ipcc
INTERGOVERNMENTAL PANEL ON climate change
Task Force on National Greenhouse Gas Inventories (TFI)

# IPCC Expert Meeting for Technical Assessment of IPCC Inventory Guidelines (Energy, IPPU, Waste Sectors)

Geneva, Switzerland, 29 June – 1 July 2015

## Co-Chairs Summary

1. In accordance with the IPCC Trust Fund programme and budget for the year 2015 (approved by the IPCC at its 40th Session), the IPCC Task Force on National Greenhouse Gas Inventories (TFI) is implementing technical assessment of IPCC Inventory Guidelines. This work is to assess where science and data availability have developed sufficiently since the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (*2006 IPCC Guidelines*) to support the refinement or development of methodological advice for specific categories and gases, with a view to identifying any specific areas or issues to be prioritized. Another aim is to conduct technical assessments on cross-sectoral issues, including improvement of user-friendliness of other inventory tools of the IPCC with a view to contributing to capacity development programmes.
2. This technical assessment is being undertaken through a combination of an on-line questionnaire survey and two expert meetings. The on-line questionnaire survey was conducted from 30 January to 27 February, and 243 experts submitted a total of 987 comments to the Technical Support Unit for the IPCC TFI (TFI TSU). About half of these (446) were the Energy, IPPU and Waste Disposal Sectors.
3. The Geneva expert meeting was the first of the two expert meetings following the on-line questionnaire survey. The Geneva meeting covered Energy, Industrial Processes and Product Use (IPPU), and Waste Sectors. In particular it aimed to:
    - assess the maturity of scientific advances and the availability of new data (but not an exact scientific examination of new methodology or data);
    - identify any specific areas or issues that should be prioritized in TFI's future work; and
    - consider associated cross-sectoral issues identified in the survey.
4. The meeting considered comments submitted by experts in response to the on-line questionnaire survey, particularly on the issues identified as high priorities through the prior analysis made by the TFI TSU. This was with a view to making recommendations to the Bureau of TFI (TFB) on the following:
    - Categories for which the science is sufficiently mature and data are available to recommend refinement or development of inventory guidance;
    - Where such refinement or development on the basis of this new information would lead to a noticeable improvement of the *2006 IPCC Guidelines* and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* (*Wetlands Supplement*)[1];
    - Specific type of refinement or updating that is needed for those categories; and
    - How these refinements could be made (i.e., suggested possible way(s) to address issues).
5. The issues were considered and discussed through three break-out groups (BOGs), taking significance & prioritization criteria (see Box 1) into account. The BOGs were:
    - BOG1: Energy Sector
      (Co-facilitators: Mr. Dario Gomez and Mr. John David Watterson, Rapporteur: Mr. Amit Garg)

1 The *Wetlands Supplement* is relevant mainly to the second meeting, on AFOLU.

- BOG2: Industrial Processes and Product Use (IPPU) Sector
  (Co-facilitators: Mr. Newton Paciornik and Mr. Julien Vincent, Rapporteur: Ms. Deborah Ann Ottinger)

- BOG3: Waste Sector
  (Co-facilitators: Ms. Riitta Pipatti and Ms. Sirintornthep Towprayoon, Rapporteur: Ms. Deborah Bartram)

Box 1: Significance and prioritization criteria (previously agreed in the Terms of Reference for this work)

- Significance of the source/sink and the gas within the sector on a global scale. Sources significant only for a limited number of particular countries currently or in the foreseeable future may not meet this criterion. The adequacy of the existing guidance for a particular category should be considered, as should the likelihood that new information would lead to a definite improvement in the IPCC Guidelines.
- Availability of relevant new scientific results.
- Sufficient data availability and maturity of scientific advances since 2006 to provide a basis for methodological development or refinement, including:
  - Ability to develop new or updated default emission/removal factors
  - Feasibility of obtaining the necessary data to implement the methods
- Emergence of new sources or gases meeting these criteria

7. Based on the discussion by each BOG, the meeting participants agreed to forward the recommendations based on the elements mentioned in paragraph 4 above to the TFB as summarized in Tables 1-3 below.

8. The following issues were identified as potential elements/areas for refinements to be made by producing a Methodology Report(s).

