INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WMO NATIONAL GREENHOUSE GAS INVENTORIES PROGRAMME UNEP

2006 IPCC Guidelines for National Greenhouse Gas Inventories

Third Authors/Experts Meeting: Industrial Processes and Product Use

(27 – 29 July 2004, Washington D.C., United States of America)

Meeting Report

Prepared and reviewed by the Technical Support Unit of the IPCC National Greenhouse Gas Inventories Programme

- Supporting material prepared for consideration by the Intergovernmental Panel on Climate Change. This supporting material has not been subject to formal IPCC review and approval process.
- The Preparation of 2006 IPCC National Greenhouse Gas Inventories Guidelines was approved by the IPCC Panel XX but their decision does not imply NGGIP or IPCC endorsement or approval of these proceedings or any recommendations or conclusions contained herein.
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BACKGROUND

1. At its 17th Session, the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the United Nations Framework Convention on Climate Change (UNFCCC) invited the IPCC to revise the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (1996 IPCC Guidelines), taking into consideration the relevant work under the Convention and the Kyoto Protocol, and to aim at completing the work by early 2006.

2. In response to this invitation, the IPCC launched the project 'Development of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines)' to assess and collate scientific and technical information relevant to estimating greenhouse gas emissions and removals in the context of the 1996 IPCC Guidelines, the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (GPG2000), and the Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF). A Scoping Meeting was held in September 2003 to develop the terms of reference (TOR), table of contents (TOC), and the work plan to complete the project in 2006.

3. IPCC XXI, in November 2003, accepted the TOR, TOC and work plan of the project as elaborated by the Task Force Bureau on Inventories (TFB). This was followed by the selection of authors in accordance with the IPCC procedures.

4. The First Coordinating Lead Authors and Steering Group Meeting (CLA/SG Meeting) and the First Authors/Experts Meeting on Cross-cutting Issues and Reporting Tables were held in parallel in Oslo, Norway, on 4-6 May 2004. These meetings aimed, among others: to prepare detailed outlines for the sectoral volumes; to provide guidance on consistency in drafting the report; and to discuss how to include the cross-cutting issues.

5. The Second Authors/Experts Meeting on Agriculture, Forestry and Other Land Use was held in Le Morne, Mauritius, on 2-4 June 2004. This meeting aimed, among others: to discuss the draft outline for AFOLU sector (Volume 4) of the 2006 IPCC Guidelines, paying special attention to consistency and harmonisation requirements within the sector and also with other sectors, and to discuss specific tasks/issues assigned to breakout groups and prepare the First-Order Draft of Volume 4.

OBJECTIVES AND ORGANISATION OF THE MEETING

6. The meeting in Washington D.C. was the third of a series of authors/experts meetings to be conducted in the year 2004 for the preparation of the 2006 IPCC Guidelines. Sixty-six (66) authors/experts participated in this meeting, including Coordinating Lead Authors (CLAs) and Lead Authors (LAs) of the volume 3 on Industrial Processes and Product Use (IPPU), a CLA of the volume 1 on Cross-Cutting Issues, a CLA of the volume 2 on Energy, members of the steering group for this project, members of the Task Force Bureau on Inventories, and a representative from the UNFCCC (see Attachment D). The meeting aimed to:

    - discuss the draft outline for Industrial Processes and Product Use (IPPU) sector (Volume 3) of the report, paying special attention to consistency and harmonisation requirements within the sector and also with other sectors;

- discuss specific tasks/issues assigned to breakout groups and prepare the First-Order Draft of Volume 3 of the 2006 IPCC Guidelines;

- discuss links between the sectoral volumes;

- consider the guidance from the First CLA meeting on the consistency and links between the sectoral volumes in drafting the 2006 IPCC Guidelines;

- consider the guidance provided by the "Cross-cutting Issue group" for consistency and harmonisation requirements through the whole report; and reporting issues; and

- explore the availability of scientific and other materials for the drafting.

