

IPCC Scoping Meeting
for a
Methodology Report
on
Short-Lived Climate Forcers
(SLCFs)

Report of the IPCC Scoping Meeting
26-28 February 2024, Brisbane, Australia

Task Force on National Greenhouse Gas Inventories

The IPCC Scoping Meeting on a Methodology report on Short-Lived Climate Forcers (SLCFs) was organized by the IPCC Task Force on National Greenhouse Gas Inventories (TFI) with support from the Government of Australia. It was held on 26-28 February 2024 in Brisbane, Australia.

This meeting report was prepared by the Co-Chairs of the IPCC TFI (Takeshi Enoki and Mazhar Hayat) and the TFI Technical Support Unit (TSU) and subjected to review by the meeting participants.

Supporting material prepared for consideration by the Intergovernmental Panel on Climate Change (IPCC). This supporting material has not been subject to formal IPCC review processes.

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Foreword

We are pleased to present this report of the Scoping Meeting for a Methodology Report on Short-Lived Climate Forcers (SLCFs) which was held on 26-28 February 2024 in Brisbane, Australia.

The IPCC, at its 49th Session on 8-12 May 2019 in Kyoto, Japan, decided that the Task Force on National Greenhouse Gas Inventories (TFI) should produce an IPCC Methodology Report on SLCFs following the Appendix A to the Principles Governing IPCC Work (Decision IPCC-XLIX-7).

Responding to this decision the IPCC TFI carried out an extensive preparatory work during the sixth assessment cycle of IPCC (AR6) with several Expert Meetings (Joint 1st and 2nd Expert Meeting on SLCFs on 11-22 October 2021 and the 3rd Expert Meeting on SLCFs on 11-15 April 2022, both held virtually). The Expert Meetings aimed to prepare supporting materials for the scoping process: including the listing of relevant SLCF species, the identification of available sources of methods, associated emission factors (EFs) and ancillary parameters to estimate SLCF emissions and the identification of knowledge gaps.

The first step in the development of a Methodology Report on SLCFs has been to convene the Scoping Meeting to produce an outline of the Methodology Report on SLCFs in accordance with the IPCC procedures. Preparation of the Scoping Meeting started in May 2023 with a call for nomination of experts which was issued to IPCC Member States and Observer Organizations. Invitees to the meeting were selected by the Bureau of TFI (TFB) from the nominations received with assistance of the TFI Technical Support Unit (TSU) on the basis of their expertise while addressing geographical representation and gender balance. The participants successfully completed the task by agreeing the title and the format of the Methodology Report on SLCFs and by producing the 3 documents needed for the scoping of the Report: the Table of Contents, the Term of Reference, and the Instructions to Experts and Authors.

The participants also identified a detailed list of categories and associated SLCF species that are sources of significant emissions or whose emissions are expected to grow significantly in the near future.

The three documents have been then considered and agreed by the TFB, at its 36th meeting, and will be submitted to the IPCC for its deliberation at the 61st Session (IPCC-LXI), from 26 July to 2 August 2024, in Sofia, Bulgaria.

We would like to thank all those involved in this meeting, namely, the experts who participated, the members of TFB, and the members of TSU, for their contribution to make this meeting a success. In particular, we would like to express our sincere gratitude to the Government of Australia and its Department of Climate Change, Energy, the Environment and Water for their generous support in hosting this meeting.



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List of Acronyms and Abbreviations

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
AR	IPCC Assessment Cycle
BC	Black Carbon
BOG	Break-out Group
EEA	European Environment Agency
EF	Emission Factor
EFDB	Emission Factor Database
EMEP	European Monitoring and Evaluation Programme
GHG	Greenhouse Gas
HWP	Harvested Wood Product
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
KCA	Key Categories Analysis
NMVOOC	Non-Methane Volatile Organic Compound
OC	Organic Carbon
PM _{2.5}	Particulate Matters with a diameter less than 2.5 micron
SLCFs	Short-lived Climate Forcers
TFB	IPCC Task Force Bureau
TFI	Task Force on National Greenhouse Gas Inventories
ToC	Table of Contents
ToR	Terms of Reference
TSU	Technical Support Unit
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WG	IPCC Working Group

Executive Summary

The IPCC, at its 49th Session on 8-12 May 2019 in Kyoto, Japan, decided that the Task Force on National Greenhouse Gas Inventories (TFI) should produce an IPCC Methodology Report on Short Lived Climate Forcers (SLCFs) (Decision IPCC-XLIX-7).

The goal of this Scoping Meeting was to prepare a proposal for the further consideration of the IPCC Plenary comprising:

- the title and format of a Methodology Report on SLCFs;
- Terms of Reference (ToR);
- Table of Contents (ToC); and
- Instructions to Experts and Authors and also to take note of the draft Work plan for the preparation of the Methodology Report.

To achieve these aims participants of the Scoping Meeting took into account the results and supporting materials of the preparatory Expert Meetings held in 2021 and 2022 and built on working draft documents prepared by the Task Force in Inventories Technical Support Unit (TSU).

The Meeting worked in 3 break-out groups (BOGs) to produce drafts of the following documents: the BOG1 on ToR (Scope) and on ToC (General Issues (Volume 1)); BOG2 on ToC Sectoral Issues (Volume 2-5: Energy, IPPU, AFOLU, Waste) including a detailed list of categories, and associated SLCF species, that are sources of significant emissions or whose emissions are expected to grow significantly in the near future; and BOG3 on ToR (Approach) and Instructions to Experts and Authors.

At its closing Plenary the Scoping Meeting agreed on the title and format of the Methodology Report. The title agreed was 2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (*2027 Supplement on SLCFs*) and the format in line with the 2006 IPCC Guidelines.

The Meeting also finalised the documents prepared by the BOGs (ToR, ToC, Instructions to Authors) and agreed to forward these to the IPCC Task Force on Inventories Task Force Bureau (TFB) for its further consideration.

1. Introduction

Formal background

The IPCC, at its 49th Session on 8-12 May 2019 in Kyoto, Japan, decided that the Task Force on National Greenhouse Gas Inventories (TFI) should produce an IPCC Methodology Report on short lived climate forcers (SLCFs) following the Appendix A to the Principles Governing IPCC Work (Decision IPCC-XLIX-7).

In Annex 1 to the decision ‘approach’, ‘output and timeline’ and ‘required activities’ are defined as follows:

Approach:

- *The preparatory work for the Methodology Report (including supporting materials and scoping) is completed as soon as possible, starting in the AR6 cycle. Followed by further methodological development in the AR7 cycle.*

Output and Timeline:

- *Expert Meetings will produce a series of supporting materials to be published after each meeting but no later than 2022.*
- *These supporting materials will be used to inform the scoping of methodological work for SLCF.*
- *The Scoping Meeting will take into consideration the work on SLCF underway in the reports of Working Group I and III*
- *The outline will be presented for approval to the Panel soon after the Scoping Meeting.*

Required Activities:

- *Technical analysis work by TSU with other experts.*
- *3-4 Expert Meetings*
- *Scoping Meeting*
- *Approval of outline by the Panel*

In accordance with the agreement by the IPCC Panel at its 53^{bis} Session (IPCC-LIII^{bis}) held in electronic format on 22-26 March 2021 the Scoping Meeting and subsequent approval for the IPCC Methodology Report on SLCFs was moved to the AR7 cycle.

Preparatory Work on SLCFs in AR6

The COVID-19 pandemic brought interference into the IPCC schedule and activities of all Working Groups and TFI preventing in-person meetings in the years 2020, 2021 and winter 2022. Following TFB’s deliberations and decisions (TFB-32 and TFB-33), the two planned Expert Meetings for the year 2020 were held jointly as a virtual meeting in October 2021 (the 1st and 2nd Joint Expert Meeting on SLCFs) while the two Expert Meetings originally planned for 2021 were limited to a single Expert Meeting held virtually in April 2022 (the 3rd IPCC Expert Meeting on SLCFs).

To support the work at Expert Meetings TSU carried out a technical analysis of the main methodologies available on SLCFs – developed by EMEP/EEA, the US EPA and UNEP. This analysis was presented in the form of tables including categorization of SLCFs sources of emissions, methodological information, and assessments of EF and AD availability for each of the identified source categories.

This technical work was shared with experts invited to the Joint 1st and 2nd Expert Meetings through a desk-work process commencing in March 2021. Feedback received from experts was compiled by TSU and analysed in a series of sectoral documents for Energy, IPPU, AFOLU and Waste in June 2021.

The Joint 1st and 2nd IPCC Expert Meeting on SLCFs in relation to methodologies on Energy, IPPU, AFOLU and Waste sectors was held virtually on 11-22 October 2021. The meeting discussed relevant SLCF emission source categories and associated SLCF species as well as available methodologies and datasets of SLCF emissions with the aim of identifying a complete list of source categories and associated SLCFs. The meeting also discussed knowledge gaps and some cross-cutting issues. The meeting report is published on the TFI website at: https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2110_SLCF.html

The 3rd Expert Meeting on SLCFs was held virtually on 11-15 April 2022. As per deliberation at TFB-33, the meeting considered the relevant information on SLCFs in WGI and WGIII contribution to the AR6 as well as discussed cross-cutting issues on definitions and relevance of SLCFs species, methodological inventory issues (key category analysis, time series,

etc.) as well as data gaps and SLCF categories list. The Expert Meeting produced a list of SLCF species with their definitions and information on their relevance for an emission inventory, a compilation of general inventory issues relevant for an SLCF emission inventory, a list of SLCF categories and a list of information gaps for an SLCF emission inventory. The meeting report is published on the TFI website at: https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2204_SLCF_EM3.html. The meeting reports were intended to inform the scoping of the Methodology Report on SLCFs as well as the work of authors of that Report during the AR7 cycle.

Scoping Meeting

The nomination letter for the Scoping Meeting for a Methodology Report on SLCFs was sent by IPCC Secretariat to the IPCC Focal Points and Observer Organisations on 5 May 2023. The TSU collected nominations until the end of August 2023, resulting in 141 experts nominations by 46 National Focal Points, Observer Organisations and Bureau Members.

The Scoping Meeting for a Methodology Report on SLCFs was held on 26-28 February 2024, followed by the 36th meeting of TFB, on 29 February-1 March 2024 in Brisbane, Australia.

The Scoping Meeting was attended by 57 experts, 11 members of TFB, and 8 members of TSU. The work was carried out in Plenary sessions and in break-out groups (BOGs).

The Agenda as adopted is presented in **Annex 6** and the list of participants in **Annex 7**.

The Scoping Meeting was tasked to consider and conclude on the title and format of the Methodology Report and to prepare draft Terms of Reference (ToR), draft Table of Contents (ToC), draft Instructions to Experts and Authors for the Methodology Report.

Working drafts of these documents were prepared by the TSU to support the work of participants.

Discussions and conclusions of the meeting are summarized in this report; the above-mentioned draft documents are presented in the **Annexes 1-4**.

2. Meeting Discussions and Conclusions

Organisation

The Scoping Meeting for a Methodology Report on SLCFs was organized in three Plenary sessions and a parallel work in three Break-out groups (BOGs).

The first Plenary session was intended to introduce the background and objectives of the meeting as well as to discuss the title and format of the Methodology Report, in order to develop a common understanding of scope of the task; the second Plenary session was aimed at taking stock of the progress of work of the BOGs and to discuss cross-BOG issues; the final Plenary session concluded on the title and format and on the documents: ToR, ToC, Instructions to Experts and Authors.

The following three BOGs were organized:

1. BOG1 – General inventory issues, in ToC and ToR;
2. BOG2 – Sectoral issues (Energy, IPPU, AFOLU, Waste) in ToC, including a detailed list of categories and associated SLCF species that are sources of significant emissions or whose emissions are expected to grow significantly in the near future; and
3. BOG3 – ToR, Instructions to Experts and Authors and Workplan.

Discussion

The Scoping Meeting started with a welcome address from Ms. Melanie Ford, Branch Head, National Inventory Systems and International Reporting branch of the Department of Climate Change, Energy, the Environment and Water of the Government of Australia, followed by opening remarks from IPCC TFI Co-Chair Mr. Takeshi Enoki on behalf of himself and his fellow Co-Chair Mr. Mazhar Hayat (was not present in the meeting).