<Energy Sector>

- Development of guidance for estimating GHG emissions from charcoal production (Category 1.A.1.c, N2O, CH4)
- Development of guidance for estimating GHG fugitive emissions from abandoned or decommissioned oil and gas wells (Category 1.B)
- Development of guidance for estimating GHG fugitive emissions from abandoned or decommissioned surface mines (Category 1.B)
- Development of guidance for estimating GHG emissions from unconventional oil and gas production such as shale gas, shale oil, tight gas ,tight oil and CBM (Category 1.B.2)
- Update or addition of default emission factors of fugitive emissions from oil and gas by reflecting current practices and the latest measurement data (Category 1.B.2)
- Provision of clearer guidance on fuel transformation considering linkages with the methodology on fugitive emissions under IPPU (Category 1.B.3)

<IPPU Sector>

- Development of guidance for estimating GHG emissions from hydrogen production (Category 2.B)
- Addition of guidance on appropriate emission factors to use for dual pressure processes for nitric acid production (Category 2.B.2)
- Update of default emission factors for production of fluorinated compounds other than HCFC-22 (Category 2.B.9)
- Development of guidance (methodology and emission factors) on non anode effect PFC emissions.(Category 2.C.3)

- Update of guidance on methods and Tier 2 emission factors for semiconductor industry (Category 2.E)
- *Update of guidance on fluorinated GHGs from magnesium production taking into account SF6 replacement by HFC-134a (Category 2.C.4) [This is a subject for additional literature analysis.]*
- *Identification of unknown PFCs sources and development of guidance on those sources (Category unknown; one possibility is rare earth production) [This is a subject for additional studies. Feasibility of development of clear guidance should be further considered.]*
- *Update of guidance and emission factors for iron and steel production (Category 2.C.1) [This is for future consideration in the longer term than others. In the short term, this should be dealt with by EFDB and FAQs.]*
- *Update of guidance on sub-applications and update of default emission factors for ODS substitutes, particularly for RAC, for different equipment types, geographical regions and time periods (Category 2.F.1) [This is for future consideration in the longer term than others.]*

<Waste Sector>

- Development or update of methods and default emission factors for emission estimation from septic tanks (Category 4.D.1)
- Improvement of guidance and update or addition of default emission factors of N2O emissions from nitrification and denitrification at wastewater treatment plants (Category 4.D.1)
- Development of guidance on N2O emissions from industrial wastewater treatment process (Category 4.D.2)
- *Development of guidance on N2O emissions from SWDS (Category 4.A) [Due to limited scientific studies and understanding of the process causing the emissions this is for future consideration – in the longer term than others.]*

9. It was agreed that refinements by FAQs and EFDB can start as soon as practicable no matter how the BOGs judged the priority is on each issue.
10. The meeting also considered and raised some cross-sectoral issues (Table 4) for further consideration at an expert meeting on cross-sectoral issues in the near future.
11. Recommendations from this meeting will be considered by the TFB, and reflected in the draft TFI's work programme for 2016 and onwards. Draft work programme will be submitted to the IPCC for consideration at its 42nd Session in October 2015.

Table 1: Recommendation on issues on Energy Sector (from BOG1)

