Application of 2006 IPCC Guidelines to Other Areas

Report of IPCC Expert Meeting

1-3 July 2014, Sofia, BULGARIA

Task Force on National Greenhouse Gas Inventories

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INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

IPCC Expert Meeting: Application of 2006 IPCC Guidelines to Other Areas

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Sofia, Bulgaria

Task Force on National Greenhouse Gas Inventories

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Foreword

The IPCC Task Force on National Greenhouse Gas Inventories (TFI) has, as part of its mandate, the objective of encouraging the widespread use of the IPCC Guidelines for estimation of national greenhouse gas (GHG) emissions and removals. This report is one of a series, developed through expert meetings, which aims to assist users of the guidelines by addressing specific problem areas.

The IPCC Guidelines are used increasingly in areas other than national GHG inventories. Therefore, it is increasingly important to ensure better consistency between national GHG inventories and estimates of GHG emissions/removals made for other purposes.

This expert meeting has brought together users of the IPCC Guidelines including national inventory compilers to share their experiences in application of the *2006 IPCC Guidelines* and sought to discuss common issues, challenges and good practices in the application of the guidelines, and provide additional guidance/advice to the users of the IPCC Guidelines.

We would like to thank all those involved in this meeting. In particular we would like to express our sincere thanks and appreciation to the Government of Bulgaria and its Executive Environment Agency for their support by hosting this meeting.

Thelma Krug

Co-Chair Task Force Bureau

Taka Hiraishi

Co-Chair Task Force Bureau

List of Acronyms and Abbreviations

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business as Usual
CDM	Clean Development Mechanism
EF	Emission Factor
EFDB	Emission Factor Database
FAQ	Frequently Asked Questions
GHG	Greenhouse Gas
HWP	Harvested Wood Product
ICLEI	ICLEI - Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
NAMA	Nationally Appropriate Mitigation Action
REDD+	Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
TFI	Task Force on National Greenhouse Gas Inventories
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

The expert meeting discussed the existing practices in the use of the IPCC Guidelines in areas other than national GHG inventories (e.g. sub-national, corporate, project, LCA) and considered the issues and good practices in the application of the guidelines in these areas. It also discussed possible further work required to enhance the utility of the IPCC Guidelines.

There was a consensus that the *2006 IPCC Guidelines* are used increasingly in areas other than national GHG inventories such as subnational level inventories and mitigation projects. The meeting felt that the guidance could be improved in some areas to assist these users, and help ensure consistency with national inventory estimates.

The meeting identified the issues for possible additional advice/guidance and considered that these issues could be addressed by Frequently Asked Questions (FAQs) on TFI website, expert meetings and in future IPCC Guidelines. A first set of the questions and answers (Q&A) has been developed to be added to FAQs at the TFI website (http://www.ipcc-nggip.iges.or.jp/faq/faq.html).

The participants acknowledged that data and information collected for other inventories and mitigation projects can help to improve national inventories, particularly with regard to emission factors (EFs).

The participants looked forward to future collaboration and acknowledged that inventory compilers and other users of the IPCC Guidelines would both benefit from continued discussions of the specific issues and sharing good practices in application of the IPCC Guidelines.

1. Introduction

The IPCC Guidelines for National GHG Inventories are internationally-agreed methodologies to estimate and report annual anthropogenic emissions and removals of GHGs within a national territory, and are used by all Parties to the UNFCCC.

The IPCC Guidelines are also used to estimate GHG emissions/removals at scales other than national and/or on a non-annual basis in various GHG reporting and mitigation endeavours. However, there are issues around boundaries, attribution and leakage among others that need to be considered for correct application of the IPCC Guidelines to other areas. Thus, it is getting increasingly important to consider consistency between national GHG inventories and estimates of GHG emissions/removals made for other purposes and to address potential issues in such estimates due to double-counting, omissions and incorrect attribution, among others.

The IPCC Expert Meeting on Application of *2006 IPCC Guidelines* to Other Areas was held in Sofia, 1-3 July 2014 and hosted by Executive Environment Agency of Bulgaria. A total of 41 participants including IPCC TFI Co-Chairs, invited experts, researchers, representatives of international organizations (e.g. FAO, ICLEI, WRI), and members of TFI Technical Support Unit (TSU) attended the meeting.

