find a common understanding of consistency and differences in atmospheric observation data and GHG inventory estimates

Questions

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