2006 IPCC Guidelines for National Greenhouse Gas Inventories

Second Authors/Experts Meeting:
Agriculture, Forestry and Other Land Use
(2 – 4 June 2004, Le Morne, Mauritius)

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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EXECUTIVE SUMMARY

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). The project is planned to complete in 2006.

The meeting in Mauritius, on 2-4 June 2004, was the second of a series of authors/experts meetings to be conducted in the year 2004 for the preparation of the 2006 IPCC Guidelines. This meeting generally aimed to convene all the authors/experts of Volume 4 (Agriculture, Forestry, and Other Land-use or AFOLU) to discuss the strategy and work plan for the completion of the task.

All authors/experts in the meeting agreed, as a “generic task” to complete the restructuring of the report base on the approved table of contents. They also agreed to do ‘gap filling’ and ensuring consistency of methods across land use categories; to refine/revise Tier 1 methods; to provide more specific guidance on application of higher tiers; and to improve the user-friendliness of the report.

Drafting by LAs and CLAs will take place between June and 15 October 2004. Consolidation of the drafts will be done by CLAs, in consultation with LAs, between 15 October and 15 November. CLAs will finalise the first-order draft (FOD), including the draft from the harvested wood product, between 15 November and 1 December. The FOD will be submitted to the TSU on 1 December 2004 to prepare for the Consolidation Meeting in January 2005.
BACKGROUND

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. 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.

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.

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 enabled the Coordinating Lead Authors of the 2006 IPCC Guidelines to prepare for the detailed outlines of the sectoral volumes and to draft the detailed workplan towards the completion of the report. This meeting also enabled the authors of Volume 1 (Cross-cutting Issues and Reporting Tables) to provide guidance on cross-cutting issues and how to ensure consistency in drafting the sectoral volumes of the report.

The meeting in Mauritius, on 2-4 June 2004, was the second of a series of authors/experts meetings to be conducted in the year 2004 for the preparation of the 2006 IPCC Guidelines. This meeting generally aimed to convene all the authors/experts of Volume 4 (Agriculture, Forestry, and Other Land-use or AFOLU) to discuss the strategy and work plan for the completion of the task.
OBJECTIVES AND ORGANISATION OF THE MEETING

The meeting convened eighty-two (82) authors/experts whose participation was categorised as Coordinating Lead Authors (CLAs) and Lead Authors (LAs) of the volume on Agriculture, Forestry and Other Land use (AFOLU), a CLA on cross-cutting issues, members of the Task Force Bureau on Inventories, and a representative from the UNFCCC (see Attachment A). The specific objectives of the meeting were 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;

- discuss specific tasks/issues assigned to breakout groups and prepare the First-Order Draft of Volume 4;

- 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.

The Government of Mauritius hosted the meeting, through its Meteorological Service Office. The Technical Support Unit of the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP-TSU) did the coordination with support from the local organisers.

The three-day meeting started with a plenary session that introduced the background, mandate, some relevant information on the preparation of the 2006 IPCC Guidelines including the issues arising from the reporting of inventory information as compiled by the UNFCCC, and the objectives and expected outputs of the meeting. Five main breakout groups (BOG) were formed namely: BOG1 – Biomass; BOG2 – Soils; BOG3 – Wetlands; BOG4 – Livestock; and BOG5 – Consistent representation of lands/management systems. These BOGs met several times to further discuss the draft detailed outline of AFOLU (the outline that was developed in the Oslo Meeting), and to assign the tasks for the drafting. Meetings of CLAs and BOG Facilitators, with Steering Group and TSU, were held in-between, to assess the progress of the BOG sessions and to develop some guidance (when necessary) on how to proceed. This Second Authors/Experts meeting closed with a plenary session to wrap up the discussions and to report the conclusions from the different BOGs.

At this meeting in Mauritius, the harvested wood product (HWP) BOG did not meet since it has to take into consideration any decision that may arise on this matter from the Conference of the Parties (COP) to the UNFCCC. This group will meet in November 2004 in parallel with the Authors/Expert Meeting of the Waste Sector (Volume 5).
OUTPUTS FROM THE MEETING

The following are some of the major decisions concluded at the different sessions of the breakout groups (BOGs):

**BOG1 – Biomass**
This group agreed to have a general framework to describe carbon stock changes, disturbance impact and non-CO₂ emissions for consistent treatment of carbon stock and transfers among biomass, dead organic matter (DOM), and soil (see Figures 1 and 2). It also agreed to develop consistent terminology and symbols for pools and fluxes. The group also agreed to develop a general disturbance matrix that will summarise all “fractions” of the five carbon pools.