7. The meeting was hosted by the U.S. Environmental Protection Agency. The Technical Support Unit of the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP-TSU) coordinated the meeting with support from the local organisers.

8. Prior to the three-day meeting, facilitators of breakout groups, CLAs, Steering Group and TSU met at U.S. EPA office in the afternoon on 26 July 2004 to discuss principles for dealing with some key cross-cutting issues. Conclusions of this meeting are summarised in Attachment A of this report.

9. The three-day meeting started with a plenary session. Following the opening remarks by the Co-chairs of the IPCC-NGGIP, welcome remarks were delivered by Mr Stephen L. Johnson, Acting Deputy Administrator, U.S. Environmental Protection Agency, and opening speech was delivered by Dr Rajendra K Pachauri, Chairman of the IPCC. Then, the background, mandate, some relevant information on the preparation of the 2006 IPCC Guidelines, and the objectives and expected outputs of the meeting were discussed.

10. Eight main breakout groups (BOG) were formed namely:
    - BOG1: Metal Industry
    - BOG2: Mineral Industry
    - BOG3: Chemical Industry (1) + Product Use, etc. [F-gases]
    - BOG4: Chemical Industry (2) [N_2O from adipic and nitric acid production, etc]
    - BOG5: Chemical Industry (3) [Petrochemical industry, etc]
    - BOG6: Non Energy Product and Feedstock Use of Fuels
    - BOG7: Fluorinated Substitutes for Ozone Depleting Substances
    - BOG8: Ozone Precursors and SO_2

11. These BOGs met several times to further discuss the draft detailed outline of IPPU and to assign the tasks for the drafting. Meetings of CLAs and BOG Facilitators, with Steering Group and TSU, were held between the day's BOG sessions to assess the progress of the BOGs and to develop some guidance on how to proceed. The Third Authors/Experts meeting closed with a plenary session to to report the conclusions from each BOG and to wrap up the discussions.

OUTPUTS FROM THE MEETING

12. The following are some of the major outcomes of discussion by each BOG:

BOG1: Metal Industry

1-1) This group concluded that the section on metal industry should cover GHG emissions from: primary aluminium production; magnesium production & processing; iron & steel production; ferro-alloys; smelted metals (Copper, Zinc, Lead, Nickel); and titanium. The group also agreed that the list of metals might probably be incomplete and therefore they needed to give further consideration. They also found that expertise on other metals is not available in the current BOG, and therefore that they need to seek other additional experts who could serve as contributing authors (CAs) for those sub-sections.

1-2) The group also discussed some cross-cutting issues, and identified the following issues as important ones.

- Need to clarify boundaries: Direct emissions from production and further processing, e.g. Magnesium diecast;
- Need to update Tiers: Re-visit Tier 1 and Tier 3 Continuous Emissions Monitoring;
- Need to provide category-specific guidance on time series consistency and recalculation.

BOG2: Mineral Industry

2-1) This group agreed that the section on mineral industry should cover GHG emissions from cement production, lime production and limestone, dolomite and other carbon uses (e.g., emissions from production of glass, bricks, ceramics and mineral wool). They came up with the following general recommendations.

- Reorganization with respect to limestone and dolomite consumption: report in category where consumed.
- Introduction of a carbonate-based methodology as an alternative (in some cases preferred) to the current CaO approach.
- Ensuring major factors affecting emissions are in equation, and not just found in text.

2-2) They also agreed on the list of priorities until December 2004 as follows.

- To investigate CaO content of clinker.
- To investigate CKD correction factor.
- To draft new carbonate approach for all categories.
- To draft cross-cutting sections for limestone and dolomite use, update as necessary sections for cement and lime production.
- To contact CAs.

BOG3: Chemical Industry (1) + Product Use, etc. [F-gases]

3-1) This group was subdivided into 3 small sub-groups. The first sub-group worked on GHG emissions from fluoro-chemicals production. The second one worked on those from electronics industry (semiconductor, liquid crystal display, etc). The third one

worked on those from manufacture and use of electrical equipment, and other product use.