The meeting aimed (i) to review examples of application of IPCC Guidelines to areas other than national GHG inventories, (ii) to identify issues to be considered and any need for additional guidance in application of the *2006 IPCC Guidelines* to other areas (iii) to consider elements/practices in various existing GHG estimation/reporting programmes that may serve as additional useful guidance to national inventory compilers. The meeting was held in two parts: a series of presentations was followed by group discussions in three Breakout Groups (BOGs).

This report summarizes discussions and conclusions of the meeting, and aims to provide additional information to the users of the IPCC Guidelines including inventory compilers based on the experiences gained in GHG estimation and reporting in areas other than national GHG inventories.

2. Meeting Discussions

The expert meeting started with opening remarks by IPCC TFI Co-Chairs followed by welcome address from Vanya Grigorova, Executive Director of the Executive Environment Agency of Bulgaria. These were followed by presentations from TSU and invited speakers.

Kiyoto Tanabe (Head, TSU) explained the background, objectives, organization and expected outcomes of the meeting, and Baasansuren Jamsranjav (TSU) gave an introduction to the *2006 IPCC Guidelines*.

The invited speakers shared their experiences in application of the IPCC Guidelines in estimation of GHG emissions in various areas including city-level GHG emissions accounting and reporting, mitigation projects (e.g. REDD+, CDM), carbon footprint/Life Cycle Assessment (LCA) and calculation of mitigation potentials highlighting how the IPCC Guidelines are used, issues or problems that have arisen and good practices.

Abstracts of the presentations are given in Annex 1 of this report and presentation files are available at IPCC TFI website (http://www.ipcc-nggip.iges.or.jp/meeting/meeting.html).

After the presentations, three BOGs were convened in the afternoon of Day 2 to continue discussions.

- BOG1: Estimation of GHG emissions/removals in sub-national/corporate/project level reporting and performance standard-setting, on non-annual basis
- BOG2: Estimation of mitigation potential/carbon footprint/Life Cycle Assessment (LCA)
- BOG3: Estimation of GHG emissions/removals in mitigation projects and programmes

The BOGs discussions were focused on:

- Issues to be considered and any need for additional guidance in application of the *2006 IPCC Guidelines* to areas other than preparation of national GHG inventories
- Elements/practices in various existing GHG estimation/reporting programmes that may serve as additional useful guidance to national inventory compilers

The BOGs presented the outcome of their discussions to the plenary in the afternoon on the final day. The following sections of the report summarize the BOG outcomes, then the final discussions of the meeting.

2.1 BOG 1: Estimation of GHG emissions/removals in sub-national/corporate/project level reporting and performance standard-setting, on non-annual basis

Co-facilitators: Ana Cristina Alves Marques (ICLEI) and Melissa Weitz (USA)

The group noted that the IPCC Guidelines have been used in areas other than national GHG inventories, for example, subnational (e.g. state, city, jurisdiction), corporate, facility level inventories (e.g. cap-and-trade), and REDD+, as well as mitigation projects (e.g. under the CDM). The participants also noted that although the IPCC Guidelines can be used in other areas to estimate emissions and removals they may not be directly applicable in some cases and discussed challenges associated with the application of the *2006 IPCC Guidelines* to areas other than national GHG inventories, issues that need to be considered and possible ways to address the issues and support the users of the IPCC Guidelines.

Major challenges associated with applying *2006 IPCC Guidelines* to subnational inventories are:

- Difference in boundary-setting such as production based vs consumption based (e.g. electricity, HWP)
- Availability, detail and quality of data (e.g. corporations vs jurisdictions)
- Questions of appropriateness of EFs and activity data (AD) (e.g. national averages vs activity-specific)
- Insufficient level of detail for specific applications (e.g. sub-national inventories need to develop additional details)
- Non-prescriptive nature of guidance on some issues (e.g. emissions from international bunker fuels are excluded from total emissions in national GHG inventories while they may need to be included in inventories at other levels)
- Degrees of freedom that can be exercised (e.g. substantially different approaches may be chosen for estimation of emissions from some categories such as transport and HWP).