| Priority | Category | Type of refinement and explanation of issue | Suggested possible way(s) of refinement |
|---|---|---|---|
| Issues relative to fuel properties and combustion activities | | | |
| High | Fuel Combustion Activities (1.A) | Comprehensive update, improvement and provision of standard net calorific values and carbon emission factors | EFDB: include in the database the values used to develop the 2006 IPCC Guidelines and new data to facilitate the assessment of statistical distributions, regional values, etc. |
| Low | Fuel Combustion Activities (1.A) | Provision of conversion factors or related information to convert parameters based on net calorific values to gross calorific values | FAQ: provide information on standard combustion calculations for non-specialized users |
| Medium | Fuel Combustion Activities (1.A) | Reconsideration and update of the default oxidation factors for fossil fuels which are 100% for all fuels | FAQ: cross-reference on importance of using higher tier and country-specific EFs and oxidation factors<br>EFDB: include in the database oxidation factors from different countries as they become publicly available. Countries are encouraged to report their scientific studies for consideration for EFDB. |
| Issues on stationary combustion | | | |
| Low | Petroleum Refining (1.A.1.b) / Refining (1.B.2.a.iii.4) | Development of guidance for estimating GHG emissions from catalyst coke incineration in the petroleum industries | FAQ: provide information on estimation and allocation under 1.B.2.a.iii.4 |
| Low | Petroleum Refining (1.A.1.b) / Refining (1.B.2.a.iii.4) | Provision of clarification on petroleum coke grades | FAQ: provide guidance to clarify reporting including on different forms of Pet Coke |
| Medium | Manufacture of Solid Fuels and Other Energy Industries (1.A.1.c), N2O, CH4 | Development of guidance for estimating GHG emissions from charcoal production | Methodology Report (Long term)<br><br>EFDB (Short term): update EFs as and when more data become available.<br>FAQ (Short term): clarify relationship between production and combustion<br><br>Need to coordinate with FOLU |
| Issues on mobile combustion | | | |
| Low | Cars (1.A.3.b.i), CH4, N2O | Development of guidance for estimating non-CO2 emissions from biofuel and blends of fossil fuels | EFDB: update EFs as and when more data become available. |
| Low | Cars (1.A.3.b.i), CH4, N2O | Addition or improvement of methods, activity data and emission factors reflecting the latest technology such as hybrid vehicle and actual status of the usage of vehicle in developing countries | EFDB: update EFs as and when more data is made available. Gathering AD is CS issue. |
| Low | Off-road (1.A.3.e.ii), CH4, N2O | Addition of information on CH4 and N2O EFs | EFDB: Update EFs when more data become available. |
| Issues on fugitive emissions | | | |
| High | Fugitive emissions from fuels (1.B) | Development of guidance for estimating GHG fugitive emissions from abandoned or decommissioned oil and gas wells | Methodology Report (Long term)<br>- Consider whether there is robust data to develop a methodology |

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| | | | EFDB (Short term): update EFs as and when more data become available. |
| Medium | Fugitive emissions from fuels (1.B) | Development of guidance for estimating GHG fugitive emissions from abandoned or decommissioned surface mines | Methodology Report (Long term)<br>- Consider whether there is robust data to develop a methodology<br>EFDB (Short term): update EFs as and when more data become available. |
| High | Oil and Natural Gas (1.B.2) | Development of guidance for estimating GHG emissions from unconventional oil and gas production such as shale gas, shale oil, tight gas ,tight oil and CBM | Methodology Report (Long term)<br>- Provide definition of what the Guidelines mean by conventional and unconventional production<br>- Consider development of Tier 1 EFs for unconventional oil and gas production, and refine methodology if necessary<br>- Scoping meeting should take into consideration the outputs from the expert meeting held in Washington in 2013<br>EFDB (Short term): update EFs as and when more data become available.<br>FAQ (Short term): provide definition of "conventional" and "unconventional" production, clarify existing guidance on estimation methods and EFs in the 2006 IPCC Guidelines |
| High | Oil and Natural Gas (1.B.2) | Update or addition of default emission factors of fugitive emissions from oil and gas by reflecting current practices and the latest measurement data | Methodology Report (Long term)<br>- Revise default EFs if necessary, using new, representative facility-specific information<br>- Provide time-changing tier 1 EFs (e.g., by using different default EFs reflecting industry practices and control technologies)<br>- Include new sub-categories more specific for natural gas production<br>- Scoping meeting should take into consideration the outputs from the expert meeting held in Washington in 2013<br>EFDB (Short term): update EFs as and when more data become available. |
| Low | Other emissions from Energy Production (1.B.3) | Development of guidance for estimating GHG fugitive emissions from geothermal power plants | FAQ: explain the source<br>EFDB: Include available data (e.g. Germany, Iceland, Italy, New Zealand, U.S.) |

| Issues on $CO_2$ transport and storage | | | |
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| Low | Carbon dioxide Transport and Storage (1.C) | Addition or improvement of methods for CO2 emissions from Carbon dioxide transport and storage | Present guidelines are sufficient on methodology. However look for new information availability to provide EFs |
| Low | Other emissions from Energy Production (1.B.3) | Provision of further guidance on fuel transformation considering linkages with the methodology on fugitive emissions under IPPU | FAQ: provide clarification confirming the allocation under 1.B.3<br><br>May be included in Methodology Report considering linkages with the methodology on fugitive emissions under IPPU. |