<Sub-BOG on fluoro-chemicals>

3-2) This sub-BOG started drafting and had major text finished during the meeting. In this work, they elaborated two new additional methods (Tier 1b and Tier 2). They agreed that emissions of some "new gases" such as NF_3 and SF_5CF_3 should be covered in this section. They identified the following 3 tasks to be done after the meeting, namely:

- To add emission factors for various types of fluorinated compound (FC) emissions;
- To decide on default abatement efficiencies;
- To provide uncertainties for the above two items.

<Sub-BOG on electronics industry>

3-3) This sub-BOG discussed various issues related to emissions from electronics industry (e.g., semiconductor manufacturing, flat panel display manufacturing, etc). Among others, they agreed:

- To revise Tier 1 method.
  The existing Tier 1 method uses FC gas purchase information which is not readily available on an industry / country basis. The group proposed to replace it with a new method driven by production capacity and silicon wafer size. This new method will be validated by comparison with historical data.
- To revise emission factors.
  Data collection worksheets will be used to revise emission factors and assess uncertainties for integrate circuit (IC) manufacturing processes, flat panel display (FPD) manufacturing processes, and abatement technologies. A new method will be devised to estimate emissions from processes that do not use 'high' GWP precursors but generate FC by-products.

3-4) They agreed that emissions of some "new gases" should be covered in this section, including HFE-7200, H-Galden 1040x, HG-10, HG-01. Also, Fluorinert FC-72, Fluorinert FC-87, Fluorinert FC-3283, Galden HT-70 and Galden HT-135 may be included although these fluorinated compounds are not currently listed by IPCC (in TAR).

<Sub-BOG on electrical equipment and other product use>

3-5) This sub-BOG discussed various issues related to emissions from electrical equipment and other product use. Among others, they agreed on the following points.

- Current characterization of electrical equipment needs to be expanded to include at least one new category. In total, electrical equipment remains an important source, although its importance varies in different countries and regions.
- Existing Tier 2a and 3 methods are basically sound. However, more experience applying them has been gained so far, and therefore additional practical guidance for countries using them can be provided.
- Treatment of recovery in methods, especially at disposal should be taken into account. It is necessary to account for (1) the technical capability of recovery equipment, and (2) actual recovery frequency (THE HUMAN FACTOR). BOG 3 can provide estimates for (1), but the country should provide values for (2).

- New Sources should be covered, for example:
  - SF_6 emissions from HV T&D component manufacturing
  - Military uses

BOG4: Chemical Industry (2) [N_2O from adipic and nitric acid production, etc]

4-1) This group discussed issues related to GHG emissions from production of various chemicals such as ammonia, urea, nitric acid, adipic acid, etc. They concluded that it was necessary to address the following general issues in their drafting work.

- Presentation of default emission factor ranges – present a single value with uncertainty level used to define the range.
- Clear specification of default emission factors based on purity of the product; if there is a standard product in terms of purity, this should be specified.
- Guidance on management of confidential data – methodological choice or reporting issue; for these sources it is considered more likely to be a reporting issue.
- Reallocation of emissions – CO_2 from ammonia to urea production, urea use – assignment of emissions to the correct source (e.g., when urea was used as fertilizer, CO_2 should be reported under Agriculture, Forestry and Other Land-Use (AFOLU) sector); soda ash sink (waste sector); magnesium carbonate (mineral products); soda ash production (chemical industry).

4-2) The group also identified various source-specific needs such as need for providing additional storage defaults for silicon carbide, etc.

BOG5: Chemical Industry (3) [Petrochemical industry, etc]

5-1) This group discussed issues on GHG emissions from petroleum refining industry, hydrogen production and petrochemical industry in consultation with other relevant authors including BOG6, BOG8 and the Energy Sector CLA. They concluded that:

- Petroleum refining industry should be categorized in the Energy Sector.
- Hydrogen production should be categorized in the Energy Sector.
- Petrochemical industry should be categorized in the IPPU Sector.