The group considered that possible improvements can be made through:

- Harmonization of principles of subnational, corporate, facility level inventories with IPCC Guidelines for better comparability and aggregation of emissions to higher level
- Explanation of issues on double counting and leakage that may be brought about by application of *2006 IPCC Guidelines* to subnational inventories
- Provision of concrete advice, for example, on
  - How national level EFs and AD can be made more adequate/applicable to subnational reporting (e.g. for consistency between reporting levels and programs)
  - Aggregation of subnational inventories towards higher or national scale.

The data collected for subnational inventories and mitigation projects (e.g. CDM) including facility level data can help to improve national inventories, particularly with regard to EFs. However, guidance or clarification is needed particularly on:

- How to use very different data from different regions (e.g. how to weight and how to average to develop nationally appropriate EFs, how to decide whether to use regional EFs as they are or to develop a national EF from them)
- Which practices and activities will have regional variations (clear information on conditions for using factors, for example: temperature, soil and climate types, management practice, control technologies) and which will have less variation (more appropriate for national factors)
- What the reference conditions are for the EF (e.g. at what temperature and pressure the EF was derived in the case it is presented as a mass of GHG per volume of natural gas) and how it should be used in national GHG inventory compilation
- How to ensure availability and consistency of time series of data.

The participants agreed that FAQs on TFI website is a possible short term solution. They felt that FAQs on the following issues could be useful:

- Difference between conservative approach taken in mitigation programs (e.g. CDM) and *good practice* approach for national GHG inventories (clarifying that *good practice* guidance requires not over- or underestimating)
- Difference between production-based and consumption-based inventories
- Other differences between national inventories and LCA or other GHG accounting systems (e.g., concerning boundaries, sector coverage, timeframes, methodologies, and EFs)
- How to compile detailed subnational data on transport and buildings which may have more detailed disaggregation than required for national inventory
- Information on existing guidance in the IPCC Guidelines that could be useful to subnational inventory compilers, for example, how to address confidentiality issues (e.g. compile information or provide information where the guidance can be found in the IPCC Guidelines)
- Consistent use of the concepts: definitions of direct and indirect emissions
- Definitional issues with subnational inventories (e.g. what constitutes forest land, deforestation, technical processes in oil and gas industry)
- Information (compilation of examples) from subnational inventories on data drivers (variables) for regional or other disaggregation to improve national inventory level of detail
- What are the implications of different methods being used in subnational inventories when summing up to obtain national emissions/removals? For example, biofuels, some states may develop specific methods.

It was highlighted that clear discussion of methods in national inventory reports would be useful to subnational groups to ensure transparency and coherence. The participants also noted that data confidentiality is an issue for compilers of subnational inventories.

The participants considered that country experience could provide examples of *good practice* on how to disaggregate AD collected by national agencies to enable the data also to be used in subnational inventories. Examples of *good practice* in handling confidential data would also be useful.

The participants also suggested integrating (as appropriate) into future IPCC guidance and guidelines the information from FAQs, and from expert meetings organized to discuss outstanding issues.

The following issues could be discussed and addressed by the expert meetings:

- Identification of the guidance in the *2006 IPCC Guidelines* where EFs and methods are appropriate for subnational inventories
- What guidance can be provided to avoid gaps and double counting (e.g. explore what are the problematic sectors and identify double counting issues), leakages and gaps such as grid electricity (calculation of EFs)
- Clarification on how to harmonize the emissions estimated using the stock change approach commonly used in the projection with the historical emissions estimated using the gain-loss method (relevant for projections for AFOLU).

The participants also considered that additional guidance is needed on application of the *2006 IPCC Guidelines* for subnational inventories, particularly on:

- How to obtain AD at subnational level
- How to develop EF applicable for subnational inventories (e.g. bottom up EF vs top down)
- How to obtain data where there are confidentiality issues.

2.2 BOG 2: Estimation of mitigation potential/carbon footprint/Life Cycle Assessment (LCA)

Co-facilitators: Sirintornthep Towprayoon (Thailand) and John David Watterson (UK)

The BOG discussion aimed to identify outstanding issues and further work required to enhance utility of future IPCC Guidelines with respect to the calculation of C footprint/LCA as well as to consider elements/practices in C footprint/LCA that may assist national inventory compilers.