The opening session was followed by presentations from TSU. Mr. Rob Sturgiss introduced IPCC TFI and Mr. Sandro Federici explained the background, objectives and organization of the meeting. Mr. Pavel Shermanau gave a presentation on preparatory work done during the previous IPCC AR6 cycle. Ms. Baasansuren Jamsranjav gave a presentation on the expected outcomes of the Scoping Meeting. The presentations highlighted that the outcomes of the Scoping Meeting are the main elements of the proposal for a Methodology Report on SLCFs that the TFI will present to the IPCC61 session, for its consideration and approval.

Then Mr. Takeshi Enoki presented three options for the title and format of the Methodology Report on SLCFs:

- Option A: Stand-alone independent Methodology Report
Title: 2027 IPCC Guidelines for National Short-lived Climate Forcers inventories
Format: to be defined
- Option B: Refinement to the 2006 IPCC Guidelines
Title: 2027 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers
Format: as of the *2006 IPCC Guidelines*
- Option C: Supplement to the 2006 IPCC Guidelines
Title: 2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers
Format: as of the *2006 IPCC Guidelines*

It was clarified that the reference to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories includes the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Wetlands Supplement) and the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement).

Option A was considered to require the largest amount of work to authors and is prone to the risk of producing guidance inconsistent with the *2006 IPCC Guidelines*.

Option B would not produce a stand-alone Methodology Report, while ensuring its full consistency with the *2006 IPCC Guidelines* and it is consistent with UNFCCC decision 18/CMA.1¹.

Option C would ensure that the Methodology Report is necessarily consistent with the 2006 IPCC Guidelines, and a stand-alone Methodology Report would be produced.

The participants discussed the options, their pros and cons, the meaning of the words supplement and refinement, and concluded on the importance of overall consistency between the Methodology Report on SLCFs and the *2006 IPCC Guidelines*.

Then participants split in 3 BOGs. Each BOG discussed and produced its inputs for the final Plenary on the documents listed below:

- **Terms of Reference (ToR)** - *The ToR sets out the background, the scope and coverage, the approach and a work plan for the production of the Methodology Report.*

A working draft was provided to participants, as produced by TSU on the basis of the ToRs for the *2019 Refinement* and the *2006 IPCC Guidelines*.

Participants discussed SLCF-specific issues, in particular:

- i) inclusion of H₂ and PM_{2.5} into the scope of the Methodology Report;
- ii) speciation of NMVOCs;
- iii) inclusion of natural background of bio-NMVOCs from vegetation; and
- iv) spatial distribution and temporal resolution of SLCF emissions.

- **Table of Contents (ToC)** – *The ToC sets the aggregated outline for chapters of the Methodology Report.*

A working draft was provided to participants, as produced by TSU on the basis of the ToCs for the *2019 Refinement* and the *2006 IPCC Guidelines*.

Participants discussed in particular the level of aggregation in volume and chapters and given the specificity of some cross-cutting guidance, the need to a more detailed information for Volume 1.

- **Draft Instructions to Experts and Authors** - *These instructions to experts and authors are intended to ensure a consistent and coherent approach across all methodologies, volumes and chapters, including the use of common terminology.*

A working draft was provided to participants, as produced by TSU on the basis of *the previous Methodological Reports, including the 2019 Refinement*.

Participants discussed in particular:

- (i) the need of authors to provide TSU with all data used to elaborate IPCC defaults;
- (ii) the use of already available methodological guidance in producing the IPCC methods and EFs;
- (iii) derivation of BC/OC emissions from PM_{2.5} emissions; and
- (iv) identification of key categories, without a common metric applicable across SLCF and GHG species, and associated decision trees.

- **Draft Work Plan** – *the Workplan shows the timeline for production of the Methodology Report and it was noted with appreciation.*

¹ paragraph 20 “Each Party shall use the 2006 IPCC Guidelines, and shall use any subsequent version or refinement of the IPCC guidelines agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA)...”

The discussion of elements within the three BOGs is presented in more detail in the following sub-sections 2.1-2.3. On crosscutting topics, the Plenary agreed that:

- Given the specificity of SLCF emissions in terms of climate change impacts, as well as their direct impacts on health, the ToC of Volume 1 includes information on elements the authors should ensure to include in the relevant chapters.
- H₂ should be included as a species in the scope of the Methodology Report given the potential importance of the hydrogen technology in future emission mitigation efforts²; and
- H₂ and NH₃ should be included among fuels, and H₂ among reducing agents in IPPU.

Inclusion of PM_{2.5} as a directly targeted SLCF species was discussed extensively. However, no consensus was reached on the inclusion of PM_{2.5} as a targeted SLCF species *per se*.

Some participants considered inclusion of the aggregate PM_{2.5} emissions out of scope of the list of targeted SLCF species while other participants argued in favor of including PM_{2.5} to ensure transparency and full scientific rigor in estimating BC/OC from PM_{2.5}.

Participants did agree that emissions of PM_{2.5} is a relevant measurement from which to derive BC/OC emissions and thus Instructions to Experts and Authors are given to request reporting of ancillary information on PM_{2.5} emissions when BC/OC emissions are derived as a fraction of PM_{2.5} as well as to report PM_{2.5} emissions to verify estimates of BC/OC when those are not derived from PM_{2.5} (paragraph 46 of Instructions to Experts and Authors).

The different views for inclusion/exclusion of PM_{2.5} as a targeted SLCF species in an inventory of anthropogenic, primary emission sources include:

- PM_{2.5} *per se* is not included in the list of short-lived climate forcers provided in Chapter 6 of the WGI AR6 Report: only the BC/OC elements are included. Some PM_{2.5} may not contain BC/OC.
- Although PM_{2.5} concentrations in the atmosphere have a direct climate effect these are largely already covered by the targeted species identified in its primary emissions component - BC, OC and NMVOCs. In these circumstances, the inclusion of PM_{2.5} as a targeted species is partly redundant or superfluous.
- PM_{2.5} also includes *secondary* inorganic aerosols - as SO₄, NO₃, NH₄ - and organic aerosols that are not consistent with an inventory limited to anthropogenic, *primary* emissions of SLCFs.
- In the Joint 1st and 2nd Expert meeting on SLCFs it was noted that PM_{2.5} is considered a SLCF highly heterogeneous spatially and temporally (varying from positive to negative RF depending on sources and meteorological characteristics). The PM_{2.5} concentration is the proxy for the radiative impact of all kinds of particles. Given that most BC and OC EFs are expressed as fraction of PM_{2.5}, the participants of this BOG decided to include primary PM_{2.5} in the list of emissions to be estimated not only because it is a SLCF but as an intermediate variable often needed to estimate BC and OC emissions.
- In the 3rd Expert Meeting on SLCFs it was noted that particles larger than PM_{1.0} will have some climatic impact, but have less impact per gram for physical reasons (optics, nucleation) and shorter lifetimes. Reporting PM_{2.5} [as ancillary data] would improve transparency of the BC and OC estimates.
- PM_{2.5} is considered to be an air pollutant and reporting on PM_{2.5} would benefit the issues related to air quality and health, although PM_{2.5} was not assessed to be a SLCF species *per se* in the WGI AR6 report.

Materials

The Scoping Meeting presentations (from TSU and BOGs) are available together with this report at the IPCC-TFI website: <https://www.ipcc-nggip.iges.or.jp/>.

Note that BOG presentations were delivered on the second day of the meeting and so reflect preliminary discussions in the BOGs and do not reflect the final status of consideration of the BOGs of the elements assigned.

² Noting that hydrogen has only an indirect impact on the greenhouse effect through changes in the atmospheric chemistry, as reduced CH₄ oxidation, as increased tropospheric O₃ concentrations and as increases in stratospheric water vapour.

2.1 BOG 1: ToR (scope) and ToC for General issues

Co-facilitators: Thelma Krug and Ole-Kenneth Nielsen

Rapporteur: Vigdis Vestreng

The participants of BOG1 discussed:

- Terms of Reference (ToR) for a Methodology Report on SLCFs (limited to the scope)
- Table of Content for a Methodology Report on SLCFs (limited to Volume 1 – General Guidance and Reporting)

In the working draft of ToR, the participants concluded on the following elements to add/modify to the working draft provided by TSU in the section on Coverage:

- include H₂ and to require the total amount of PM_{2.5} emitted when BC and/or OC are derived from PM_{2.5} measured emissions. No consensus was derived at this point on whether to include PM_{2.5} as an species in itself or only for BC/OC emitting sources.
- NMVOCs to be provided as an aggregate, although at higher tiers speciation should be considered.
- Clarify that sources to be included are those for which scientific evidence is available.
- Clarify that although spatial distribution is national and time resolution is annual, authors should provide guidance on further spatial and temporal disaggregation.

In the working draft of ToC, the participants concluded on the following elements to add/modify to Chapters in the working draft provided by TSU:

- A chapter on precursors and indirect emissions is out of scope given that only primary emissions are within the scope of the Methodology Report on SLCF.
- Introduction should include: Background on SLCFs and their importance for climate, Key differences between SLCFs and well Mixed GHGs emissions, Holistic approaches to SLCFs and the importance of co-emitted species, Spatial distribution and temporal resolution and relevance to climate effects, Interlinkages with air pollution and health, Interlinkages with meteorology, Importance of technologies and abatement technologies.
- Approaches to Data Collection should include: Spatial distribution and temporal resolution, Measurement techniques, NMVOCs speciation, Technologies and Abatement technologies.
- Timeseries consistency should include: Addressing changes in measurement techniques, Addressing changes in technologies, including for abatement.
- QA/QC and Verification should include: Consistency with co-emitted GHGs and SLCFs, Comparison with global/regional inventories, Comparisons with atmospheric observations and models.

During the work, BOG1 discussed several issues/questions.

Species:

- I. In defining SLCF species, which criteria should be used to select NMVOCs to be estimated and reported, given that they are rather aggregate of species rather than single species?*

Those NMVOCs that are practically feasible, those co-emitted, those with higher climate impact (through production of O₃ in the troposphere), those semi-volatile and not aggregated.

Speciation of NMVOCs to be suggested for higher tiers, while for Tier 1 EF to be provided for total VOCs, ensuring availability of AD for Tier 1 VOCs.

- II. Is H₂ to be added to the list of species? Is any further species to be added?*

Emissions of H₂ expected to be significant in the next future, although not well-assessed by IPCC WGI yet, for example, H₂ was mentioned in IPCC AR5 WGI, 8.SM.14 Metric Values for Other Near-Term, Climate Forcers to Support Section 8.7.2.

III. *Should indirect emissions, of e.g. O₃ and secondary aerosol, be considered?*

No, the scope is to be limited to primary emissions only.

However, PM_{2.5} emissions to be considered by authors to derive BC/OC EFs; although, where practicable, authors should provide guidance and EFs for BC/OC according to both approaches: as BC/OC emissions or as a fraction of PM_{2.5} emissions. Further, EFs should be provided stratified by technologies, where practicable. Finally, guidance to ensure consistency/mass balance among different carbonaceous components of emissions should be provided.

Definitions:

IV. *Shall definitions contained in the 2019 Refinement be applied to the SLCF supplement, while adding any new definition needed? (e.g. Should the occurrences of the adjective “anthropogenic” be further clarified on the basis of guidance provided in the 2019 Refinement?)*

Context: while the managed land proxy qualifies as anthropogenic C stock changes, and associated GHG emissions and CO₂ removals, occurring on managed land as anthropogenic, not all non-CO₂ GHG fluxes from a managed land are reported in a national GHG inventory. For instance, N₂O emissions from soils are limited to the additional quantity of N₂O emitted as consequence of human activities; this is because the aim of a national GHG inventory is to capture the perturbation caused by human activities in the biogeochemical cycles of GHG and their precursors.