Figure 1: Framework to describe the consistent treatment of C stock and transfers among biomass, dead organic matter and soils.
BOG2 – Soils
The Soils group agreed to conduct scoping/review of the following issues:

A. On soil carbon issues,
   - Estimation of dead organic matter (DOM) pool in collaboration with the DOM Biomass group
   - Update of mineral soil C stock change factors (in settlements, uncertainty, erosion scaling factor (for Tier 2), rice management factors, agroforestry, and management categorisation;
   - Evaluation of adjustment in time to new equilibrium (e.g. stratification by climate region); and
   - Liming on soil organic carbon loss

B. For Mineral Soils, Organic Soils & Liming
   - Management effects on soil inorganic carbon (e.g. primary carbonate loss & secondary carbonate gain – method);
   - Salt-affected soils e.g. naturally salty soils (Tier 2), anthropogenic salty soils (Tier 2);
   - Soil categories/reference C stocks (native reference carbon stocks, sensitivity and further stratification);
   - Organic soils (re-examine C loss factors; examine CO₂-CH₄ dynamics - recalculation issues);
   - Coupling between C stock change and N₂O losses;
• Cross cutting issues (uncertainties in default EFs – country specific – random effect; decision tree for completeness; issues from mixing tiers; time series consistency & recalculation); and
• General guidance for Tiers 2 and 3 applications (selection of models, source categories, activity data, uncertainty, validation / verification)

C. On rice cultivation
• Basic forms of the GL96 and GPG2000 methodology that can be used in the report
• Readjustment of default emission factors (EFs)
• Readjustment of current scaling factors (SFs)
• Determination of additional SFs
• Provision of guidelines in using additional activity data (water management, organic amendments, climate zone, soil type), and
• Establishment of uncertainties in reported CH₄ inventories based on EFs, SFs, and activity data

D. On soils N₂O emissions
• Review of additional literature on EFs for mineral N; organic N; excreta during grazing; crop residue N (including cover crops); biological-fixed N; forests, pasture renewal and rotational systems
• Review of information on freeze-thaw environments
• Revision of indirect emissions of N₂O from N deposition, EF for leached N (EF₅), and for ammonia losses;
• Provide QA/QC methodology to ensure completeness of reported emission related to N sources
• Evaluate if inclusion in methodology is appropriate for tillage practice, land use change, mid-season aeration of rice paddies, EF for fertiliser applied to flooded land and wetlands
• Advice on activity data for inclusion of emissions of NOₓ from Energy and IPPU
• Uncertainties and QA/QC, and
• Worksheets and Reporting Tables

BOG3 – Wetlands
The Wetlands BOG, which covered the greenhouse gas emissions and removals from peatland and flooded land, agreed to address the following tasks:
• Definitions & Terminology
• Scoping papers
• Linkages and cross-cutting issues with other land-uses
• Methodologies
• International Contacts

This group will look into the issue of definitions and terminologies in order to develop decision tree that will distinguish different sub-categories of managed peatland: unchanged, converted from agroforestry/forestry; or converted from unmanaged peatland. The group agreed to prepare scoping papers for the following topics to support the drafting of the wetlands chapter:

1. Forest conversion to peatlands
2. Restoration or abandonment of post extraction/agriculture/forestry
3. Cranberry production
4. Water purification
5. Riparian areas managed for flood control
6. Managed coastal wetlands
7. Dissolved organic carbon (DOC) and dissolved inorganic carbon (DIC)

The BOG agreed to establish strong linkages with the groups working on soils (on drained wetland soils), biomass burning (on peatland burning), and rice cultivation. It will also try to elaborate on the distinction between nutrient-rich and nutrient-poor peatland and the implications of their use.

For flooded lands, the group agreed to improve the default EFs to reflect new data and other refinements. Scoping paper on carbon coming into flooded lands from other land categories will be developed and the linkage to indirect N\textsubscript{2}O calculations will be established. Guidance on the use of the carbon stock change equation for lands converted to flooded lands will be refined to avoid overestimation.

**BOG4 – Livestock**

For livestock population and feed characterization, the Livestock BOG agreed to do consistency check across the following sources:

- enteric fermentation
- CH\textsubscript{4} and N\textsubscript{2}O emissions from manure management; and
- N\textsubscript{2}O from soils.