The discussion was focused on EFs and good practice principles (transparency, consistency, comparability, completeness and accuracy (TCCCA)).

The discussion points can be summarized as follows:

Issues to be considered and any need for additional guidance in application of the 2006 IPCC Guidelines to areas other than preparation of national GHG inventories

The BOG considered that it may be useful to

- conduct literature reviews and consult experts to identify where and how the IPCC *good practice* guidance is used in LCA and C footprint analysis
- consider supplementary guidance, or, an enhancement of future guidelines to help systems analysis inherent to LCA (e.g. mapping to/from IPCC categories)
- encourage the use of key category analysis (KCA) in LCA and C footprint analysis (noting that the KCA threshold for use in the national GHG inventory may need to be adjusted for C footprint analysis).

The participants acknowledged the need of EFs for specific purposes (e.g. for C footprint analysis) and guidance on how to develop site-specific EFs (e.g. company-specific values) and felt that the TFI could consider elaborating the existing guidance on how to generate good quality EFs and how these EFs are used and how to make them available.

It was also considered that the following issues could be addressed by FAQs at TFI website providing advice/guidance on:

- Applicability of IPCC default EFs (where including at which scale, how to use them)
- How IPCC default EFs can be converted for the use in LCA and C footprint analysis
- Challenges of applying the IPCC default EFs in LCA and C foot printing
- General guidance on grid EFs
- Use of IPCC Emission Factor Database (EFDB) and IPCC Inventory Software (http://www.ipcc-nggip.iges.or.jp/). For example, the IPCC Inventory Software might be useful in some cases for LCA and C footprint analysis (e.g. for cross-checking)
- How to promote consistency and comparability
- How to apply the ideas of KCA and decision trees in C footprint analysis and LCA

- Verification, particularly where IPCC could offer the guidance on quality assurance/quality control (QA/QC)
- How to present uncertainties
- Use of IPCC *good practice* guidance (e.g. TCCCA) to LCA and C footprint analysis
- Use of IPCC Guidelines by governments for carbon pricing mechanisms, including use of EFs intended for national inventories, but being applied at a facility level, for emissions that will be priced (and so may require a higher level of accuracy).

Elements/practices in various existing GHG estimation/reporting programmes that may serve as additional useful guidance to national inventory compilers

The group considered that LCA and C footprint tools might have some information/experience that could be useful for national GHG inventories. Countries have LCA databases that may provide useful information/data for national GHG inventories, therefore, need to consider how to extract information from the LCA database for the IPCC EFDB. In addition, existing good quality data covering large number of processes/industries (e.g. Chevron) can be collected and included in the EFDB. The BOG suggested for IPCC TFI to have a mechanism to review the suitability of LCA data that could contribute to national GHG inventories for inclusion in the EFDB. It was also suggested to consider developing a decision tree for submission of data (e.g. LCA data) to the EFDB.

The participants also considered that the following issues need to be considered by IPCC TFI:

- Developing a glossary for definitions and terms used in LCA and national inventory
- Gathering information on reporting requirements for different mechanisms
- Surveying and studying quantification methods being used by governments for mandatory reporting of GHGs, and leverage the studies/references underpinning those methods to help inform updates of the IPCC Guidelines.

In addition, participants noted for LCA within country boundaries there should be consistency between GHG inventories and LCA. Also there should be opportunities for LCA experts to contribute to developing future IPCC Guidelines. It was also suggested to review LCA/C footprint tools as they might have some information and experience from which the IPCC could benefit.

2.3 BOG3: Estimation of GHG emissions/removals in mitigation projects and programmes

Co-facilitators: Stanford Mwakasonda (South Africa) and Jim Penman (UK)

Mitigation is any action that reduces emissions relative to what they would otherwise have been (implies need for a baseline or projection). The BOG discussed and considered methodological issues related to mitigation policies, projects and programmes or actions and ways the issues might be addressed.

Basics and principles

Mitigation can be called different things in different contexts (e.g. NAMAs, policies, measures, programmes, projects). The participants highlighted that IPCC guidance is methodological and needs to be objective, consistent and relevant but not prescriptive across the range of issues that countries encounter, as well as applicable and operational for all relevant country circumstances. The participants felt that the *2006 IPCC Guidelines* are relevant, but don't tell countries all they need to know about how to estimate the effect of mitigation actions on GHG emissions and removals. Nevertheless, for mitigation actions to be reflected in national total emissions, their effect must be reflected in a country's GHG inventory.