Table 2: Recommendation on issues on IPPU Sector (from BOG2)

| Priority | Category | Type of refinement and explanation of issue | Suggested possible way(s) of refinement |
|---|---|---|---|
| Low | Other Process Uses of Carbonates (2.A.4) | Provision of clearer guidance on emissive/non-emissive carbonates use. | FAQ: provide additional guidance, if possible and deemed appropriate. (Although Table 2.7 in the Guidelines may be confusing, major sources of emissions are covered in the Guidelines.) |
| High | Chemical Industry (2.B) | Development of guidance for estimating GHG emissions from hydrogen production. No guidance in 2006 GL, though mentioned (see Ammonia, Methanol). | Methodology Report<br>- Method exists in U.S. GHGRP.<br>- Double-counting and non-energy use of fuel statistics should be considered.<br>- Linkage with Energy Sector should be considered.<br>- Guidance on data collection should be provided. |
| Low | Nitric Acid Production (2.B.2) | Addition of guidance on appropriate EF to use for dual pressure processes for nitric acid production. | FAQ or EFDB (Short term): provide additional guidance, although update of EFs may not be necessary.<br><br>Methodology Report (Long term)<br>- Guidance given in FAQ or EFDB above may be included in a new Methodology Report. |
| High | Fluorochemical production (Production of fluorinated compounds other than HCFC-22) (2.B.9) | Update of default emission factors for production of fluorinated compounds other than HCFC-22.<br><br>The default EF of 0.5% is a factor of five to ten smaller than the uncontrolled EFs implied by information gathered during development of U.S. GHGRP. Inappropriately low default may result in failure to identify source category as key. | Methodology Report<br>- Relevant new data and information are available from U.S. GHGRP.<br>- Feasibility of updating the default EF should be further considered at the Scoping Meeting. |
| High | Iron and Steel Production (2.C.1) | Update or elaboration of guidance on three pillars: method, allocation, emission factors for iron and steel production. | No specific recommendation can be made yet on possible ways of refinement, given recent implementation of 2006 GL.<br>- Parties' submissions are needed as well as information on EFs.<br>- Linkage with Energy Sector should be considered.<br><br>Possibly, FAQ or EFDB (Short term)<br>Possibly, Methodology Report (Long term) |
| High | Aluminium Production (2.C.3) | Development of guidance (emission factors) on non anode effect PFC emissions.<br><br>New research reveals large emissions that are not captured by current IPCC methods. | Methodology Report<br>- Literature and multiple measurements of EFs exist. |

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| | | | - Additional studies regarding variability of EFs would be helpful.<br>- New data and information may be available from aluminium industry which continues to pursue measurements. |
| High | Magnesium Production (2.C.4) | Update of guidance on fluorinated GHGs from magnesium production taking into account SF6 replacement by HFC-134a.<br><br>Some of the HFC-134a may react with the molten magnesium to be (1) destroyed and/or (2) converted into other compounds, including other fluorinated GHGs. | No specific recommendation at this stage.<br>- One or two studies of this phenomenon may exist but could not be located in time for Expert Meeting.<br>Possibly, Methodology Report<br>- Need to obtain existing literature (if any) for consideration at the Scoping Meeting. |
| High | Electronics Industry (2.E) | Update of guidance on methods and Tier 2 emission factors for Semiconductor Industry.<br><br>Information gathered under GHGRP supports addition of new and updated Tier 2 EFs, methodological refinements (i.e., distinguishing among wafer sizes, which have different emission factors), and coverage of new sources. (Note: GHGRP etch and clean EFs representative of global industry, but GHGRP destruction and removal efficiencies are not) | Technical Bulletin (Short term)<br>Methodology Report (Long term)<br>- Relevant information and data are available from U.S. GHGRP to add new and updated Tier 2 EFs, methodological refinements and coverage of new sources. |
| High | Refrigeration and Air Conditioning (2.F.1) | Update of default emission factors for ODS substitutes, particularly about RAC.<br><br>RAC emissions are significant; ranges for defaults are broad. | Technical Bulletin (Short term)<br>Methodology Report (Long term)<br>- Guidance could be made more precise by further segregating equipment types, regions, and time periods. |
| High | Unknown PFCs sources | Identification of unknown PFCs sources and development of guidance on those sources.<br><br>Bottom-up estimates of PFC emissions are about half as large as the emissions implied by changing atmospheric concentrations. Possible sources of these unquantified emissions include:<br>- Rare earth elements production<br>- Non anode effect emissions from Aluminium Production | Methodology Report<br>- Additional studies would be required.<br>- Feasibility of development of clear guidance should be further considered at the Scoping Meeting. |