Improvement will be needed to:

- Expand information in relation to swine and poultry (representative categories, feed characteristics and formulas )
- Consider the influence of management system ( intensive / extensive systems ) broken down by region
- Add paragraph on relevance of expression of emissions on basis of per unit production / discussion of system approach.
- Annual Population ( three year average to annual average considering influence of raising period and season change)

For Enteric Fermentation, the group agreed to:

- Modify the decision tree in GPG2000;
- Update the Default Values and EF for Tier 1;
- Update the formula for Net Energy calculation for Tier 2;
- Update the Methane Conversion Rate based on new science and technical knowledge available; and
- Propose for Tier3 that countries explore specific methods including process-based model or direct measurement approach

For Manure Management, the group decided to:

- Update default Tier 1 emission factor
- Update background table
- Revise inputs to Tier 2 (i.e. MCF, VS, N, new management systems; new lagoon MCF defaults);
- Define main parameters and management systems
- Consolidate text across GPGs, Guidelines, and Workbook
- Develop uncertainty values for Tier 1 methane factors
• Revise decision trees to reflect all available options

For Nitrogen Losses in Manure Systems, the group will look into the proper accounting for applied nitrogen to soils from manure management systems taking into account the following:
• Step to subtract for volatilization to ammonia and nitrogen oxides in livestock system
• Research needed to collect default parameters for calculation
• Maintain consistency with world-wide ammonia inventory studies

BOG5 – Consistent Representation of lands/management systems
This group agreed to enhance the consistency in representation of land areas by: 1) using a common set of classifications of land into areas that match default factors and where possible available global data (particularly for Tiers 1 and 2 methodologies); and 2) developing (initially) around existing classifications in GPG and Guidelines, and varied direction from AFOLU authors as methodologies are further developed. The task is viewed to be accomplished by the following steps (elements of work):

1. Describe the major Land Use/Management categories (Chapters 2 and 3 of GPG 2003)
2. Synthesize a common set of biophysical classifications (see Table 1)
3. Provide technical guidance on how to estimate land areas:
   • How to use spatial and/or statistical data to estimate land areas
   • Provide guidance on matching area estimates to default factors in the methodological guidance
   • Encourage transparent reporting through (or to) classification systems, relevant at Tiers 2 and 3

Table 1: Example of Biophysical Classifications

<table>
<thead>
<tr>
<th>Climate</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Mostly done)</td>
<td>(Mostly done)</td>
<td>(Variable)</td>
</tr>
<tr>
<td>Boreal</td>
<td>High activity clay (HAC)</td>
<td>1996 Guidelines adopt FAO</td>
</tr>
<tr>
<td>Cold temperate, dry</td>
<td>Low activity clay (LAC)</td>
<td>1993 (but provide defaults</td>
</tr>
<tr>
<td>Cold temperate, moist</td>
<td>Sandy</td>
<td>and report on alternative</td>
</tr>
<tr>
<td>Warm temperate, dry</td>
<td>Spodic</td>
<td>schemes)</td>
</tr>
<tr>
<td>Warm temperate, moist</td>
<td>Volcanic</td>
<td></td>
</tr>
<tr>
<td>Tropical, dry</td>
<td>Wetland</td>
<td></td>
</tr>
<tr>
<td>Tropical, moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tropical, wet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONCLUSIONS

All authors/experts agreed, as generic tasks, to complete the restructuring of the report base on the approved TOC; to do ‘gap filling’ and ensuring consistency of methods across land use categories; to refine/revise Tier 1 methods (default) through data collection, analysis, and synthesis of data for re-estimating emissions and stock change factors (where appropriate); to provide more specific guidance on application of higher Tiers; and to improve the user-friendliness of the report (e.g. decision trees, step-by-step ‘cookbook’, examples).

Finally, the meeting agreed to a work plan for the first order draft (FOD). Drafting by LAs and CLAs will take place between June and 15 October 2004. CLAs will consolidate the drafts, in consultation with LAs, between 15 October and 15 November. CLAs will finalise the FOD, including the draft from the harvested wood product, between 15 November and 1 December. The FOD will be submitted to the TSU on 1 December 2004 for technical editing and formatting and in preparation for the Consolidation Meeting to be held in January 2005.

Attachment A – Participant list
List of Participants

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Second Authors/Experts Meeting : Agriculture, Forestry and Other Land Use
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