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**PROGRESS REPORT**

**Expert Meeting on Short-Lived Climate Forcers**

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

(Submitted by the Secretary of the IPCC)

## PROGRESS REPORT

### Expert Meeting on Short-Lived Climate Forcers

#### 1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) decided at its 46<sup>th</sup> Session in September 2017 in Montreal to hold an expert meeting on Short-Lived Climate Forcers (SLCFs) to discuss issues on estimation of emissions and climate effects jointly co-organized by the Task Force on National Greenhouse Gas Inventories (TFI) and Working Group I (WGI). In accordance with this decision, the meeting was held on 28-31 May 2018 at the headquarters of the World Meteorological Organization (WMO) in Geneva, Switzerland.

The meeting brought together many scientists and inventory compilers. From 172 experts nominated by IPCC member governments, observer organizations and members of IPCC Bureau as well as the Bureau of IPCC Task Force on National Greenhouse Gas Inventories (TFB), 80 were selected as participants, taking into account regional and gender representation, expertise and experience in this field.

The report of this expert meeting has been published on the TFI website at: <http://www.ipcc-nggip.iges.or.jp/>. The outcomes of this meeting are summarized in Section 2 of this document. Based on the outcomes, a plan of future work by TFI has been considered by the TFB and the scientific steering committee for this expert meeting, which is proposed in Section 3 of this document for consideration by the Panel at a future session as from the 49<sup>th</sup> Session of IPCC. The outcomes of the meeting are also expected to feed into the WGI AR6 report, primarily in Chapter 6 (Short lived climate forcers) but also chapter 7 (The Earth's energy budget, climate feedbacks, and climate sensitivity). Relevant discussion and recommendations are presented in the report of the expert meeting.

The Co-Chairs of TFI and WGI would like to thank all those involved in this meeting, namely, the experts who participated, and the members of TFB and WGI Bureau and their Technical Support Units (TSUs), for their contribution to make this meeting a success. In particular, the Co-Chairs would like to express sincere gratitude to the Governments of Switzerland and Norway for their financial contribution, and to the WMO and IPCC Secretariat for their generous support by hosting this meeting.

#### 2. Summary of the outcomes of the expert meeting

SLCF species are gases and particles that affect the climate. They have lifetimes in the atmosphere of a few days to a decade, and many of them are also air pollutants. Human activities contribute to SLCF emissions to the atmosphere. The impacts of SLCF species on climate are complex and depend on multiple factors, for example, where and when they are emitted. Methane is the longest lived SLCF, and is also included under the well mixed GHGs. There has been substantial improvement in scientific understanding of emissions and climate effects of SLCFs since the last Expert Meeting on Emission Estimation of Aerosols Relevant to Climate Change in 2005, and continued improvements since the AR5 WGI report (2013).

The following SLCF species were considered during the Expert Meeting: Black Carbon (BC), Organic Carbon (OC), PM<sub>2.5</sub>, NO<sub>x</sub>, CO, NMVOC (including BVOC), SO<sub>2</sub> and NH<sub>3</sub>. Methane and halogenated compounds were not included, because inventory methodologies for them are already provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines)*.

Since AR5, progress has been made in improved definitions of OC and BC, increased understanding of non-combustion aerosol sources, more measurements on aerosol particle sizes, and better model parametrisations of aerosol processes. Some of the remaining uncertainties are expected to be reduced if more information on SLCF emissions from improved inventories is available. More robust emission estimates can manage some of the remaining uncertainties associated with recent and projected SLCF radiative forcing.

Much of the existing work on SLCF inventories is due to the role of these substances in affecting air quality and human health. Improved SLCF emission inventories and methodologies are also necessary to enhance scientific understanding and assessment of their role in climate change as well as to inform climate policy at the national and international levels, particularly through United Nations Framework Convention on Climate Change (UNFCCC). Internationally-agreed, globally applicable methodologies and emission factors for SLCF emission inventories are necessary. In several cases there are current data gaps that limit their application and require further developments. It is desirable to commence work for these inventories, based on existing methodologies such as those in the EMEP/EEA Emission Inventory Guidebook for Air Pollutants (EMEP/EEA Guidebook), recognizing that further discussion is needed on the timing, nature, format, and sequencing of such work. The IPCC can play an important role because of its unique position, and therefore it is considered to be the right organisation to fill gaps in existing methodologies and to develop and disseminate an internationally-agreed, globally applicable methodological guidance based on existing methodologies. This could be achieved in close cooperation and collaboration with other relevant international bodies such as EMEP/EEA, CCAC, Arctic Council, ICAO, IMO.