V. *How should the definition of anthropogenic emissions apply to NMVOCs from natural vegetation and from cultivated vegetation (e.g. forest/tree plantations)?*

Natural background emissions of SLCFs, as biogenic VOCs from any vegetations (excluding from fires) in managed land should be excluded from the inventory.

VI. *Black carbon originated from burning of biomass and dead mass is a carbon transfer to a long-term sequestration C pool, should this be counted, and thus reported, in a national inventory?*

This is considered a non-significant process and thus not requested to be included within the scope of the Methodology Report.

Key Category Analysis (KCA):

VII. *2006 IPCC Guidelines applies the KCA by applying a common metric to all GHGs emissions and removals; while Expert Meetings conducted during AR6 concluded that KCA for SLCF emissions is to be done species by species without a common metric. Is such conclusion to be applied to the Report?*

VIII. *Where a positive answer applies, should the threshold of KCA be revised to avoid overburdening countries with SLCF reporting and to ensure that SLCF emissions estimates are not prioritized over GHG estimates?*

IX. *Where the threshold is to be revised, should also the “25-30% rule” (i.e., a significant sub-category is one that makes up more than 25-30% of emissions from a category) be revised? Note that conclusions taken on KCA and the significance criteria shall be implemented in the ToR text.*

Conclusions reached in AR6 cycle are recognised as valid. Thresholds are to be reviewed and/or revised to avoid the qualification of too many categories as key (overburdening inventory compilers).

Space/Time/Feature:

X. *Do we need guidance on spatial and temporal distribution of SLCF estimates? (How to provide for voluntary implementation of disaggregated estimates at sub-annual and sub-national temporal and spatial distribution, with considerations on data needs and reporting requirements)*

XI. *The nature of the SLCF sources (e.g. stationary vs mobile) determine spatial and temporal differences in emissions, should guidance be provided on the impact on SLCF lifetime of such difference?*

While default approach should stay on national emissions within an annual time period, for higher approaches authors should provide additional methodological information, where practicable, on temporal resolution and spatial distribution.

SLCF-specific guidance:

XII. *What is SLCF specific guidance in relation to general inventory issues:*

Participants concluded that new guidance is to be limited to SLCF-specific elements, while general guidance applies unchanged. Thus, authors, should add SLCF-specific guidance, if any, in additional sections within the current structure in chapters of the 2006 IPCC Guidelines and its 2019 Refinement.

2.2 BOG 2: ToC for Sectoral Issues

Co-facilitators: Songli Zhu and Vincent Camobreco

Rapporteur: Dan Zwartz

The participants of BOG2 discussed the working draft of TOC for Energy, Industrial Process and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU) and Waste sectors.

During its work, BOG2 discussed several issues/questions and looked into the supporting material “List of SLCF Categories and Species” which was one of the outcomes of the Expert Meetings on SLCFs held in 2021 and 2022.

To support its discussions, the BOG2 also looked at the reports of the Expert Meetings on SLCFs held in 2021-2022.

Sectoral issues/questions considered:

- Energy

Q1. Do we need to disaggregate Fugitive Emissions?

A1. Not in the draft Table of Contents (recognising that they are disaggregated in the List of Categories and Species, and will be addressed separately in the methods and reporting).

Q2. Do we need a chapter/category on capture and storage of SLCF emissions?

A2. No.

Q3. Shall NH₃ and/or H₂ be added as fuel?

A3. Yes, both NH₃ and H₂. Added categories to 1.B.3 (Other emissions from Energy Production) to include fugitive emissions from new fuels. See the List of SLCF Categories and Species (highlighted with yellow and with red font).

- IPPU

Q1. Should Non-Energy Products from Fuels and Solvent Use be disaggregated (e.g., Solvent Use)?

A1. No, not in the draft TOC. For simplicity, and because the subcategories don't demand dramatically different author recruitment.

Q2. Should Other categories be specific/disaggregated (e.g., Pulp and Paper Industry)?

A2. No, not in the draft TOC. For simplicity, and because the subcategories don't demand dramatically different author recruitment.

- AFOLU

Q1: Are additional Wetlands categories relevant (e.g., Aquaculture)?

A1. No changes needed to these categories. The activities are addressed in the Wetlands Supplement, and authors may consider developing methods to estimate SLCF emissions.

Q2: Category 3.C.4 deals with direct N₂O emissions from managed soils. Should new categories for NO_x and NH₃ emissions be added?

A2. Retained conclusion from Expert Meetings 1 & 2. Following the report of Expert Meetings 1 & 2, the existing IPCC category name cannot be changed, but new disaggregated categories for NO_x and NH₃ emissions could be added. The report should develop methods for the SLCF species, not for N₂O.

Q3: *Category 3.C.5 deals with indirect N₂O emissions from managed soils. Should it instead deal with NO_x and NH₃ emissions and associated indirect N₂O emissions? Note that FracGASM and FracGASF in Table 11.3 of the 2006 IPCC Guidelines calculate emissions of NO_x and NH₃ as a sum.*

A3. Retained conclusion from Expert Meetings 1 & 2. Following the report of Expert Meetings 1 & 2, the existing IPCC category name cannot be changed, but new disaggregated categories for NO_x and NH₃ emissions could be added. The report should develop methods for the SLCF species, not for N₂O.

Q4: *Shall we specify/disaggregate Other categories? (See the List of SLCF categories and species)*

A4. Authors to consider whether these subcategories could be moved to relevant subsectors or retained as a group in the subcategory 3.D.2 Other.

- Waste

Q1. *Should NO_x emissions from decomposition of waste at solid waste disposal sites be included?*

A1. Leave to the authors. Not discussed in previous Expert Meetings; no experts present here.

Q2. *Should SLCFs emissions (e.g., NH₃, NMVOC) from constructed wetlands (CWs) used for wastewater treatment be included?*

A2. Leave to the authors. Not discussed in previous Expert Meetings; no experts present here.

Q3. *Should 4.B Biological Treatment of Solid Waste category be disaggregated into 4.B.1 Composting and 4.B.2 Anaerobic Digestion?*

A3. Not in the draft TOC. Yes, added to List of Categories and Species.

Q4. *Should NO_x emissions for anaerobic digestion be included?*

A4. Yes, added to list (replaced “?” with “X”) in the List of Categories and Species.

The BOG2 looked into the List of SLCF Categories and Species for all sectors and suggested some changes including additional categories added for consideration by authors of the Methodology Report on SLCFs (e.g., 2.E Electronic Industry and 2.G Other Product Manufacture and Use for IPPU sector) and new categories added under 1.B.3 Other Emissions from Energy Production to include fugitive emissions from new fuels (BOG2 agreed to include NH₃ and H₂ as fuel).

Furthermore, as suggested by BOG1, H₂ is added as a species in the List SLCF Categories and Species. The BOG2 went through the list of categories for all sectors/categories and indicated the categories which could/might be relevant to H₂ emissions. However, the authors should decide what categories are relevant or have enough information to determine methodologies for H₂ emissions.

The BOG2 also provided other comments/suggestions including those for consideration by authors (see Comments column of Annex 5. List of SLCF Categories and Species). However, the authors should also consider what categories are relevant or have enough information to determine methodologies for specific SLCF emissions.

The BOG2 worked on draft sectoral TOC, based on its discussions the BOG2 agreed to the working draft sectoral TOC adding Stationary Combustion and Mobile Combustion instead of Fuel Combustion Activities.

Outcomes of BOG2 were presented at Plenary session on Day 3:

- Draft ToC
- List of SLCF Categories and Species
- Considered issues/questions

During the Plenary, participants agreed to indicate NH₃ and H₂ as a species for new category 1.B.3.c.i Transmission and Storage.

2.3 BOG 3: ToR, Instructions to Experts and Authors, Workplan

Co-facilitators: Jongikhaya Wittl and Dario Gomez

Rapporteur: Patricia Krecl

The participants of BOG3 discussed the working drafts of the following documents:

- Terms of Reference (ToR) for a Methodology Report on SLCFs
- Instructions to Experts and Authors
- Workplan.

In the working draft of ToR, the participants suggested to improve/clarify the following.

- Scope: Anthropogenic emissions should include only primary emissions and not include secondary human-induced substances.
- Coverage: i) All fluorinated gases should not be included in the Methodology Report, without specifying only hydrofluorocarbons (HFCs). ii) Geographical and temporal coverage is national and annual level, and authors should also consider guidance on spatial and temporal disaggregation of SLCF emissions.
- Approach: some minor text improvements were introduced.

In the working draft of Instructions to Experts and Authors, the participants suggested to improve/clarify the following.

- Literature: text regarding electronic copies was added.
- Definitions: The term “Key categories” was added.
- Emission factors and methods: The paragraph on double-counting of carbon was added.
- Decision tree: Another example was suggested.
- Appendix: the content of appendix was clarified.

The BOG3 participants noted with appreciation the working draft of the Work plan, as it is subject to the TFB consideration and aligning together with the Methodology Report on Carbon Dioxide Removal Technologies, Carbon Capture Utilization and Storage.

During the work, BOG3 discussed several issues/questions.

Q1. Does the generic text used for GHG inventory methods completely address the needs of the Methodology Report on SLCF emission inventories? Or should any element be added to the ToR?

A1. The experts agreed on the general structure of the TOR used for the GHG emission inventories. However, some specific points were discussed. Scope. We clarified that the new Methodology Report will consider anthropogenic emissions of SLCF, not including secondary human-induced substances. Coverage. We specified that the geographical coverage is at national level, but spatial-temporal variations might be relevant for certain SLCF. (To be discussed with BOG1).

Q2. IPCC Tier 1 – double-counting of carbon. IPCC default method does not have an Oxidation Factor so that an inventory compiler that applies the IPCC default method is forced to assume that all carbon is emitted as CO₂, while the addition of SLCF methods will require to estimate also other carbon compounds (CO, NMVOCs and BC/OC) from which indirect CO₂ emissions originates. Should IPCC default method in the Energy sector be revised by adding the “oxidation factor” in the relevant equation?

A2. A new para was added in the draft Instructions to Experts and Authors.

44. *Authors should note the issue of double-counting, for example in the Energy sector the IPCC default method for combustion assumes an Oxidation Factor equal to 1 resulting in all carbon calculated as CO₂, while the addition of SLCF methods will require to estimate also other carbon compounds (CO, NMVOCs and BC/OC). Authors should provide guidance to inventory compilers on how to address the issue of double-counting.*

Q3. *It is stated in the draft text that the default EFs for Tier 1 are to represent EFs without the effect of controls or abatement technologies. Is this realistic for future guidance? Could a better formulation be found?*

Q4. *Should Authors be clearly requested to provide IPCC default EFs disaggregated according to the component variables applied in the method? [e.g., the inclusion of oxidation factors in combustion equations]*

A3-A4. The draft Instructions have already the text in paragraph 38 to address these questions. I was suggested to add "abatement technologies" under "technology".

Lead authors may also provide multiple default emission factors, disaggregated by region, technology (including abatement technologies), or another relevant classification scheme.

Q5. *Regional guidelines might be revised much more frequently than the IPCC SLCF Guidelines, so should authors cross-reference those elements associated with technology development, e.g. data collection, data analysis, EFs or is it better to provide guidance on how national inventory compilers may develop those on the basis of new information from regional guidelines? Please consider that this is to be done in strict coordination with BOG1.*

A5. Further guidance is not needed.

Q6. *Should authors be recommended to add information on international sources of AD for each potentially significant source category, so far as a relevant source is available?*

A6. There is already a text in the draft Instructions - see paragraph 43.

43. *Where the method applied for SLCF differs from that applied to estimate GHG emissions from the same source, or the source is not covered in the 2006 IPCC Guidelines, in addition to methodological guidance, guidance on activity data sources available at international level, and where possible at national level, will be provided.*

Q7. *Please review Appendix 1 of working draft Instructions to Experts and Authors and consider revisions to maximise utility for the EFDB. Consider whether text can be added to ensure that authors provide TSU with all data, and resources, used to elaborate on IPCC default values, and where an expert judgement is provided that such judgment is supported through the submission of an elicitation protocol (see https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_2_Ch2_DataCollection.pdf)*

A7. The BOG3 did revision of the Appendix and text. All mandatory information was included in the form.