Selecting mitigation action

GHG inventories can help in prioritization of mitigation actions, by indicating how different sources contribute to the national total and trend in emissions. Key category ranking could be useful in identifying mitigation opportunities. The participants noted that feasibility and relative cost of mitigation is also an issue and felt that it could be considered in association with inventory methodologies although it is beyond current scope of TFI.

Projections and effects of mitigation

Projections can identify the emissions that the mitigation action will reduce. They may require aggregation or disaggregation of inventory source categories to link the inventory with the mitigation action. Coverage of gases needs to be consistent. The aggregated or disaggregated inventory AD need to be related to drivers of the projections. The effect of the mitigation action could arise by modifying the projected AD or by changing the projected EF or both. Projections methodology could be economic or technical, of various types. Projections and effects of mitigation need to be reported transparently. The relationship between projections and GHG inventories could be considered by the TFI, especially how to establish consistency between projections and inventories with regard to AD and EFs.

Activity data and emission factors

Data collection for the future inventories will need to be sensitive to the effect of the mitigation action on future AD and EFs. Stratification within source categories may be needed to capture the effect of mitigation actions. It is necessary to consider data issues as part of design and implementation of mitigation policies.

EF range may change for example due to better or more complete data, less uncertainty as well as to reflect research results and/or effect of mitigation technologies. Therefore, it is necessary to continue assessing uncertainty ranges.

In national reporting, consistency in the estimations made in GHG inventories, projections, estimation of mitigation actions is important and methodological development may be needed to accommodate this. For example the following need to be considered:

- Can default values be relevant in the context of assessing mitigation actions?
- Could there be a risk of inadvertent bias due to focusing consideration on mitigation actions?

Subnational engagement

Representation of sub-national actions within national total (e.g. project, programme, corporate or other entity estimates) may require appropriate stratification, together with associated methods. National GHG inventory methods should be capable of capturing any associated leakage from the sub-national action, and avoid double counting.

In some cases data may need to be aggregated in different ways to take account of different perspectives of different stakeholders who will take mitigation action (e.g. electricity end users vs producers). Past IPCC TFI expert meetings have addressed sub-national issues to some extent however more work could be useful.

As the next step the participants suggested that TFI develop FAQ list covering key concepts related to mitigation actions (the FAQ list could then feed into subsequent guidelines development) and to consider need for a forum (perhaps electronic) to exchange ideas and experiences.

3. Summary

The participants discussed the existing practices in the use of the *2006 IPCC Guidelines* in areas other than national GHG inventories such as sub-national, corporate, project level estimation and reporting of GHG emissions/removals, estimation of mitigation potential and C footprint/LCA and considered the issues and good practices in the application of the guidelines in these areas. It also discussed possible further work required to enhance the utility of the IPCC Guidelines.

There was a general consensus that the *2006 IPCC Guidelines* have been increasingly used in areas other than national GHG inventory (such as subnational level inventories and mitigation projects) however, the guidance could be improved in some areas to assist the users of the IPCC Guidelines. The participants noted the importance of ensuring consistency in estimates of GHG emissions/removals developed at different scales.

The participants identified the issues for possible additional advice/guidance and considered that these issues could be addressed by FAQs on TFI website, expert meetings and in future IPCC Guidelines.

A first set of the Q&A was developed (see Annex 3) to be added to FAQs on TFI website (http://www.ipcc-nggip.iges.or.jp/faq/faq.html). The participants felt that the FAQs could then feed into subsequent guidelines development and suggested integrating information from FAQs into the future IPCC guidelines/guidance, as appropriate.

The following issues could be discussed and addressed by future expert meetings:

- Identification of the guidance in the *2006 IPCC Guidelines* where EFs and methods are appropriate for reporting programmes other than national GHG inventories (e.g. subnational inventories)
- What guidance can be provided to avoid double counting (e.g. explore what are the problematic sectors and identify double counting issues), leakages and gaps (e.g. grid electricity)
- Clarification on how to harmonize the emissions estimated using the stock change approach commonly used in the projections with the historical emissions estimated using the gain-loss method (relevant for projections for AFOLU).