5-2) The group developed decision tree flowcharts to define boundaries between petroleum refining and petrochemical industry. It was also agreed that emissions from petrochemical by-products burned for energy recovery would be reported in the Energy Sector, while those without energy recovery would be reported in the IPPU Sector.

5-3) Anticipating that principal activity data for petrochemicals would be feedstock consumption data, the group discussed with BOG6 and agreed that the activity data and estimation methods would be coordinated with the feedstocks analyses being developed by BOG6. Also, anticipating that BOG8 would be providing methodological guidance for emissions of ozone precursors, the group concluded that the guidance for emissions of non-combustion CO and NMVOCs from petrochemical processes should be coordinated between BOG5 and BOG8.

BOG6: Non Energy Product and Feedstock Use of Fuels

6-1) This group discussed issues related to non-energy products and feedstock use of fuels. They agreed to consider product manufacture and product use separately, and concluded that:

- Completeness of process descriptions for product manufacture should be checked and new manufacture process "CO2 from remainder of NEU" should be defined.
- Product use should be split into 1) direct uses of NEU of fuels; 2) emissions from derived products.
- Emissions from waste handling should be dealt with in incineration (Waste Sector) or combustion for energy purposes (Energy Sector)

6-2) The group also agreed to provide guidance for checking and reporting completeness and avoidance of double counting of NEU.

6-3) The group also concluded that coordination with other BOGs is needed:

- BOG1 – Metal industry: iron and steel production, primary aluminium production and secondary magnesium production
- BOG2 – Mineral industry: soda ash production, asphalt production vs. asphalt usage (road raving, roofing)
- BOG4 – Chemical industry: ammonia production, urea production and carbide production
- BOG5 – Petrochemicals: Feedstock uses in petrochemical industry should be dealt with by BOG5 (ethylene by steam cracking, methanol, carbon black).
- BOG8 – Ozone precursors: solvent and other product use

BOG7: Fluorinated Substitutes for Ozone Depleting Substances

7-1) This group discussed how to update the methodological guidance for estimation of fluorinated substitutes for ozone depleting substances. They concluded that:

- Previous reporting is patchy and inconsistent, and efforts to improve depend on Parties' commitment.
- Tier 2 methodologies are essential for most sub-categories because of complexity and delayed emissions.
- The main challenge is activity level data at sub-category and sub-sub-category level, and confidentiality is an additional hurdle.
- It is proposed that simplified Tier 2 methodology should be introduced to provide socio-economic linking factors for default activity allocations (possibly at regional level).
- Guidance should be underpinned by global activity database validation.

7-2) The group found some cross-cutting issues that require coordination with other BOGs.

- NMVOCs to be handled by BOG8
- Need to clarify supply chain demarcation to distinguish BOG3 emission reporting from BOG7
- Need to share methodologies on Estimating Voluntary Recovery (e.g. SF6)

7-3) The group also identified some other issues that require further consideration.

- Need to agree whether the global activity database can be linked with the existing IPCC Emission Factor Database (EFDB) structure or similar for ease of access
- Need to embed existing emission factors into EFDB

- Linkage with update of Common Reporting Format

BOG8: Ozone Precursors and SO_2

8-1) This group discussed how to provide guidance for estimating emissions of ozone precursors & SO_2. Following the basic principle established in the terms of reference (TOR) of this project[1], they concluded that:

- Reference should be made to UNECE/EMEP guidance which is meant to be internationally applicable, including developing countries. National methods and factors can obviously be used.
- Completeness would not be explicitly addressed, but some text on this issue would be developed.
- It is necessary to include a detailed table listing relevant source categories, pollutants, specific references to UNECE/EMEP guidance sections, and special considerations for linkages to other greenhouse gas source categories (e.g., NEU).
- As a cross-cutting issue, it is necessary to treat our guidance on ozone precursors and SO_2 consistently across Sector volumes.