Q8. *Should the Table of Content be further elaborated to provide more detailed guidance to authors on the expected content of the Report? Could for instance the List of SLCF categories and species prepared by TSU further elaborated and added to it? Please consider that this is to be done in strict coordination with BOG2. E.g., how to address the use of NH₃ and H₂ as a fuel.*

A8. Input of BOG1 and BOG2.

One issue was forwarded to discuss in the Plenary – the nature of a Methodology Report and text in the paragraph 9, which was:

9. Guidance provided in the 2027 Supplement on SLCFs builds on guidance provided in the 2006 IPCC Guidelines, thus additional information to be provided is limited to guidance in the application of differences in methods, if any, and to the needed default values for EFs and for parameters, if any. For example, if, for a source category, the same method is applied to the estimation of GHG as well as SLCF emissions, then a reference to the relevant existing guidance on activity data and method will suffice while new information may be limited to default values for EF and parameters, if any. Where the method to be applied to the estimation of SLCF emissions from a source category differs from existing guidance for GHG emissions, or the source category is not covered in the 2006 IPCC Guidelines, then complete guidance on the method and needed activity data and EFs, and parameters, will be provided.

It was suggested to remove this paragraph and improve the text in the Format of the report. Also, there is a text in the Instructions to Experts and Authors.

Paras 42 and 43 of the Instructions to Experts and Authors

42. Authors shall prefer IPCC methods applied to estimate GHG emissions when those can be straightforwardly applied to estimate SLCF emissions as well as when those can be applied mutatis mutandis. The use of consistent methodologies allows inventory-compilers to use the same datasets for both sets of estimates. This is to enhance efficiency in the use of resources available to inventory-compilers and thus to promote accuracy of estimates.

43. Where the method applied for SLCF differs from that applied to estimate GHG emissions from the same source, or the source is not covered in the 2006 IPCC Guidelines, in addition to methodological guidance, guidance on activity data sources available at international level, and where possible at national level, will be provided.

As the result, the Plenary decided to remove this paragraph; the text in the Format was improved.

The draft documents (ToR, Instructions, Workplan) were submitted to the final Plenary session for approval.

3. Conclusions

The Scoping Meeting goal was to produce the outline of a Methodology Report on SLCFs in accordance with the Appendix A to the Principles Governing IPCC Work, which contains the procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC reports.

The following outcomes of the Scoping Meeting, as recommended to be used by the TFB for its submission for an outline of a Methodology Report on SLCFs to the IPCC Panel, were produced:

- The title:
2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (2027 Supplement on SLCFs)
- The format:
2027 Supplement on SLCFs will provide guidance on the preparation and reporting of a national inventory of SLCF emissions. Existing IPCC methods, categorization and guidance in the 2006 IPCC Guidelines³, shall be preferred when those can be straightforwardly applied to estimate SLCF emissions. It does not replace or refine the 2006 IPCC Guidelines but should be used in conjunction with the 2006 IPCC Guidelines.

The format should be one single Methodology Report including an Overview Chapter and five volumes following the format of the 2006 IPCC Guidelines.
- Draft ToR of *2027 Supplement on SLCFs* should be as presented in **Annex 1**, draft ToC – **Annex 2**, draft Instructions to Experts and Authors – **Annex 3** and the Work plan – **Annex 4**. The supplementary or supporting material – Table of SLCF categories and species – is presented in **Annex 5**.

These recommendations and documents will constitute the basis of the TFI proposal to the IPCC-61.

³ 2006 IPCC Guidelines for National Greenhouse Gas Inventories and its Wetlands Supplement, as updated, supplemented and elaborated in the 2019 Refinement (hereafter referred as the 2006 IPCC Guidelines)

Annex 1. Terms of Reference (ToR)

2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (2027 Supplement on SLCFs)

Background

1. At the 49th Session (IPCC-49) held in May 2019 (in Kyoto, Japan) the IPCC approved the Task Force on National Greenhouse Gas Inventories (TFI) to produce an IPCC Methodology Report on SLCFs following the Appendix A to the Principles Governing IPCC Work (Decision IPCC-XLIX-7).
2. IPCC TFI carried out preparatory work including Expert Meetings⁴ during the AR6 cycle. The Scoping Meeting produced the draft Table of Contents, which is outlined in Annex 1.

Scope

3. The new Methodology Report will provide guidance on SLCF emissions which are:
 - Anthropogenic, not including secondary human-induced substances
 - National
 - Annual
 - Reported in mass units for each individual emitted species.
4. Coverage:
 - Species covered by the new Methodology Report will be NO_x, CO, NMVOCs, SO₂, NH₃, BC and OC (BC and OC can be presented in terms of fraction of PM_{2.5}; along with the total amount of PM_{2.5} emitted), and H₂.
 - Methane and halogenated species under Montreal Protocol and Kigali Amendment will not be covered since these are already addressed by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2006 IPCC Guidelines*), the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (*Wetlands Supplement*) and the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2019 Refinement*).
 - For NMVOCs, the methodology should provide estimates for total NMVOCs. The speciation of NMVOCs should be considered by authors, as appropriate.
 - Anthropogenic emissions⁵ only, where anthropogenic refers to emissions from human activities and from managed⁶ land.
 - Sources covered are those of anthropogenic emissions, where scientific evidence is available; while for others, guidance could be provided as a basis for future methodological development.
 - Geographical and temporal coverage is national and annual level, and authors should also consider guidance on spatial and temporal disaggregation of SLCF emissions.
5. Key elements:
 - Structure: Information on each sector will be synthesised into a single document (a volume for each of the inventory sectors: Energy, Industrial Process and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU), Waste. There will also be a volume on cross-cutting issues, including reporting tables).
 - Content of cross-cutting guidance: The volume for cross-cutting issues will include: introduction⁷, with guidance on SLCF species and definitions, approaches to data collection⁸; uncertainties; methodological

⁴ The Joint 1st and 2nd IPCC Expert Meeting on SLCFs: https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2110_SLCF.html

The 3rd IPCC Expert Meeting on SLCFs: https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2204_SLCF_EM3.html

⁵ as defined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2006 IPCC Guidelines*), the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (*Wetlands Supplement*) and the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2019 Refinement*).

⁶ land where human interventions and practices have been applied to perform production, ecological or social functions.

⁷ considering the importance for climate effects of spatial distribution and temporal resolution of SLCF emissions, and changes in co-emitted species

⁸ including generic methods of measurements, approaches to derive BC/OC emissions from PM_{2.5} emission estimates and measurements, NMVOC speciation, spatial distribution and temporal resolution, technology, and abatement information.

choice and identification of key categories; time series consistency; quality assurance/quality control (QA/QC) and verification; and reporting guidance and tables.

- Content of sectoral guidance: The volumes for each sector will include tiered methodological approaches; decision trees; methods and emission factors, where appropriate; cross-references as necessary to avoid double counting or omissions of emissions; sector-specific guidance on uncertainty assessment and QA/QC; and reporting and documentation guidance.

Approach

6. The result of the work will be an IPCC Methodology Report “2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers” (2027 Supplement on SLCFs).
7. The authors will ensure consistency with categories and build on the methodological guidance within the *2006 IPCC Guidelines, Wetlands Supplement* and *2019 Refinement*.
8. The authors will follow “Instructions to Experts and Authors” presented in Annex 2 to ensure a consistent and coherent approach across all the volumes and chapters, including the use of common terminology.
9. Importantly, the authors will provide guidance based on the *good practice*⁹ guidance definition and the structured tiered approach described in the *2006 IPCC Guidelines, Wetlands Supplement* and *2019 Refinement*.
10. The production of the Methodology Report will be completed in 2027 as noted in the work plan in Annex 3 following Decision IPCC-LX-9.

⁹ “Good practice” is a key concept for inventory compilers to follow in preparing national greenhouse gas inventories. The key concept does not change in the 2019 Refinement. The term “good practice” has been defined, since 2000 when this concept was introduced, as “a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that uncertainties are reduced so far as practicable”. This definition has gained general acceptance amongst countries as the basis for inventory development and its centrality has been retained for the 2019 Refinement. Certain terms in the definition have been updated based on feedback from the statistics community, such that this definition can be also understood as “a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that they are precise so far as practicable” in the context of refinement of Chapter 3 of Volume 1.

Good Practice covers choice of estimation methods appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties and data archiving and reporting to promote transparency.

Annex 2. Table of Contents (ToC)

2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (2027 Supplement on SLCFs)

Overview

Volume 1. General Guidance

- Introduction
(including, but not limited to: Background on SLCFs and their importance for climate, Key differences between SLCFs and GHGs emissions, Holistic approaches to SLCFs and the importance of co-emitted species, Spatial distribution and temporal resolution and relevance to climate effects, Interlinkages with air pollution and health, Interlinkages with meteorology, Importance of technologies and abatement technologies)
- Approaches to Data Collection
(including, but not limited to: Spatial distribution and temporal resolution, Measurement techniques, NMVOC speciation, Technologies and Abatement technologies)
- Uncertainties
- Methodological Choice and Identification of Key Categories
(including, but not limited to KCA by SLCF species, Issues of co-emitted species in SLCF KCA)
- Timeseries consistency
(including, but not limited to: Addressing changes in measurement techniques, Addressing changes in technologies, including for abatement)
- QA/QC and Verification
(including, but not limited to: Consistency with co-emitted GHGs and SLCFs, Comparison with global/regional inventories, Comparisons with atmospheric observations and models)
- Reporting guidance and Tables

Volume 2. Energy Sector

- Introduction
- Stationary combustion
- Mobile combustion
- Fugitive Emissions
- Other

Volume 3. IPPU Sector

- Introduction
- Mineral Industry
- Chemical Industry
- Metal Industry
- Non-Energy products from fuels and Solvent Use
- Other

Volume 4. AFOLU Sector

- Introduction
- Generic methodologies
- Consistent representation of land
- Emissions from Livestock and Manure Management
- Land use categories

- Managed soil¹⁰
- Other

Volume 5. Waste Sector

- Introduction
- Solid Waste Disposal
- Biological Treatment of Solid Waste
- Incineration and Open Burning of Waste
- Wastewater Treatment and Discharge
- Other

¹⁰ As expanded by the Wetlands Supplement guidance/categorization

Annex 3. Instructions to Experts and Authors

2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (2027 Supplement on SLCFs)

Instructions to Experts and Authors

1. Work on a Methodology Report “2027 SLCF to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (2027 Supplement on SLCFs)” will be guided by the IPCC procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of the IPCC Reports (Appendix A to the Principles Governing the IPCC Work¹¹). This document is consistent with the IPCC procedures and applies to all experts engaged in the production of a new Methodology Report.
2. In this document the term “experts” covers Co-Chairs, members of the TFI Bureau (TFB), technical support unit (TSU) Staff, Coordinating Lead Authors (CLAs), Lead Authors (LAs), and Review Editors (REs) as well as Contributing Authors (CAs) and Expert Reviewers.
3. These notes are intended as guidance to experts contributing to a new Methodology Report. They are intended to ensure a consistent and coherent approach across all the volumes or chapters and to promote common terms used.

Confidentiality

4. Authors meetings are closed meetings. Any discussions are confidential except for any published report of the meeting. This is to ensure that experts participating in the meetings can express themselves and discuss issues freely and openly.
5. The IPCC considers the drafts of a new Methodology Report, prior to acceptance, to be pre-decisional, provided in confidence to reviewers, and not for public distribution, quotation or citation.
6. The TSU will keep drafts of a new Methodology Report sent for the IPCC review, any comments received on them and the responses by authors. All written expert and government review comments will be made available to reviewers on request. These will be made available on the IPCC website as soon as possible after the acceptance by the Panel and the finalisation of the report.