Some SLCF species are of key importance globally and/or regionally for climate change (e.g. CH<sub>4</sub>, NO<sub>x</sub>, OC, BC and SO<sub>2</sub>). Others may become a high-priority over time in terms of mitigation strategies (e.g. NH<sub>3</sub> and VOC). In order to take into account trends and developments, all SLCFs should be considered with more focus on species and sources that are not well covered in existing guidance. It is recognised that OC is not covered in existing guidance due to methodology and data gaps. The current approach to derive BC emissions might need assessment, improvement or new elaboration due to significant challenges in deriving BC from PM<sub>2.5</sub> and variability in observations.

If the IPCC Plenary decides to engage into further work on SLCF inventories, careful consideration needs to be given to possible issues in consolidating existing inventory methodologies on GHGs and SLCFs, including those in harmonizing methods, aligning source categories, documenting emission factors, and linking to climate processes and climate change, and to establishing close cooperation and information exchange with other bodies working with these issues, for example, the UNECE Task Force on Emission Inventories and Projections (TFEIP), which develops the EMEP/EEA Guidebook.

Generally, much of the existing guidance on good practice methodologies/approaches on GHG inventory is applicable to, or can be a good basis for, SLCF inventories at a national level, if a more detailed air pollutant inventory does not exist. For example, the common activity data could be used for fossil fuel combustion, livestock enteric fermentation and manure management source categories, although additional information may be required for SLCF emission estimation. For some emission sources, however, existing inventory methodology does not provide a good basis for SLCF inventory (e.g., combustion of biofuels for cooking and heating, open burning of domestic waste).

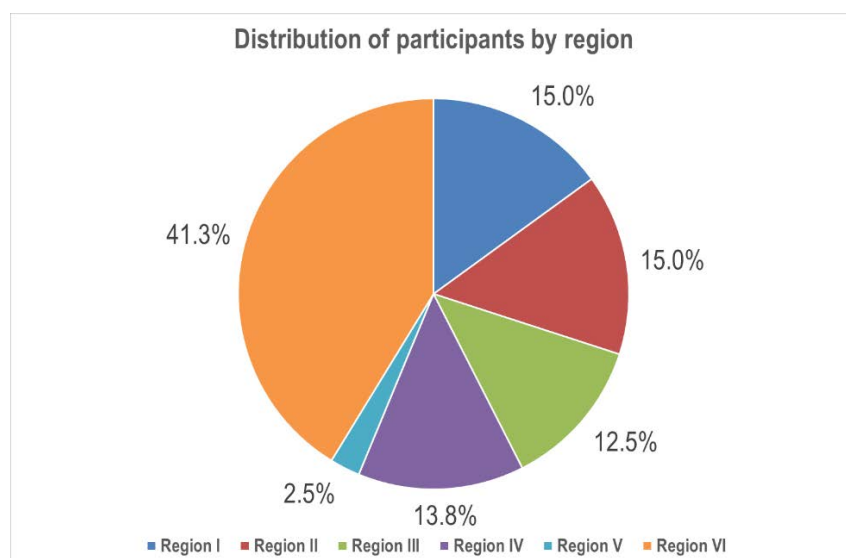
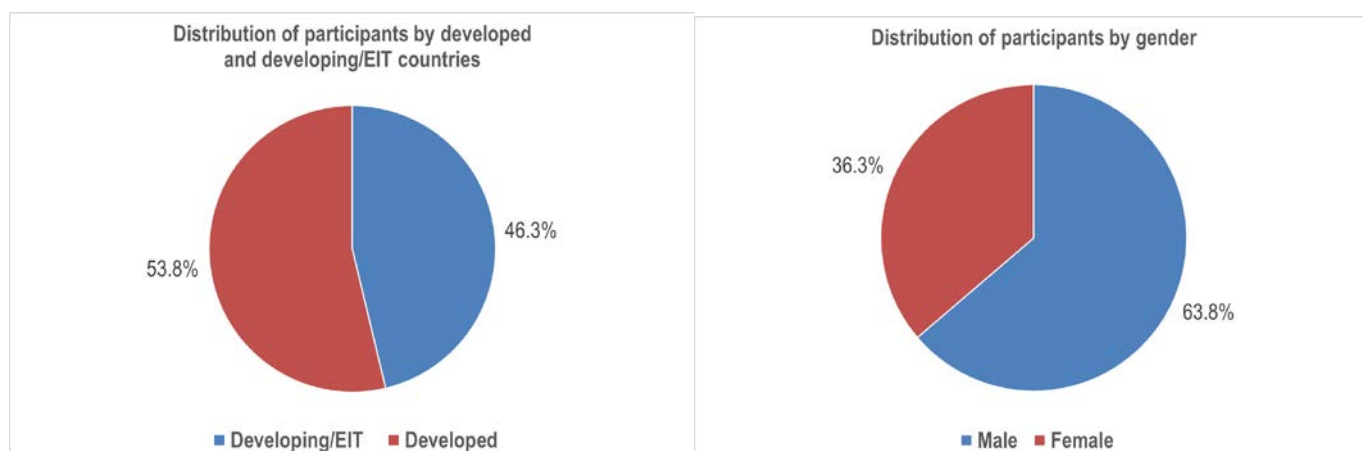
Reporting of SLCF and GHG inventories should be in mass units for each individual emitted compound. Some SLCF species (e.g., VOC) comprise multiple different chemical compounds and thus mass-based emissions must be carefully defined. It should be noted that the existing inventory methodology on GHGs (*2006 IPCC Guidelines*) does not require inventory compilers to calculate and report national total emissions in CO<sub>2</sub> equivalent unit. The understanding of emission metrics and how they can be used, particularly in the context of SLCF emissions, has advanced but there is currently no agreed recommendation. The meeting participants concluded that SLCF emissions