Data collected for subnational inventories, mitigation projects (e.g. CDM) and facility level data can help to improve national inventories, particularly with regard to EFs. However, guidance or clarification is needed particularly on:

- How to use very different data from different regions (e.g. how to weight and how to average to develop nationally appropriate EFs, how to decide whether to use regional EFs as they are or to develop a national EF from them)
- Which practices and activities will have regional variations (clear information on conditions for using factors, for example: temperature, soil and climate types, management practice, control technologies) and which will have less variation and therefore be more appropriate

- What the reference conditions are for the EF (e.g. at what temperature and pressure the EF was derived in the case it is presented as a mass of GHG per volume of natural gas) and how it should be used in national GHG inventory compilation
- How to ensure availability and consistency of time series of data.

It was also considered that LCA and C footprint tools might have some information/experience that could be useful for national GHG inventories, and that LCA databases may contain useful information, especially for the IPCC EFDB. Therefore, it is necessary to consider how to extract information from the LCA databases for the IPCC EFDB.

The participants identified the need for additional or supplementary guidance on application of the *2006 IPCC guidelines* for areas other than national GHG inventories particularly on how to obtain AD and develop EFs, among others:

- How to obtain AD at sub-national level
- How to develop EF applicable for sub-national inventories (e.g. bottom up EF vs top down)
- How to obtain data where there are confidentiality issues
- How to develop activity-specific (e.g. LCA, C footprint analysis) and site-specific EFs (e.g. at company level)

It was noted that national GHG inventory methods should implicitly capture any associated leakage from the sub-national action, and avoiding double counting.

The participants suggested that TFI develop a glossary for definitions and terms used in other areas (e.g. key concepts related to mitigation actions) and gather information on reporting requirements and quantification methods being used for different mechanisms to help inform updates of the IPCC Guidelines. The meeting also suggested that TFI consider a forum (e.g. electronic) to exchange ideas/experiences. In addition, the meeting considered that it may be useful to conduct literature review and consultation of experts to identify where and how the IPCC good practice guidance is used in other areas.

The participants agreed that inventory compilers and other users of the IPCC Guidelines would both benefit from continued discussions of the specific issues and sharing good practices in application of the IPCC Guidelines.

Annex 1. Abstracts

Application of IPCC Guidelines to REDD+: Advice from GFOI

Jim Penman
University College London, UK

REDD+ consists of a set of activities agreed by the UNFCCC Conference of Parties (COP), to reduce greenhouse gas emissions and conserve and enhance carbon stocks in forests. REDD+ is to be implemented at the national level with sub-national implementation as a possible interim step. Decisions of the COP require use of IPCC guidance and guidelines for estimating emissions and removals associated with REDD+. Nevertheless IPCC emissions inventory methodologies do not identify all REDD+ activities by name. Without providing rigid definitions (which could be controversial) the Global Forest Observations Initiative has provided advice which describes how IPCC guidance and guidelines can be used to estimate emissions and removals associated with REDD+, consistent with the definition of good practice, and linked this advice to remotely sensed data made freely available internationally by the space agencies. The presentation will describe GFOI's approach, including the relationship between GFOI's advice and IPCC guidance, taking account of decisions of the COP, and consider possible future developments.

U.S. EPA Experience in Applying the IPCC Guidelines to Other Areas

Melissa Weitz
U.S. Environmental Protection Agency

This presentation will provide an overview of U.S. EPA experience using the 2006 IPCC Guidelines in a variety of applications, including the development of GHG quantification methods for government agency-level GHG reporting, the development and implementation of a regulation requiring facility-level GHG reporting, and quantification protocols for GHG mitigation projects. U.S. federal government agencies use methods developed based on IPCC guidance to calculate government agency-wide emissions and track progress against reduction targets. Large facilities in the U.S. calculate and report GHG emissions using methods developed based on IPCC guidance to comply with a U.S. EPA regulation. U.S. EPA's former Climate Leader Program provided protocols based on IPCC methods for the quantification of emissions reductions.