Table 3: Recommendation on issues on Waste Sector (from BOG3)

| Priority | Category | Type of refinement and explanation of issue | Suggested possible way(s) of refinement |
|---|---|---|---|
| High | Solid Waste Disposal (4.A) | Development of guidance on $N_2O$ emissions from SWDS.<br><br>Potential for significant emissions, but reactions are complex and not sufficiently understood to assess level of importance. Also $N_2O$ emissions from leachate need to be considered. | Methodology Report (Very long term) New source; need to assess maturity of data for developing IPCC method to be assessed.<br><br>EFDB (short term): include topic as focus area in 2016 IPCC EFDB data meetings |
| High | Domestic Wastewater Treatment and Discharge (4.D.1) | Development or update of methods and default emission factors for emission estimation from septic tanks.<br><br>Significance is unclear, but septic tanks are used in almost every country. | Methodology Report<br>- Scoping meeting should consider whether this issue can/should be addressed in the Methodology Report, if an expert meeting mentioned below does not take place before the Scoping meeting.<br><br>EFDB (Short term): add data to reflect different types of septic systems (e.g., bottomless, water sealed) and temperature<br>Expert meeting (Short term): for technical assessment of ability to update/complement default parameters and clarify the methodology (e.g., when using multiple systems) |
| High | Domestic Wastewater Treatment and Discharge (4.D.1) | Improvement of guidance and update or addition of default emission factors of $N_2O$ emissions from nitrification and denitrification at wastewater treatment plants.<br><br>New studies confirm highly variable emissions dependent on type of treatment, but the current EF is considered too low for these types of systems and there may be need for an EF for other types of systems. Current guidance is outdated and does not respond to recent research. | Methodology Report<br>- Relevant new studies are available.<br><br>- Scoping meeting should consider whether this issue can/should be addressed in the Methodology Report, if an expert meeting mentioned below does not take place before the Scoping meeting.<br><br>EFDB (Short term): add data to evaluate the default factor and evaluate range of emissions.<br>FAQ (Short term): discuss/highlight potential source<br>Expert meeting (Short term): for technical assessment of method, EF, and activity data before further consideration for supplementary guidance related to $N_2O$ emissions from wastewater treatment. |
| High | Industrial Wastewater Treatment and Discharge (4.D.2) | Development of guidance on $N_2O$ emissions from industrial wastewater treatment process.<br><br>Significance of this source is not clear, but additional guidance would be helpful. | Methodology Report<br>- Methodology used for domestic wastewater could be applied to industrial wastewater (both direct and indirect $N_2O$) for countries where this is a significant source and activity data are available.<br><br>- Scoping meeting should consider whether this issue can/should be addressed in the Methodology Report, if an expert meeting mentioned below |