addressed in this meeting report should not be converted to CO<sub>2</sub> equivalent units in the same way as done based on GWP<sub>100</sub> in the inventory reporting under the UNFCCC. The meeting agreed that the issue of metrics and how they can be used may be further considered based on new scientific literature for coordination across Working Group reports, particularly those of Working Group I and Working Group III, towards the Synthesis Report (SYR) of the Sixth Assessment Report (AR6).

### 3. Proposed plan of future work by TFI

- (1) Soon after the adoption/acceptance of the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* at the 49<sup>th</sup> Session of the IPCC in May 2019, the TFI proposes to establish a small task team consisting of TFI TSU and some other experts, possibly those from the secretariat of UNECE TFEIP, to prepare a paper on the alignment of the *2006 IPCC Guidelines* and the EMEP/EEA Guidebook (By the end of 2019). The contents of this paper would focus on the following 2 items:
  - Cross-walk IPCC categories with major sources to identify focus areas
  - Compare the IPCC inventory guidelines and EMEP/EEA Guidebook to identify what can be harmonized and what cannot.
- (2) In early 2020, an expert meeting will be held by TFI, possibly jointly with UNECE/TFEIP, to consider the following, taking into account the outcomes of expert meeting on SLCF in May 2018 as well as the paper mentioned above (1).
  - Conduct detailed survey of available guidance to identify gaps
  - Identify where methods and activity data converge (e.g., Tier 2 for non-CO<sub>2</sub> and BC)
  - Identify where methods and activity data do not converge (e.g., C stock changes, fluorinated gases)
- (3) The outcomes of the steps (1) and (2) will be reported to the Panel as IPCC supporting materials. They will help filling gaps in the existing methodological guidance on SLCF inventory, and will help countries who wish to start producing and reporting national SLCF inventories.
- (4) A further work plan will be developed after consideration of the outcomes of the steps (1) and (2) above. This future work plan should take into account discussion by the Panel at a future session as from the 49<sup>th</sup> Session of IPCC as well as the views of the UNFCCC.
  - One possible approach may be to organize a series of expert meetings focusing specific sources/SLCF species to come up with detailed methodological advice.
  - Another possible action is to organize a joint TFI/WGI expert meeting on SLCF again in late 2021, building on the WGI contribution to the AR6 which will be approved/accepted in April 2021 as well as the outcomes of TFI expert meetings mentioned above. This joint expert meeting may be useful to provide insights for the further TFI work during the AR7 cycle, benefiting from the latest WGI's assessment of climate effects of SLCFs including issues on metrics, among others.
  - Production of a new Methodology Report which deals with SLCF inventory, if necessary, may be done in the AR7 cycle, building on the outcome of these steps.

## Annex: Statistics of participants in the expert meeting



REGION I	Africa
REGION II	Asia
REGION III	South America
REGION IV	North America, Central America and the Caribbean
REGION V	South-West Pacific
REGION VI	Europe