Experience Using 2006 GL AFOLU Methods for Estimating Mitigation Potential for Agriculture and Carbon Footprint of Primary Agricultural Products

Brian McConkey, Steve Smith; Darrel Cerkowniak; and Ray Desjardins
Agriculture and Agri-Food Canada

To ensure consistency between mitigation opportunities and the national inventory, Canada chose to apply 2006 GL for the mitigation. To do this an "equivalent agriculture inventory" was calculated using a subset of AFOLU that included the agriculture sector and C stock changes for cropland and grazing land. The activity data for mitigation was derived from mitigation scenarios input into an economic models of Canadian agriculture.at a coarser resolution than that actual data used in national inventory. The scenarios included various policy measures that were expected to reduce GHG emissions. By using the economic model, off-target shifts in the agricultural system in response to policy measures were included. An example of an off-target shift would be a change in livestock numbers from a policy measure aimed at fertilizer use on cropland. An important exception to IPCC GL AFOLU was that emissions associated with fertilizer manufacture and on-farm use of fossil fuels were included so no major emission effects of mitigation policy that occurred outside of AFOLU were ignored. Because of its dependency on history of land use and practice change, it was not feasible to apply 2006 GL directly for estimating soil carbon change for mitigation scenarios. Instead a future inventory was calculated based on the existing history and an "equivalent" soil carbon change factor was developed for the mitigation scenarios. The major advantage of applying 2006 GL for C footprint was that the GHG estimation methods were readily acceptable by many users. The emissions had to be linked to production data and the method was most appropriate at commodity rather than entity scale. Attributing soil carbon changes to specific agricultural products was not feasible generally so all products from general agricultural system had the average C stock change applied; again, most appropriate for commodity scale.

Lessons Learned from the Application of Emission Factors Defined in 2006 IPCC Guidelines to the Clean Development Mechanism (CDM)

Kazuhisa Koakutsu
Institute for Global Environmental Strategies, Japan

It is important to understand how and where IPCC Guidelines has been applied to the project-based mechanism such the Clean Development Mechanism (CDM) for the calculation of emission reductions. This presentation will review the major approved CDM methodologies from the point of emission factors (EFs) applied and will summarize how the development of methodology has incorporated the EFs defined in the IPCC Guidelines.

Implementing IPCC Methodology in Model CASMOFOR to Estimate the Forest Carbon Sink

Zoltan Somogyi
Forest Research Institute of the National Agricultural Research and Innovation Centre
Budapest, Hungary

Afforestations and other forestry means have high potentials to mitigate climate change at low cost. In order to estimate these potentials, appropriate models are to be used. Such a model is CASMOFOR (http://www.scientia.hu/casmofor), which ranked highest among similar models in a recent study. CASMOFOR applies the gain-loss method of the *2006 IPCC Guidelines,* which are applied in order for the model to be compatible with national greenhouse gas inventories. The model can calculate "best estimates" if all available relevant country-specific information is incorporated. Experience as to how the model has so far been used includes (a) developing projections for afforestation planning, for reports such as National Communications under the UNFCCC, and for a number of policy analyses, (2) verifying elements of the Hungarian national greenhouse gas inventory and her forest management reference level under the second commitment period of the Kyoto Protocol, and (3) various research projects. In addition to developing estimates at various scales (stand, project or country levels), the model is also rather flexible with regard to processes and pools modelled, as well as system boundaries. While the model can produce rather accurate estimates with regard to the biomass carbon pool, estimating and attributing carbon stock changes of other carbon pools currently involve higher uncertainties due to the limitations of our knowledge and available data related to these pools. The experience with the application of the model suggests ways how IPCC could contribute to the process of developing forest carbon sink estimation methodology, including appropriate use of data, and reducing uncertainties, and to make forest carbon accounting models better tools for forest-related mitigation.