Conflict of Interest

7. It is important that all experts involved in the IPCC activities avoid any conflict of interest or the direct and substantial appearance of a conflict of interest. It is recognised that many experts in Emission Inventories are employed by, or funded by, parties with some interest in the outcome (e.g. most inventory compilers are funded by national governments or industry). It is therefore important to be open and transparent about financial and other interests.
8. The IPCC implements a Conflict of Interest (COI) Policy^{12 13} that applies to all individuals directly involved in the preparation of IPCC reports, including senior IPCC leadership (IPCC Chair and Vice-Chairs), other Bureau and Task Force Bureau members, authors with responsibilities for report content (CLAs, LAs), Review Editors and staff of the TSU. The overall purpose of this policy is to protect the legitimacy, integrity, trust, and credibility of the IPCC and of those directly involved in the preparation of reports, and its activities.
9. Before an individual is appointed as a CLA, LA and RE for a new Methodology Report, the TFB will request the individual to complete a Conflict of Interest Disclosure Form (“the COI Form”) contained in Annex B to the COI Policy which will be submitted to the TSU. The TFB will then evaluate the form to determine whether the individual has a conflict of interest that cannot be resolved.
10. All CLAs, LAs and REs will inform the TSU annually of any changes in the information provided in their previously submitted COI Form. The TFB will evaluate the revised information.
11. All COI Forms and any records of the deliberations of the COI Expert Advisory Group, deliberations and/or decisions of the COI Committee in relation to conflict of interest issues in respect of specific individuals and any information disclosed by individuals for the purposes of the COI Policy will be transferred to the Secretariat after they have been reviewed and will be securely archived by the Secretariat and retained for a period of five years after the end of the assessment cycle during which the relevant individual contributed, after which the information will be destroyed.

¹¹ <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf>

¹² <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-conflict-of-interest-2016.pdf>

Subject to requirement to notify the existence of a conflict of interest to others, the information referred to above will be considered confidential and will not be used for any purpose other than consideration of conflict of interest issues under these Implementation Procedures without the express consent of the individual providing the information.

Responsibilities of authors and other experts

12. The role of authors is to impartially assess ALL the available literature and to describe the best methodologies available. Experts should be impartial. Authors should review all literature available up to a cut-off date to be decided by the TFB as part of the agreed work plan.
13. After drafting the report authors will be asked to consider all comments received on the drafts and to adjust and revise the text accordingly. They should document their responses. If they do not accept a comment this should be explained. Review Editors should check whether the accepted changes were fully incorporated in the revised text.
14. Responsibilities and duties of authors and other experts are currently explained in more detail in the IPCC procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of the IPCC Reports (Appendix A to the Principles Governing the IPCC Work).

Literature

15. The use of literature should be open and transparent. In the drafting process, emphasis is to be placed on the assurance of the quality of all cited literature. Priority should be given to peer-reviewed scientific, technical and socio-economic literature if available.
16. It is recognized that other sources provide crucial information for IPCC Reports. These sources may include reports from governments, industry, and research institutions, international and other organizations, or conference proceedings. Use of this literature brings with it an extra responsibility for the author teams to ensure the quality and validity of cited sources and information as well as providing an electronic copy. In general, newspapers and magazines are not valid sources of scientific information. Blogs, social networking sites, and broadcast media are not acceptable sources of information for IPCC Reports. Personal communications of scientific results are also not acceptable sources.
17. For any sources written in a language other than English, an executive summary or abstract in English is required.
18. All sources will be integrated into a reference section of an IPCC Report.
19. For more details of the procedure on the use and referencing of literature in IPCC Reports, see Annex 2 to the IPCC procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of the IPCC Reports (Appendix A to the Principles Governing the IPCC Work).

Principles of the new Methodology Report

20. Guidance in the **new Methodology Report** should be understandable and easy to implement. Lead authors should make efforts to balance the need to produce a comprehensive self-contained report with reasonable limits to the length and detail of the guidance. In particular:
 - a. The guidance should follow a cookbook approach by providing clear step by step instructions. It should not try to be a textbook. Detailed background information on emission processes, scientific studies, etc. is generally referenced rather than included.
 - b. Lead authors must consider relevant scientific developments and national methods used by countries in their inventories.
 - c. Authors should bear in mind that the target audience is a diverse group of readers who are primarily concerned with the elaboration of national inventories. For this reason, the emphasis should be on ensuring clear communication of practical and understandable guidance.
21. This work aims to cover all IPCC inventory sectors with categories where the science is considered to be robust enough to provide guidance for a Tier 1 methodological approach and have a relative¹⁴ contribution to the global/regional emissions of the species, using the significance and prioritization criteria as shown below.

¹⁴ i.e. not insignificant

Significance and prioritization criteria

- Significance of the category and the species within the sector on a global/regional scale. Categories significant only for a limited number of particular countries, currently or in the foreseeable future, may not meet this criterion.
- Sufficient data availability and maturity of scientific advances to provide a basis for methodological development, including:
 - Ability to develop default emission factors and parameters
 - Feasibility of obtaining the necessary data to implement the methods

22. The general structure, approach and definitions used in the *2006 IPCC Guidelines*, such as tiered approach and decision trees will be followed. Annexes may be used where necessary to contain additional data to support the methodologies, although large numbers of annexes will probably not be necessary. Appendices are not ruled out where scientific knowledge is insufficient for countries to agree full methodologies, but please avoid as far as possible work on areas that have to be relegated to an appendix. Appendices should be sub-titled by “Basis for future methodological development”.

Definitions

23. The following terms will be used throughout the **new Methodology Report**, and it is essential that all Lead Authors have a common understanding of their meaning and relevance:
24. **Tier A** Tier refers to a description of the overall complexity of a methodology and its data requirements. Higher tier methods are generally more complex and data-intensive than lower tier methods. The guidance for each category should contain at least a Tier 1 method, and in many cases there will be a Tier 2 and Tier 3. The general expectation is that Tier 2 and Tier 3 methods will both be consistent with *good practice* guidance for key sources, although in some cases Tier 3 will be preferred.
25. **Tier 1** approaches are simple methods that can be applied by all countries in all circumstances. Default values for the emission factors and any other parameters needed must be supplied (see below for documentation needed).
26. **Tier 2** methods should in principle follow the same methodological approach as Tier 1 but allow for higher resolution country specific emissions factors and activity data. In some categories, this may not be the case. These methods should better replicate the parameters affecting the emissions. Country specific emission factors are needed and possibly more parameters will also be needed.
27. **Tier 3** methods give flexibility either for country specific methods including modelling or direct measurement approaches, or for a higher level of disaggregation, or both. This is a more complex method, often involving a model. This will replicate many features of nation emissions and require specific parameters for each country.
28. **Default information** is data that is appropriate for use where there is no better detailed, country specific information. If appropriate, authors may specify regional default data. Users of the guidelines should be encouraged to try to find better country specific data. Default data are appropriate for Tier 1 methods and the guidelines should contain all the default values needed. Emission factors for higher tiers need not be specified because it is a function of higher tier methods to find data reflecting national circumstances. Default information is included primarily to provide users with a starting point from which they can develop their own national assumptions and data. Indeed, national assumptions and data are always preferred because the default assumptions and data may not always be appropriate for specific national contexts. In general, therefore, default assumptions and data should be used only when national assumptions and data are not available.
29. **Decision Trees**. A decision tree is a graphical tool to assist countries in selecting from the IPCC methods.
30. **Key categories** are inventory categories which individually, or as a group of categories (for which a common method, emission factor and activity data are applied) are prioritised within the national inventory system because their estimates have a significant influence on a country’s total inventory in terms of the absolute level, the trend, or the level of uncertainty in emissions. Key category analysis should be performed species by species. The appropriate threshold to define key categories should be considered by authors.
31. **Sector** refers to the four sectors of the guidelines (Energy; Industrial Process and Product Use (IPPU); Agriculture, Forests and Other Land Use (AFOLU) and Waste) these are divided into categories and subcategories.
- a. Sector 1
 - b. Category 1.A

- c. Sub-category 1st order 1.A.1
 - d. Sub-category 2nd order 1.A.1.a
 - e. Sub-category 3rd order, 1.A.1.a.i
32. **Worksheets.** These will be printed versions of spreadsheet tables, that, when filled in, enable the user to perform the emission estimation. They should contain all the calculations and written text with any formulae. Additional worksheets may be required to compile the results of the worksheets into the reporting tables.
33. **Reporting Tables** are tables that present the calculated emission inventory and sufficient detail of other data used to prepare the inventories for others to understand the emission estimates.
34. Usage:
- a. **“Good Practice”** is defined in the 2019 Refinement as follows: “a key concept for inventory compilers to follow in preparing national greenhouse gas inventories. The key concept does not change in the 2019 Refinement. The term "good practice" has been defined, since 2000 when this concept was introduced, as "a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that uncertainties are reduced so far as practicable". This definition has gained general acceptance amongst countries as the basis for inventory development and its centrality has been retained for the 2019 Refinement. Certain terms in the definition have been updated based on feedback from the statistics community, such that this definition can be also understood as "a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that they are precise so far as practicable" in the context of refinement of Chapter 3 of Volume 1”.
The concept mentioned above should be applied to all species dealt with in this report.
 - b. Good Practice covers choice of estimation methods appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties and data archiving and reporting to promote transparency.
 - c. **“Shall”** should not be used. Either say “Good Practice is...” or say what needs to be done or what should be done. These all indicate what needs to be done to comply with Good Practice.
 - d. **“Be encouraged to”** indicates a step or activity that will lead to higher quality inventory but are not required for ensuring consistency with the IPCC Guidelines.
 - e. **“Recommend”** should not be used. In the GPG2000, the word “recommend” was avoided and “Suggested” was used instead.
 - f. **“Inventory agency”** is the body responsible for actually compiling the inventory, perhaps from contributions from a number of other bodies while **“inventory compiler”** is the person actually compiling the inventory,

Reporting Tables and worksheets

35. Worksheets reflect the application of tier 1 methods only, due to the varied implementation of higher tier methods by countries. Lead authors should stress the importance of documentation and archiving of particular types of information of relevance to each category, although advice may be given of what needs to be reported for transparency at higher Tiers.

Emission factors and methods

36. Authors should provide default emission factors and parameters. In doing this work, they should draw on the widest possible range of available literature, scientific articles and country reports.
37. All data reported in the guidance as IPCC default values shall be justified by authors by providing TSU with all background data used, and the source of those data, as well as all information on the method applied to derive the default values from the background data, as needed to replicate the calculation, in a timely manner as drafts are being developed. Background data should be compiled in the attached form (Appendix 1) to facilitate the upload in the Emission Factor Database (EFDB). Lead authors should be familiar with the draft cross-cutting guidance on data collection in Volume 1 and the guidance on cross-cutting issues in this note on terms, data types, data demands of methods and stratification requirements. Default data should also meet the EFDB evaluation criteria – robustness, documentation, and applicability¹⁵.
38. Authors should develop guidance to provide additional information on rationale, references and background

¹⁵ EFDB evaluation criteria: https://www.ipcc-nggip.iges.or.jp/EFDB/documents/EFDB_criteria.pdf

information on parameters used for estimating of default values where such information is available (similar to Annexes in Chapter 10, Volume 4, of the *2019 Refinement*), with a view to enhancing the transparency and applicability of default values presented in the new Methodology Report.

