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Expert Meeting on Use of Atmospheric Observation Data in Emission Inventories

(Prepared by the Co-Chairs of the Task Force on National Greenhouse Gas Inventories)

(Submitted by the Secretary of the IPCC)

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WMO UNEP

Expert Meeting on
Use of Atmospheric Observation Data in Emission Inventories

1. Background and context

National greenhouse gas (GHG) inventories provide information on the level and trend of GHG emissions and removals associated with human activities which is essential to the assessment of human impacts on the climate system. National GHG inventories are important for policy makers to plan actions to curb those emissions as well as to quantify the results of implemented actions to reduce the atmospheric concentration of GHGs.

Under the UNFCCC, countries are required to apply the methods and approaches sourced from the IPCC Methodology Reports to ensure transparency, accuracy, completeness, consistency and comparability of their national GHG inventories. For example, under the Paris Agreement, all Parties shall use the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (*2006 IPCC Guidelines*) in accordance with the modalities, procedures and guidelines for the transparency framework for action and support adopted in Decision 18/CMA.1 and referred to in its Article 13.

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 category and the application of associated emission/removal factors. Direct measurements of GHG fluxes as well as top-down estimation methods using atmospheric concentration data remain an exception.

Atmospheric measurements can be used as a tool to assess and guide improvements to national greenhouse gas inventories through inverse modelling. In the *2006 IPCC Guidelines*, the benefit of use of atmospheric measurement data was referred to, but practical guidance on how to use could not be provided. After the *2006 IPCC Guidelines* were produced, there has been a move towards establishing dedicated national greenhouse gas monitoring networks for this purpose in some countries, and also there has been advancement in science and technologies relating to atmospheric measurements. Taking that into account, guidance on the use of atmospheric measurements for verification of national GHG inventories was updated and elaborated in the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (*2019 Refinement*), Volume 1, Chapter 6.

The potential of atmospheric measurements to support climate policy has recently been recognised also by the Subsidiary Body for Scientific and Technological Advice (SBSTA) of UNFCCC, which stated: "The SBSTA noted the increasing capability to systematically monitor greenhouse gas concentrations and emissions, through in situ as well as satellite observations, and its relevance in support of the Paris Agreement" (SBSTA47 Report, para 59). Accordingly, the UNFCCC Executive Secretary has signed a cooperation agreement with the WMO Secretary General on the Integrated Global Greenhouse Gas Information System (IG3IS) that WMO has established with the aim of promoting top-down methods and helping bridge science and policy. WMO under the Global Atmosphere Watch (GAW) programme is also oversighting the collection, archiving and distribution of data on atmospheric measurements as operated by the World Data Centre for Greenhouse Gases (WDCGG) -GHGs (such as CO_2, CH_4, CFCs, N_2O) and related gases (such as CO)-, the World Data Centre for Reactive Gases (WDCRG) – as SO_2, NO_X, Ozone (tropospheric), NMVOCs- and the World Data Centre for Aerosols (WDCA).

Recent activities such as those performed under the WMO on collection, archiving and distribution of data on atmospheric concentration of GHGs, as well as of other short-lived climate forces (SLCF), are of benefit to the community of inventory compilers as they provide information which can be used to verify their estimates on national scales or from large sources as well as in specific cases to develop emission/removal factors. Development and improvement of source-specific emission factors are becoming increasingly important to keep enhancing the quality of GHG estimates, especially for those

sectors and categories where development and application of new technologies impact the associated rate of emissions.

Nowadays, atmospheric observations are based on a large variety of platforms (e.g., ground-based (including vehicle-based mobile laboratories), ship-borne, aircraft-borne, satellite-borne), sensors/instruments (e.g., infrared absorption spectroscopy, uv-visible differential optical absorption spectroscopy, solid-state and electrochemical sensors), and models applied to derive activity-dependant fluxes and/or time-dependant rates of change in atmospheric concentrations. Such large variability likely provides for an effective system to monitor emissions under a variety of circumstances.

2. Objectives of the expert meeting

With this background and context, and considering rapid advancement in science and technologies relating to atmospheric measurements, the TFI proposes to hold an Expert Meeting on use of atmospheric observation data in support of emission inventories with the following objectives:

I. Assess and critique recent datasets as well as new and operational systems, platforms, instruments/sensors and methods/models to derive, from atmospheric observations, representative emission rates from source categories over time periods of interest.

II. Assess and evaluate the usability of these recently available datasets as well as new operational systems, platforms, instruments/sensors and methods/models to derive, from atmospheric observations, comparative data to verify IPCC default factors and uncertainties as well as to allow inventory-compilers to verify their emission estimates through application of IPCC good practice methods and approaches.

III. Assess and evaluate useful examples of comparisons between atmospheric observations and national inventories that are consistent with good practice provided in the 2019 Refinement to the 2006 IPCC Guidelines on National Greenhouse Gas Inventories (e.g., following the steps provided in tables 6.3 and box 6.5 of Volume 1) that have led to implemented or planned improvements in national inventories.

IV. Assess and evaluate available examples where emission estimates derived from atmospheric observations have been incorporated into a bottom-up inventory framework, including the associated resources (technical, human, funds) needed in their implementation.

V. Assess and evaluate the usefulness of efforts (including resource implications) to grid (spatially and temporally) national emissions inventory and the use of these gridded products in comparisons with atmospheric observations.

By achieving these objectives, this Expert Meeting is expected to support the development of IPCC materials that will assist countries to make better estimates of emissions, for example the Methodology Report on SLCFs to be produced during the IPCC 7th assessment cycle (AR7 cycle).

3. Expected participants

The Expert Meeting would primarily engage research communities on:

- ✓ Atmospheric observation of GHGs and SLCFs
- ✓ Inverse modelling
- ✓ National Emission inventories

In accordance with the Appendix A to the Principles Governing IPCC Work, the Task Force Bureau will identify and select participants to this Expert Meeting.

4. Date and venue

Date: in the week of 5-9 September 2022
Venue: to be determined

5. Budget

Decision IPCC-LIII-2 on the IPCC Trust Fund Programme and Budget for the years 2020, 2021, 2022 and 2023 includes in its Annex 3 (Forecast 2022 budget noted by IPCC-LIII) a budget line on “TFI Expert meeting (contingency)” providing for 25 journeys, CHF 117,000 in total. This budget is proposed to be revised to CHF 187,200 in total to support 40 participants from developing countries and countries with economies in transition for this Expert Meeting.