8-2) The group also discussed issues on indirect emissions of CO_2 from atmospheric oxidation of CH_4, CO & NMVOC. What should be taken into account are:

- CH_4 from fugitive Energy sector source categories (i.e., coal mining, oil and gas systems).
- NMVOC and CO emissions from non-combustion processes related to fossil fuel production (i.e., coal mining, oil and gas activities).
- CH_4, CO, and NMVOC emissions from the IPPU Sector categories (and possibly Waste).

8-3) Indirect emissions of CO_2 from atmospheric oxidation of these gases should not be thought of as new sources or methods, but instead a more complete and consistent accounting of emissions from existing source categories. The group agreed:

- To develop guidance on calculation, including a brief and clear explanation of the scientific and accounting issues
- To focus on solvents and linkages with NEU carbon accounting.
- To provide default NMVOC carbon content factors.

[1] TOR mentions "A need for development for new methods for ozone precursors is not anticipated as these are addressed under other agreements and conventions. Appropriate linkages to these methodologies will be provided."

13. At the final plenary session, CLAs highlighted some pending issues to be further considered, for example:

- Final definition of interfaces between petrochemical industry, petroleum refineries, solvent use, waste sector and energy sector;
- Coverage of use of carbonate materials in mineral industry and other industries;
- Ammonia production and use: interface between IPPU and AFOLU; and
- Details on submission of draft worksheets and reporting tables for FOD.

14. CLAs also highlighted some cross-cutting issues that were raised in the meeting of CLAs, BOG Facilitators, Steering Group and TSU in the morning on Day 3. Those were issues on use of continuous emissions monitoring (CEM), multiple tiers within one source category, time series (consistency), and life cycle analysis. Discussion on these issues is summarised in Attachment B of this report.

15. During the final plenary session, 4 issues were raised and discussed, namely:

- Emission factors evolving;
- Boundary between energy related, non-energy related and waste sector emissions;
- Fossil carbon emitted as NMVOC, as fugitive emissions of methane and NMVOC or as CO; and
- Deletion of methods.

Conclusions on these issues are summarised in Attachment C of this paper.

16. Finally, the meeting agreed to a work plan for the first order draft (FOD). Drafting by LAs and CLAs will take place between August and 25 October 2004. CLAs will consolidate the drafts, in consultation with LAs, between 25 October and 15 November. CLAs will finalise the FOD between 15 November and 25 November. The FOD will be submitted to the TSU on 26 November 2004 for technical editing and formatting and in preparation for the Consolidation Meeting to be held in January 2005.

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Attachment A

Principles for dealing with Key Cross-Cutting Issues

These principles emerged from the BOG Facilitator/CLA/Steering Group/TSU meeting held at EPA on the afternoon of 26 July 2004

On the issue of indirect CO_2 emissions:

1) If fossil carbon gets emitted as a gas, it should be counted as CO_2 in the corresponding source category, at least at higher tiers[2].
2) Fossil carbon in CH_4 should also be counted as CO_2 in the corresponding source category
3) Carbon in biogenic methane should not also be counted as CO_2

On the issue of non-energy use of fuels

4) Storage factors or their mathematical equivalent can be part of the methods but should be accompanied by emission factors to reflect the ultimate fate of the products in question.

On the issue of recategorisation of sources

5) Cross linkage between existing IPCC and ISIC categories can be provided but no new categorisation should be introduced

On new gases

6) Where appropriate we can cross reference in the main text (eg by means of footnotes) gases which do not satisfy the three criteria for inclusion in the 2006 Guidelines, but for which emissions estimates may be required in future.

On ozone precursors and SO_2

7) We should not develop new methods, but should update cross references to UNECE/EMEP (previously CORINAIR) and other relevant methodologies.

Other issues

8) We should retain the approaches to national boundaries and timing of emissions used in the IPCC 96 Guidelines and the Good Practice Guidance.

9) We have agreed that to develop worksheets routinely for Tier 1 methods only, but worksheet layout may be used as a mathematical convenience where appropriate at higher Tiers.