39. Single IPCC default emission factors might not be ideal for any one country, but they can be recommended provided that regional factors are unavailable, and the defaults are representative of typical conditions as far as can be determined. It may be necessary or appropriate to provide a range of default emission factors along with clear guidance about how countries should select from within the range. Lead authors may also provide multiple default emission factors, disaggregated by region, technology (including abatement technologies), or another relevant classification scheme.
40. It is important to provide more default emission factors that reflect the unique conditions of developing countries. In general, default emission factors for Tier 1 should represent emissions without category-specific mitigation measures, as well as relevant abatement technologies for which data are available.
41. Users of the guidelines should be encouraged to develop and use country specific data. Emission factors for higher tiers need not be specified in the *2027 Supplement on SLCFs*. Default information is included primarily to provide users with a starting point from which they can develop their own national assumptions and data. Indeed, national assumptions and data are always preferred because the default assumptions and data may not always be appropriate for specific national contexts.
42. The basic principle concerning national methods will continue to apply – countries are encouraged to use national data or methods so long as they are consistent with the IPCC Guidelines.
43. Authors shall prefer IPCC methods applied to estimate GHG emissions when those can be straightforwardly applied to estimate SLCF emissions as well as when those can be applied *mutatis mutandis*. The use of consistent methodologies allows inventory-compilers to use the same datasets for both sets of estimates. This is to enhance efficiency in the use of resources available to inventory-compilers and thus to promote accuracy of estimates.
44. Where the method applied for SLCF differs from that applied to estimate GHG emissions from the same source, or the source is not covered in the *2006 IPCC Guidelines*, in addition to methodological guidance, guidance on activity data sources available at international level, and where possible at national level, will be provided.
45. Authors should note the issue of double-counting, for example in the Energy sector the IPCC default method for combustion assumes an Oxidation Factor equal to 1 resulting in all carbon calculated as CO₂, while the addition of SLCF methods will require to estimate also other carbon compounds (CH₄, CO, NMVOC and BC/OC). Authors should provide guidance to inventory compilers on how to address the issue of double-counting.
46. For BC/OC emissions, authors should provide guidance, including on techniques of measurement, to derive emission factors directly and from ratios to anthropogenic primary PM_{2.5}, where practicable. When ratios are used authors should include information on primary anthropogenic PM_{2.5} EF from which the ratios have been derived to enhance transparency. If direct EFs are applied authors may consider exploring the use anthropogenic primary PM_{2.5} EF for verification and usability purposes as well as to inform associated uncertainty.
47. In considering the methodologies for SLCF emissions in the AFOLU sector, authors should not include natural background emissions from land as these are not considered to be anthropogenic.

Boxes

48. *Consistent with the 2006 IPCC Guidelines, the new Methodology Report may contain Boxes, which should not be used to provide methodological guidance, but for information purposes or providing examples.*

Decision trees

49. Consistent with the format and structure of the *2006 IPCC Guidelines*, the new Methodology Report may contain a decision tree for some sub-categories to assist countries in selecting from the IPCC methods. These decision trees link the choice of IPCC methods to national circumstances via specific questions about data availability and status as a key category¹⁶.
50. To ensure consistency in decision tree logic and format across categories, lead authors should adhere to the following requirements:
 - a. The decision trees should be based on a series of questions with clear yes/no answers, and two subsequent branches along yes/no paths.

¹⁶ The most appropriate choice of estimation method (or tier) may also depend on national circumstances, including the availability of resources and advice on this will be given in the cross-cutting volume.

- b. The decision trees should start with assessing data availability for the highest tier method, and then direct countries step-wise towards lower tier methods if activity data, emission factors or other parameters are not available.
- c. The decision tree should indicate the lowest tier method that is judged to be appropriate for estimating emissions from a key category.
- d. If data are not available for the method referred to in c, the 'No' response should direct the reader to the question "Is this a key category?" If the answer to this is 'Yes', the decision tree should recommend that the country collect the necessary data to implement a higher tier method. If the answer is 'No', then the decision tree can recommend a lower tier method. There is no need to deal with the case for a key source where a country does not have the resources to gather additional data needed to implement higher Tier methods. This is dealt with in Volume 1 of the *2006 IPCC Guidelines*.
- e. The branches of the decision trees should end in 'out-boxes' that correspond to specific tiers identified in the guidance for that category and are labelled by Tier. Lead authors may also recommend out-boxes for hybrid tiers.
- f. Lead authors may develop separate decision trees for different sub-categories. Alternatively, they may include decision tree options for selecting different tiers for different sub-categories. This second option is appropriate if it is advantageous to recommend a higher tier method only for significant sub-categories rather than for the entire category. **Decision trees that use the 'significance' criterion must include the "25-30% rule"¹⁷, as reassessed by authors.**

51. Additional Formatting Guidelines (see example):

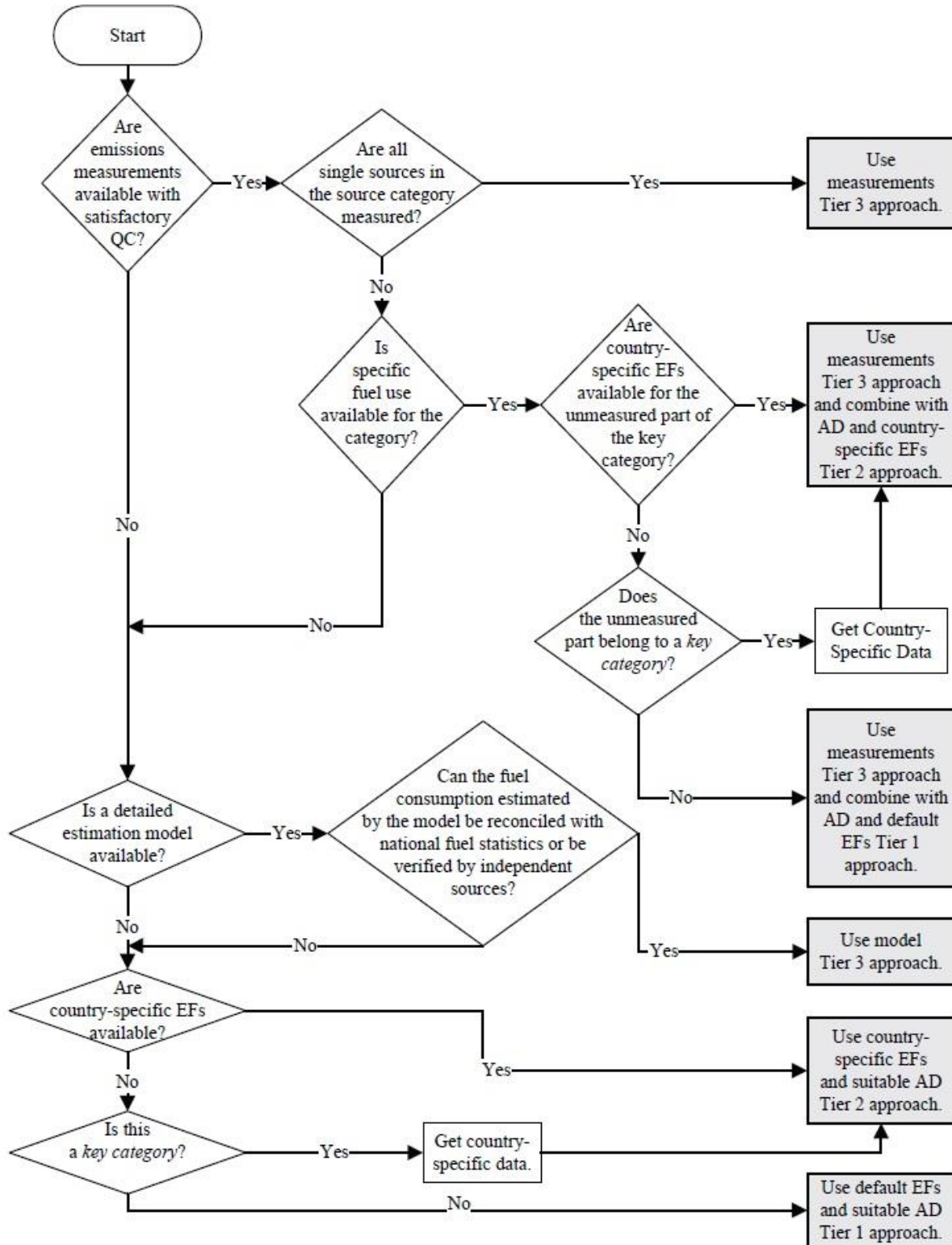
- a. Decision trees should be drafted in separate files. The TSU will integrate these files into the main text at a later date.
- b. Decision trees should NOT ask the question: "Does this source occur in the country?" This is because decision trees will only be used for sources which occur.
- c. There should be a "START" box.
- d. "Diamonds" should be used for questions/decisions.
- e. "Squares" should be used for all other information.
- f. The out-boxes should be individually numbered.
- g. The text font should be Times New Roman 10pt.
- h. Text should be centered within the boxes.

¹⁷ As defined in the 2019 Refinement (i.e., a significant sub-category is one that makes up more than 25-30% of emissions from a category).

Example. Decision tree for estimating emissions from fuel combustion

(Figure 1.2 Chapter 1 Volume 2 of the 2006 IPCC Guidelines)

Figure 1.2 Generalised decision tree for estimating emissions from fuel combustion



Note: See Volume 1 Chapter 4, "Methodological Choice and Key Categories" (noting section 4.1.2 on limited resources) for discussion of *key categories* and use of decision trees.

Units

52. SI units shall be used throughout: in text, equations, worksheets and tables. Emissions have to be expressed in mass units and units have to be used consistently within each sector. When similar activity data is used for different sectors same units need to be used (CLAs have to take care about such harmonisation). Conversion factors have to be provided (for example to estimate N₂O from N). Where input data available may not be in SI units conversions should be provided.
53. Standard abbreviations for units and chemical compounds are given in Appendix 2.

Appendix 1. EFs and parameters Documentation

This form should be used to document all EFs and parameters used in the new Methodology Report. This gives the minimum information that should be considered by the authors.

Author ¹					
IPCC Category					
Name of EFs / parameters					
Activity, e.g. Fuel ² in the Energy Sector					
Species ³ :	CO	NO _x
Value:					
Unit:					
Uncertainty (as +/-% or 2.5 and 97.5 percentiles) ⁴					
Applicability⁵ – fill in as necessary if data not generally applicable. Describe appropriate Technologies, Practices, Abatement Technologies, Region, and/or Regional Conditions					
Source of data (chose one)	Measurement - Scientific Literature Other Measurement National Inventory Report Calculated Based on fuel quality Expert Judgement ⁶				
Method of derivation of the value (e.g., arithmetic mean, weighted mean, adjustment of a literature data by expert judgment etc.					
Reference ⁷					
URL					
Abstract in English (if the abstract is in another language)					

Note:

1. The author is the LA/CA/CLA who writes the relevant section and proposes the data.
2. Fuels as defined in the Energy volume of the 2027 Supplement on SLCFs
3. Add additional species as required
4. As defined by cross-cutting volume
5. Only to be completed where it is necessary to specify the applicability of the data
6. Attach the elicitation protocol
7. As reference to document, report, calculation or if expert judgement to those involved (Names or group e.g. "Waste BOG on Solid Waste Disposal Sites") with DOI, where possible

Appendix 2. Units and Abbreviations

Abbreviations of, and how to spell, chemical species

BC	Black Carbon
CCl ₄	Carbon tetrachloride
CF ₄	Tetrafluoromethane
C ₂ F ₆	Hexafluoroethane
CFCs	Chlorofluorocarbons
CH ₄	Methane
CO	Carbon monoxide
CO ₂	Carbon dioxide
EC	Elemental Carbon
H ₂	Hydrogen
HFCs	Hydrofluorocarbons
NH ₃	Ammonia
NMVOCs	Non-methane volatile organic compounds
NO _x	Nitrogen oxides
N ₂ O	Nitrous oxide ¹⁸
OC	Organic Carbon
PFCs	Perfluorocarbons
PM _x	Particulate Matter (x – micrometers)
S	Sulphur
SF ₆	Sulphur hexafluoride
SO ₂	Sulphur Dioxide

¹⁸ In the IUPAC N₂O is officially named “Dinitrogen Oxide”. However, “nitrous oxide” is widely used and understood in the emission inventory community and by the UNFCCC and so, to avoid confusion, will be used.