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| | | | does not take place before the Scoping meeting.<br>FAQ (Short term): Guidance could be provided on how to address industrial wastewater treatment emissions.<br>EFDB (Short term): add data to reflect industrial data and emissions.<br>Expert meeting (Short term): for technical assessment of activity data and method before further consideration for supplementary guidance related to $N_2O$ emissions from wastewater treatment. |
| Low/ Medium | Waste (4) | Development of guidance on GHG emissions from disposal of dead body of livestock killed by pandemic of infectious diseases.<br><br>"Other" category addresses dead body of livestock but lacks description of how to estimate. | FAQ: add guidance to describe how to report and what is good practice<br>EFDB: add newly available data |
| Low/ Medium | Waste (4) | Update of MSW generation rate.<br>It is necessary to improve guidance on data collection of waste generation and treatment. | EFDB or FAQ: add good country-specific examples for data collection |
| Low/ Medium | Solid Waste Disposal (4.A) | Update of default data related to GHG emission estimation from SWDS such as methane generation rate (*k* value), $DOC_f$, oxidation factor | EFDB: add newly available data<br>FAQ: add discussion that there is a range associated with default data, and refer reporters to EFDB |
| Low/ Medium | Biological Treatment of Solid Waste (4.B) | Update of default emission factors for GHG emissions from biological treatment | EFDB: add newly available data, taking into account potential for emissions from digestate storage, to determine significance of emissions.<br>FAQ: add further discussion about mechanical biological treatment. |
| Low/ Medium | Incineration and Open Burning of Waste (4.C) | Update of default emission factors and parameters for GHG emissions from incineration of waste | EFDB: add newly available data.<br>FAQ: add discussion of new technologies, such as gasification, pyrolysis, and plasma technology. |
| Low/ Medium | Domestic Wastewater Treatment and Discharge (4.D.1) | Development of guidance on GHG emissions from underground sewer.<br><br>This is recognized as a source of $CH_4$ emissions, but its overall significance is unclear.<br>It is difficult to develop activity data to support emission calculation. | EFDB: add data to evaluate this as a new source.<br>FAQ: discuss/highlight potential source |
| Low/ Medium | Domestic Wastewater Treatment and Discharge (4.D.1) | Addition or improvement of guidance on how to deal with the sludge or organic waste removed from wastewater treatment process in estimation of GHG emissions from wastewater treatment, and guidance on GHG emissions from sludge digestion.<br><br>Existing methodology is appropriate. | FAQ: provide examples for handling of sludge/organic waste in multiple pathways through the treatment system, including sludge digestion. Also, provide examples of conversions of biogas to units used in energy sector. |

Table 4: Cross-sectoral issues for further consideration at an expert meeting on cross-sectoral issues

| Category | Type of refinement and explanation of issue | Suggested possible way(s) of refinement |
|---|---|---|
| Precursors and Indirect Emissions | Clearer guidance for the calculation of indirect CO2 emissions with regard to:<br>- which sources should be included in the calculation of indirect CO2. (E.g. it is not clear whether indirect CO2 should be calculated based on biomass fuels or other biogenic sources or CH4 and NMVOC such as enteric fermentation, manure management and landfills.)<br>- whether indirect CO2 emissions are already covered by assumptions or not in the methods and default parameters provided in the sectoral methodological guidance in the 2006 IPCC Guidelines (Vol. 2-5). | FAQ: provide explanation of terminology<br>Technical bulletin: provide clearer guidance |
| Approaches to Data Collection | Development of guidance on the integration of GHG emissions reported from industrial facilities into national GHG inventories<br>- After the 2006 IPCC Guidelines were developed, many countries started obtaining GHG emission reports from industrial facilities within their jurisdiction (e.g. EU-ETS). Based on the experiences gained by such countries, new guidance may be developed to supplement the 2006 IPCC Guidelines on how the data reported from facilities can be used in national GHG inventories.<br>- This subject was discussed at two expert meetings - the Expert Meeting on Use of Models and Measurements in GHG Inventories in Sydney, Australia (August 2010) and the Expert Meeting on the Use of Facility and Project Information in National GHG Inventories in Wellington, New Zealand (July 2011). | Improve user-friendliness of website (Short term)<br><br>Methodology Report (Long term)<br>- The contents of existing meeting report and technical bulletin may be incorporated into a new Methodology Report. |
| Approaches to Data Collection | Enhancement of support to inventory compilers in order to facilitate their data collection | Explore collaboration with the UN Statistical Division and other organization's efforts (e.g., International Solid Waste Association, OECD Library, 3R Knowledge Hub, FAO AQUASTAT) |
| Other | Addressing emerging issues (and need to communicate them to the research community) | Expert meetings: address topics that are emerging and technology assessments for supplementary guidance<br>EFDB: add newly available data |
| Other | Better dissemination of information produced.<br>It is important to ensure that inventory compilers and other targeted users are aware of, and have access to, the IPCC TFI Products (in whatever format). | No specific recommendation at this stage |