[2] So as to avoid very complex calculations for small amounts of carbon at Tier 1.

Attachment B

Points from CLA/BOG Facilitator/TSU/SG Meeting Thursday 29 July 2004

Application of Continuous emissions monitoring (CEM)

CEM should be described as a tier option where (in the view of the BOG) it is appropriate to do so, and the BOG should provide advice on methodological choice setting out the circumstances under which CEM (if practically and economically feasible) is the option for inventory purposes. The BOGs should bear in mind that CEM is simply a limiting case of sampling and that the best advice might be about how often it is necessary to sample controlling variables to make the emissions estimate representative, rather than whether the monitoring should be continuous or not.

The cross cutting chapter will provide overall advice on methodological choice including the advice that implementation of higher tier methods in one sector should not incur disproportionate costs.

Multiple Tiers

The BOGs should provide advice on methodological choice setting out the circumstances under which each tier is the appropriate choice. The cross cutting chapter will provide general cross cutting advice on the circumstances under which use of more than one tier within the sector might give the best result (in terms of neither over nor under estimation, so far as can be judged), and the BOGs should consider whether any specific advice appropriate to the circumstances of the sector is needed.

Time Series

The cross-cutting chapter provides a set of general techniques for splicing methods to develop a consistent time series. These techniques are particularly important in cases where data are available for a higher tier method for later years but not for earlier years. Each BOG should determine which of these techniques are most appropriate for their emission categories, and recommend particular types of surrogate datasets or drivers.

Life cycle analysis

The BOGs should provide methods applicable to emissions occurring within their particular categories and not beyond, (remembering that it may be necessary to coordinate between BOGS if there are linkages) but they should provide different methods if there are different processes within the category.

Attachment C

Points from the Closing Plenary, IPPU Meeting Washington 29 July 2004

Emission factors evolving

The 2006 Guidelines should provide a complete set of default emission factors (or other parameters used to estimate emissions) for each category. These factors should be relevant to the range of current or foreseeable technologies, and the 2006 Guidelines should indicate where these are particularly likely to become outdated due to technological change or for other reasons. The Guidelines should suggest how updated emission factors could be obtained in these cases, and draw attention to the Emission Factor Database as a mechanism for making emission factors widely available.

Boundary between energy related, non-energy related and waste sector emissions

Energy related emissions are emissions associated with; i) the extraction and production of fuel for any use, and ii) the use of fuel to produce useful energy. This includes emissions associated with non-energy products (and fuels used as feedstocks) that are recycled to produce useful energy, unless these have entered the statistics on waste disposal.

Non energy related emissions are all other emissions from industrial process and product use except those covered by the waste sector

Fossil carbon emitted as NMVOC, as fugitive emissions of methane and NMVOC or as CO

The intention is to include the carbon in these emissions in an estimate of total fossil carbon release, as is done automatically under the methodologies used for estimating CO_2 from fossil fuel combustion[3]. This only concerns fossil carbon in NMVOC, methane and CO emissions that are not already counted in feedstock/non-energy use estimates. In most cases no new methodological advice will be required (except on NMVOC speciation, via BOG 8) since the estimates required will be calculable directly from the emissions estimates for these gases and default carbon factors for these gases[4]. The intention is to use this approach consistently across the 2006 Guidance, in consultation with the CLAs and LAs.

Deletion of methods

Methods which, in the opinion of the LAs, are no longer useful should be deleted. Deletion will inevitably involve judgement, and deletion of a method which is in fact still useful under some national circumstances will tend to give rise to comments at the review stage, which may necessitate reinstatement.

[3] There is no intention to change the approach for estimating CO_2 from fuel combustion, or to require back calculation of CO_2 emissions from fuel combustion excluding fossil carbon emitted as NMVOC, CH_4 or CO.
[4] Obtainable directly from stoichiometry, taking account data on speciation from BOG 8 where needed.

Attachment D

List of Participants

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