Units and abbreviations

cubic metre	m ³
hectare	ha
gram	g
gigagram	Gg
tonne	t
gigatonne	Gt
joule	J
degree Celsius	°C
calorie	cal
year	Yr
capita	Cap
gallon	gal
dry matter	Dm
atmosphere	atm

Prefixes and multiplication factors

Multiplication Factor	Abbreviation	Prefix	Symbol
1 000 000 000 000 000	10 ¹⁵	peta	P
1 000 000 000 000	10 ¹²	tera	T
1 000 000 000	10 ⁹	giga	G
1 000 000	10 ⁶	mega	M
1 000	10 ³	kilo	k
100	10 ²	hecto	h
10	10 ¹	deca	da
0.1	10 ⁻¹	deci	d
0.01	10 ⁻²	centi	c
0.001	10 ⁻³	milli	m
0.000 001	10 ⁻⁶	micro	μ

Standard equivalents

1 tonne of oil equivalent (toe)	1 x 10 ¹⁰ calories
10 ³ toe	41.868 TJ
1 short ton	0.9072 tonne
1 tonne	1.1023 short tons
1 tonne	1 megagram
1 kilotonne	1 gigagram
1 megatonne	1 teragram
1 gigatonne	1 petagram
1 kilogram	2.2046 lbs
1 hectare	10 ⁴ m ²
1 calorie _{IT}	4.1868 joule
1 atmosphere	101.325 kPa

Annex 4. Workplan

2027 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Short-lived Climate Forcers (2027 Supplement on SLCFs)

Date	Action	Comments
February 2024	Scoping Meeting	Prepare ToR, ToC, Workplan and Guidance to authors
February 2024	TFB36 Meeting	Adoption of Outcomes of the Scoping Meeting and Submission to IPCC
3 rd quarter 2024	IPCC-61	IPCC Plenary approves ToR, ToC, Workplan and Guidance to authors
3 rd quarter 2024	Call for Nomination of Authors and Review Editors	IPCC invites nominations from governments and international organizations
3 rd quarter 2024	Establishment of the Steering Committee	TFB select members to join TFI Co-Chairs in the Steering Group (<i>to ensure consistency across all the volumes and continuity with the earlier IPCC inventory reports</i>)
4 th quarter 2024	Selection of Coordinating Lead Authors, Lead Authors and Review Editors	Selection by TFB considering expertise and geographical and gender balance
1 st half 2025	1 st Lead Author Meetings	LAM1 to develop zero order draft (ZOD)
2 nd half 2025	2 nd Lead Author Meeting	To develop first order draft (FOD) for review
1 st quarter 2026 (8 weeks)	Expert Review	8 weeks review by experts
1 st half 2026	Science Meeting	A small meeting of CLAs and some LAs to discuss specific issues that require intensive discussion to reinforce the writing process
1 st half 2026	3 rd Lead Author Meeting	To consider comments and produce second order draft (SOD) for review
2 nd half 2026	Literature cut-off date (one week before SOD Review)	Peer-reviewed papers accepted by the cut-off date (even if not yet published) will be considered. Non-peer-reviewed documents which are made publicly available by the cut-off date.
2 nd half 2026 (8 weeks)	Government & Expert Review	8 weeks review by governments and experts
1 st half 2027	4 th Lead Author Meeting	To consider comments and produce final draft (FD)
1 st half 2027	Government Review	Distribute to governments for their consideration prior to approval (at least 4 weeks prior to the Panel)
2 nd half 2027	Adoption/acceptance by IPCC	Final draft submitted to IPCC Panel for adoption/acceptance
2 nd half 2027	Publication	Electronic means

Annex 5. Table of SLCF categories and species

Energy Sector

IPCC category	Category	SLCFs								Comments
		NOx	NH ₃	SO ₂	CO	NMVOC	BC	OC	H ₂	
1	ENERGY									Consider H2 emissions where it is used as a fuel Authors to provide guidance on classification of H2 use in fuel cells
1.A	Fuel combustion activities									
1.A.1	Energy Industries									
1.A.1.a.	Main activity electricity and heat production	X	X	X	X	X	X	X	X	
1.A.1.b.	Petroleum refining	X	X	X	X	X	X	X	X	
1.A.1.c.	Manufacture of solid fuels and other energy industries									
1.A.1.c.i.	Manufacture of solid fuels	X	X	X	X	X	X	X	X	
1.A.1.c.ii.	Other energy industries	X	X	X	X	X	X	X	X	
1.A.2	Manufacturing industries and construction									
1.A.2.a.	Iron and steel	X	X	X	X	X	X	X	X	
1.A.2.b.	Non-ferrous metals	X	X	X	X	X	X	X	X	
1.A.2.c.	Chemicals	X	X	X	X	X	X	X	X	
1.A.2.d.	Pulp, paper and print	X	X	X	X	X	X	X	X	
1.A.2.e.	Food processing, beverages and tobacco	X	X	X	X	X	X	X	X	
1.A.2.f.	Non-metallic minerals	X	X	X	X	X	X	X	X	
1.A.2.g.	Transport equipment	X	X	X	X	X	X	X	X	
1.A.2.h.	Machinery	X	X	X	X	X	X	X	X	
1.A.2.i.	Mining (excluding fuels) and quarrying	X	X	X	X	X	X	X	X	
1.A.2.j.	Wood and wood products	X	X	X	X	X	X	X	X	
1.A.2.k.	Construction	X	X	X	X	X	X	X	X	
1.A.2.l.	Textile and leather	X	X	X	X	X	X	X	X	
1.A.2.m.	Non-specified industry	X	X	X	X	X	X	X	X	

continuation of the table for Energy Sector

1.A.3.	Transport	Consider including non-exhaust emissions in these subcategories, where applicable (for example, brake and tyre wear) Need to ensure there isn't overlap with evaporative fugitive emissions in other sectors								
1.A.3.a.	Civil aviation									Note that water vapour emissions have a significant climate forcing (contrail effects) but are not in scope. Consider mentioning in the report, but not preparing a method.
1.A.3.a.i.	international aviation (international bunkers)	X		X	X	X	X	X	X	
1.A.3.a.ii.	Domestic aviation	X		X	X	X	X	X	X	
1.A.3.b.	Road transportation									
1.A.3.b.i.	Cars	X	X	X	X	X	X	X	X	
1.A.3.b.ii.	Light duty trucks	X	X	X	X	X	X	X	X	
1.A.3.b.iii.	Heavy duty trucks and buses	X	X	X	X	X	X	X	X	
1.A.3.b.iv.	Motorcycles	X	X	X	X	X	X	X	X	
1.A.3.b.v.	Evaporative emissions from vehicles					X				
1.A.3.b.vi.	Urea-based catalysts	X	X	X	X	X	X	X	X	
	Non-exhaust emissions						X	X		
	Use of lubricants	X	X	X	X	X	X	X	X	
1.A.3.c.	Railways	X	X	X	X	X	X	X	X	
1.A.3.d.	Waterborne navigation									
1.A.3.d.i.	international waterborne navigation (international bunkers)	X	X	X	X	X	X	X	X	
1.A.3.d.ii.	Domestic waterborne navigation	X	X	X	X	X	X	X	X	
1.A.3.e.	Other transportation									
1.A.3.e.i.	Pipeline transport	X	X	X	X	X	X	X	X	
1.A.3.e.ii.	Off-road	X	X	X	X	X	X	X	X	

continuation of the table for Energy Sector

1.A.4.	Other Sectors									Consider including non-exhaust emissions in these subcategories, where applicable (for example, brake and tyre wear)
1.A.4.a.	Commercial/institutional									Consider non-combustion SLCF emissions, such as from food preparation, as discussed in the table for the report of Expert Meetings 1 & 2
1.A.4.a.i.	Stationary combustion	X	X	X	X	X	X	X	X	
1.A.4.a.ii.	Off-road vehicles and other machinery	X	X	X	X	X	X	X	X	
1.A.4.b.	Residential									Consider non-combustion SLCF emissions, such as from food preparation, as discussed in the table for the report of Expert Meetings 1 & 2
1.A.4.b.i.	Stationary combustion	X	X	X	X	X	X	X	X	
1.A.4.b.ii.	Off-road vehicles and other machinery	X	X	X	X	X	X	X	X	
1.A.4.c.	Agriculture/forestry/fishing									
1.A.4.c.i.	Stationary	X	X	X	X	X	X	X	X	
1.A.4.c.ii.	Off-road vehicles and other machinery	X	X	X	X	X	X	X	X	
1.A.4.c.iii.	Fishing (mobile combustion)	X	X	X	X	X	X	X	X	
1.A.5	Other (Not specified elsewhere)									
1.A.5.b.ii.	Mobile (waterborne component)	X	X	X	X	X	X	X	X	
1.A.5.b.iii.	Mobile (other)	X	X	X	X	X	X	X	X	

continuation of the table for Energy Sector

1.B	Fugitive emissions from fuels								
1.B.1	Solid fuel								
1.B.1.a.	Coal mining and handling								
1.B.1.a.i	Underground mines								
1.B.1.a.i.1	Mining	X	X	X	X	X	X	X	
1.B.1.a.i.2	Post-mining seam gas emissions	X	X	X		X	X	X	
1.B.1.a.i.4	Flaring of drained CH4 or conversion of CH4 to CO2	X	X	X		X	X	X	
1.B.1.a.ii	Surface mines								
1.B.1.a.ii.1	Mining	X	X	X	X	X	X	X	
1.B.1.a.ii.2	Post-mining seam gas emissions	X	X	X		X	X	X	
1.B.1.c.	Fuel transformation								
1.B.1.c.i.	Charcoal and biochar production	X	X		X	X	X	X	
1.B.1.c.ii.	Coke production	X	X	X	X	X	X	X	Change this category to "Coke production and handling"
1.B.1.c.iv	Gasification transformation							X	included to consider syngas
1.B.2	Oil and natural gas								Note that emissions from flaring are included in these categories, as described in the 2019 Refinement.
1.B.2.a	Oil								
1.B.2.a.i.	Exploration	X		X	X	X	X	X	
1.B.2.a.ii.	Production and upgrading	X		X	X	X	X	X	
1.B.2.a.iii.	Transport		X?			X			
1.B.2.a.iv.	Refining	X	X	X	X	X	X	X	
1.B.2.a.v.	Distribution of oil products					X			
1.B.2.a.vi	Other					X			
1.B.2.b	Natural gas								
1.B.2.b.i.	Gas exploration	X		X	X	X	X	X	
1.B.2.b.ii.	Production and gathering	X		X	X	X	X	X	
1.B.2.b.iii.	Processing	X	X	X	X	X	X	X	
1.B.2.b.iv.	Transmission and storage					X			
1.B.2.b.v.	Gas distribution					X			
1.B.2.b.vi.	Gas post-meter					X			

continuation of the table for Energy Sector

1.B.3	Other emissions from energy production								Note that some emissions have been included considering future possibilities reflecting the new fuels NH3 and H2, not on the basis of current activities.
1.B.3.a.	Other								
	Geothermal energy extraction		X	X					
1.B.3.b	Hydrogen								
1.B.3.b.i	Extraction								X
1.B.3.b.ii	Transmission and storage								X
1.B.3.b.v	Distribution								X
1.B.3.b.vi	Post-meter								X
1.B.3.c	Ammonia								
1.B.3.c.i	Transmission and storage	?	X						X
1.B.3.b.v	Distribution		X						
1.B.3.b.vi	Post-meter		X						
1.B.3.d	Blended gases								Does not include blends of natural gas and biogas (already treated in the 2019 Refinement)
1.B.3.d.i	Transmission and storage	?	?			X			X
1.B.3.d.v	Distribution		?			X			X
1.B.3.d.vi	Post-meter		?			X			X

IPPU Sector*

IPCC category	Category	SLCFs								Comments
		NOx	NH ₃	SO ₂	CO	NMVOC	BC	OC	H ₂	
2	IPPU									Authors to consider H ₂ emission from possible future processes, as applicable.
2.A	Mineral Industry									
2.A.1	Cement Production	X		X		X	X	X		
2.A.3	Glass production					X				
2.A.4	Other Process Uses of Carbonates			X		X				
2.B	Chemical Production									
2.B.1	Ammonia production	X	X	X	X	X				
2.B.2	Nitric Acid production	X	X							
2.B.3	Adipic Acid production	X			X	X				
2.B.6	Titanium Dioxide Production	X		X	X					
2.B.7	Soda ash production		X		X					
2.B.8	Petrochemical Industry									
2.B.8.b	Ethylene					X				
	- Propylene					X				
2.B.8.c	Ethylene Dichloride and Vinyl Chloride Monomer					X				
2.B.8.d	Ethylene Oxide					X				
2.B.8.e	Acrylonitrile					X				
2.B.8.f	Carbon Black	?		X	X	X	X	X		
2.B.10	Other									
	- Hydrogen production (dependent on production process)				X				X	
	- Sulfuric acid			X						
	- Ammonium nitrate	X?	X	?						
	- Ammonium phosphate		X							
	- Ammonium sulphate		X	X						
	- Urea		X			?	X			
	- Polyethylene					X				
	- Polyvinylchloride					X				
	- Styrene					X				
	- Polystyrene					X				
	- Styrene butadiene, Styrene-butadiene latex, Styrene-butadiene rubber (SBR)					X				
	- Acrylonitrile Butadiene Styrene (ABS) resins					X				
	- Formaldehyde					X				
	- Ethylbenzene					X				

continuation of the table for IPPU Sector

	- Phthalic anhydride			?	?	X				
	- Benzene					X				
	- Methylbenzene / Toluene					X				
	- Xylene					X				
	- Glycol					X				
	- Terephthalic acid				X	X				
	- Polyethylene terephthalate					X				
	- Maleic anhydride				X	X				
	- Pharmaceuticals, pesticides, herbicides					X			?	Authors to consider the significance of this source and availability of data.
2.C	Metal Industry									
2.C.1	Iron and Steel Production	X		X	X	X	X	X		
2.C.2	Ferroalloys production						X			
2.C.3	Aluminium Production	X		X	X	X	X	X		
2.C.5	Lead Production	?		?	?		?	?		
2.C.6	Zinc production			X			?	?		
2.C.7	Other									
	- Copper			X		?	X	X		
	- Nickel			X						
	- Other metals			X			?	?		Including rare earth metals as in the 2019 Refinement.
	- Metal welding and cutting	?		?	?					
2.D	Non-Energy Products from Fuels and Solvent Use									
2.D.3	Solvent Use									
	- Domestic solvents use					X				
	- Coating application					X				
	- Degreasing					X				
	- Dry cleaning					X				
	- Chemical products					X				
	- Printing					X				
	- Other solvent and product use					X				
2.D.4	Other									
	- Road paving with asphalt	X			X	X	X			
	- Asphalt roofing	X			X	X	X			
	- Solvent transport and storage					X				

continuation of the table for IPPU Sector

2.E	Electronic industry	X	X			X				Note that the report of Expert Meetings 1 & 2 concluded that SLCF emissions in this category are not significant. The expert view at this meeting disagrees.
	(subcategories)									subcategories as in the 2019 Refinement, as applicable.
2.F	Product Uses as Substitutes for Ozone Depleting Substances		X			X				
2.G	Other Product Manufacture and Use									The report of Expert Meetings 1 & 2 concluded that SLCF emissions in this category are not significant. The expert view at this meeting was that these could be reconsidered, noting that the EMEP/EEA guidance includes some emission factors.
2.H	Other									
2.H.1	Pulp and Paper Industry	X	X	X	X	X	X	X		
2.H.2	Food and Beverages Industry		X	X	X	X	X	X		
2.H.3	Wood industry	X		X	X	X				

* Please note that according to the 2006 IPCC Guidelines emissions from fuel combustion are reported in Energy Sector, not in IPPU. There are different methodological approaches regarding allocation of emissions in various methodological frameworks, e.g. EMEP/EEA reports BC/OC from Cement and other industries in IPPU and other pollutants (CO, NOx, NMVOCs, SO2) in Energy sector, although SO2 may be present in raw materials.

AFOLU Sector

IPCC category	Category	SLCFs								Comments
		NOx	NH ₃	SO ₂	CO	NMVOC	BC	OC	H ₂	
3	AFOLU									
3.A.2	Manure Management									
3.A.2.a.i.	Dairy Cows	X	X			X				
3.A.2.a.ii.	Other Cattle	X	X			X				
3.A.2.b	Buffalo	X	X			X				
3.A.2.c	Sheep	X	X			X				
3.A.2.d	Goats	X	X			X				
3.A.2.e	Camels	X	X			X				
3.A.2.f	Horses	X	X			X				
3.A.2.g	Mules and Asses	X	X			X				
3.A.2.h	Swine	X	X			X				
3.A.2.i	Poultry	X	X			X				
3.A.2.j	Other	X	X			X				
3.C.1	Burning									In the draft ToC these are included under 'Land Use Categories'
3.C.1.a	Burning in Forest Land	X	X	X	X	X	X	X		
3.C.1.b	Burning in Cropland	X	X	X	X	X	X	X		Note this source is included here for consistency with the 2006 Guidelines. Under UNFCCC reporting it would be under Agriculture / Burning of agricultural residues.
3.C.1.c	Burning in Grassland	X	X	X	X	X	X	X		
3.C.1.d	Burning in all other lands	X	X	X	X	X	X	X		
3.C.4	Direct N₂O emissions from managed soils	X	X							Following the report of Expert Meetings 1 & 2, the existing IPCC category name cannot be changed, but new categories for NO _x and NH ₃ emissions could be added. The report should develop methods for the SLCF species, not for N ₂ O.
3.C.5	Indirect N₂O emissions from managed soils	X								Following the report of Expert Meetings 1 & 2, the existing IPCC category name cannot be changed, but new categories for NO _x and NH ₃ emissions could be added. The report should develop methods for the SLCF species, not for N ₂ O.

continuation of the table for AFOLU Sector

3.D.2	Other									Authors to consider whether these subcategories could be moved to relevant subsectors or retained as a group in the subcategory 3.D.2 Other.
3.D.2.x	Other: "Livestock manure applied to soils"					X				move to subcategory of Managed soils
3.D.2.x	Other: "Urine and dung deposited by grazing livestock"					X				move to subcategory of Managed soils
3.D.2.x	Other: "Manure incineration"	X	X	X	X	X	X	X		move to subcategory of Manure management
3.D.2.x	Other: "Anaerobic digestion of animal manure"	X	X							move to subcategory of Manure management
3.D.2.x	Other: "Pesticide application"					X				move to subcategory of Managed soils
3.D.2.x	Other: "Cultivated crops"					X				move to subcategory of Land use categories.
3.D.2.x	Other: "Managed deciduous/coniferous forests"					X				move to subcategory of Land use categories
3.D.2.x	Other: "Grassland; Tundra; Other Low Vegetation; Other Vegetation (Mediterranean shrub)"					X				move to subcategory of Land use categories
3.D.2.x	Other: "Fugitive dust from tilling"	X					X	X		move to Managed soils (change 'dust' to 'emissions'?)
3.D.2.x	Other: "Fugitive dust from animals"	X	X					X		change 'dust' to 'emissions'? Change 'animals' to 'livestock'

Waste Sector

IPCC category	Category	SLCFs								Comments
		NOx	NH ₃	SO ₂	CO	NM VOC	BC	OC	H ₂	
4	Waste									Authors to consider H ₂ emission from possible future processes, as applicable.
4.A	Solid Waste Disposal									
4.A.1	Managed Waste Disposal Sites									
	- Landfill fires	X		X	X	X	X	X		
	- Flaring	X		X	X	X	X	X		
	- Other (decomposition)		X		X	X				
4.A.2	Unmanaged Waste Disposal Sites									
	- Landfill fires	X		X	X	X	X	X		
	- Flaring	X		X	X	X	X	X		
	- Other (decomposition)		X		X	X				
4.A.3	Uncategorised Waste Disposal Sites									
	- Landfill fires	X		X	X	X	X	X		
	- Flaring	X		X	X	X	X	X		
	- Other (decomposition)		X		X	X				
4.B	Biological Treatment of Solid Waste									
4.B.1	Composting		X		X	X				
4.B.2	Anaerobic Digestion	X	X							
4.C	Incineration and Open Burning of Waste									
4.C.1	Waste Incineration	X	X	X	X	X	X	X		
4.C.2	Open Burning of Waste	X	X	X	X	X	X	X		
4.D	Wastewater Treatment and Discharge									
4.D.1	Domestic Wastewater Treatment and Discharge		X			X				
4.D.2	Industrial Wastewater Treatment and Discharge		X			X				
4.E	Other									
	Other waste	(X)	X	(X)	(X)	(X)	(X)	(X)		The expert view at this meeting was that emission of other species could occur, noting that the EMEP/EEA guidance includes some emission factors.

Annex 6. Agenda of the Scoping Meeting

IPCC Scoping Meeting Methodology Report on Short-lived Climate Forcers (SLCFs): 2027 Supplement to the 2006 IPCC Guidelines

**Brisbane, Australia
26-28 February 2024**

Agenda (as adopted)

Day 1	9:00 - 9:30	Registration
	9:30 - 10:00	Welcome Address: <ul style="list-style-type: none"> - Co-Chairs of IPCC TFI (Takeshi Enoki and Mazhar Hayat) - Australian Government (Melanie Ford)
	10:00 - 13:00	<p>Plenary session 1 (Presentations and discussion)</p> <ol style="list-style-type: none"> 1. Introduction to IPCC TFI 2. Background and objectives of the meeting 3. Technical Preparatory Work: <ul style="list-style-type: none"> - Technical analysis work by TFI TSU - Joint 1st and 2nd SLCF Meetings - 3rd SLCF Meeting 4. Expected outcome of the Scoping Meeting: <ul style="list-style-type: none"> - Recommendation on the title and format of the Methodology Report - Draft Terms of Reference (TOR) - Draft Table of Contents (TOC) - Draft Work Plan - Draft Instructions to Experts and Authors 5. Title and Format of the Methodology Report <i>(Outcomes of the meeting will be included in the meeting report and will be considered by the TFB to make a proposal to IPCC-61)</i> <p>Q&A</p>
	13:00 - 14:30	<i>Lunch break</i>

Day 1	14:30 – 18:00	<p>Break-out group (BOG) session</p> <p>BOG1: General and Cross-sectoral issues (Species and definitions, methods of measurements, spatial and temporal distribution, cross-cutting inventory issues, including Key Category Analysis, Uncertainty assessment, QA/QC) Facilitator: Thelma Krug and Ole-Kenneth Nielsen Rapporteur: Vigdis Vestreng</p> <p>BOG2: Sectoral TOC for Energy, IPPU, AFOLU and Waste sectors (categorization, sectoral and cross-sectoral issues) Facilitator: Songli Zhu and Vincent Camobreco Rapporteur: Dan Zwartz</p> <p>BOG3: TOR, Work Plan, Instructions to Experts and Authors Facilitator: Jongikhaya Wittl and Dario Gomez Rapporteur: Patricia Krecl</p>
	18.00-20.00	<i>Reception</i>

Day 2	09:30 - 13:00	<p>BOG session (continuation)</p> <ul style="list-style-type: none"> • BOG1 • BOG2 • BOG3
	13:00 - 14:30	<i>Lunch break</i>
	14:30 - 18:00	<p>Plenary Session 2</p> <p>Report from BOGs with discussion on any issues presented by the BOGs or identified by the Plenary; including on cross-BOG issues, if any.</p>
Day 3	09:30 - 13:00	<p>BOG session (finalization of docs)</p> <ul style="list-style-type: none"> • BOG1 – Finalization of TOC for General Volume • BOG2 – Finalization of TOC for Sectoral Volumes (Energy, IPPU, AFOLU, Waste) • BOG3 – Finalization of TOR, Work Plan, Instructions to experts and authors
	13:00 - 14:30	<i>Lunch break</i>
	14:30 – 18:00	<p>Plenary session 3 (Discussion based on reports from BOGs & wrap-up)</p> <ul style="list-style-type: none"> • Presentation of TOC • Presentation of TOR, Instructions to authors, and work plan • Discussion and finalization of the documents to be recommended to the Task Force Bureau • Closing remarks

Coffee break: 11:00 – 11:30 and 15:30 – 16:00 every day

Annex 7. List of Participants

IPCC Scoping Meeting Methodology Report on Short-lived Climate Forcers (SLCFs): 2027 Supplement to the 2006 IPCC Guidelines

**Brisbane, Australia
26-28 February 2024**

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