Implementation of IPCC and Other Carbon Certification Guidelines in Climate Change Mitigation Projects: Experiences from 20 subnational initiatives in six countries

Shijo Joseph[1], Louis Verchot[1], Martin Herold[2] and William D. Sunderlin[1]*

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Experiences in the UNFCCC mechanism for reducing emissions from deforestation and forest degradation, and enhancing the carbon stocks (REDD+), are advancing and valuable lessons are being learned through demonstration activities on the ground. Currently, about 340 REDD+ and other forest carbon projects have been initiated across 52 developing countries. These projects rely on IPCC guidelines and other carbon certification standards to estimate the activity data and emission factors required for the computation of emission reductions and carbon credits issued through voluntary carbon markets. Our presentation focuses on the implementation of these guidelines and other standards in 20 projects and subnational initiatives in six developing countries, including seven in Latin America (five in Brazil and two in Peru), seven in Africa (five in Tanzania and two in Cameroon) and six in Southeast Asia (five in Indonesia and one in Vietnam). The study was carried out through a questionnaire survey, regional workshops and field visits. Of the 20 projects, 11 were found to have high MRV capacity. The capacity to generate activity data was higher in Latin America compared to the other regions. With respect to the five carbon pools and non-CO_2 greenhouse gases, few projects inventoried all five carbon pools and none inventoried N_2O or CH_4. The projects in Latin America focused mostly on above-ground biomass; projects in dry forests of Tanzania combined above ground biomass, below ground biomass, deadwood and litter; and activities in Indonesia focused primarily on above-ground biomass, below-ground biomass and soil carbon in peatlands. Although IPCC 2006 guidelines is the fundamental reference guide for project developers, the concerns over the absence of clear-cut methods for generating activity data at the higher Tiers was evident in projects. Whereas VCS methods are perceived as difficult to attain without considerable investment due to complex methods that do not take into account local project site conditions and financial viability. The lack of methodological clarity for error management and uncertainty reduction at higher scales could be addressed by revising the existing guidelines, and incorporating new and innovative approaches such as area dependent resolution selection, accuracy *vs*. cost curves, site specific key drivers analyses within the key category, and so on. REDD projects and programs differ from national GHG inventories as they need to assess a reference emission level, which has all of the problems associated with trying to quantify a counterfactual case (BAU deforestation or forest degradation). With the implementation of forest conservation activities, REDD+ programs also need to assess net avoided emissions and enhanced sinks against a net reference level that includes sinks and sources. REDD activities also need to address issues of permanence and leakage. Additionally, for REDD+ at least, reporting of emission reduction assessments need to be consistent with national GHG inventories. As the global community targets to have consensus on climate agreement by 2015 and the corresponding implementation by 2020, the lessons from REDD+ phase 1 and 2 activities show that additional guidance on

applying the IPCC 2006 guidelines to areas other than national scale inventories would greatly facilitate implementation of emission abatement programs aimed at slowing, halting and reversing land use related emissions.

Calculation of Mitigation Potential / Carbon Footprint / Life Cycle Assessment (LCA), including Application of *2006 IPCC Guidelines*

John David Watterson (with contributions from Christine St John Cox and Judith Bates)
Ricardo-AEA, UK

This presentation considers the procedures and methodologies which are used to assess the GHG impacts of people, corporations, sectors, or industries, and the approaches that are used to assess mitigation potentials from their activities. It then sets these aspects in the context of the methodologies and data that are available in the *2006 IPCC Guidelines*.

There is a wide range of guidance and methodologies that is used to estimate the GHG impacts from the activities of people, corporations, sectors or industries. This guidance has been developed to serve the specific needs of these users, and these needs are different to those of the users of the *2006 IPCC Guidelines*, who typically, are compliers of national GHG inventories.

Life-cycle assessment (or LCA) is a technique to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave. A carbon footprint is historically defined as the total set (or sets) of greenhouse gas emissions caused by an organisation, event, product or person. Climate change mitigations are actions to limit the magnitude and/or rate of long-term climate change; the mitigation potential is often defined as an estimate of the possible reduction in GHG emissions or enhancement of removals of CO_2.

This presentation summarises the key features of the guidance and methodologies commonly used for carbon footprinting and life cycle assessment. It examines if and how the *2006 IPCC Guidelines* (or other IPCC guidance) and emission factors have been used to help develop such guidance and methodologies. It considers the differences in “boundaries” between the IPCC guidelines and other guidance, and explains why this is an important issue when assessing GHG emissions.

The presentation concludes with a number of key questions which helped shape the session discussing these aspects. Some key questions include: What might the IPCC be able to learn from other guidance? Could the IPCC support the development of alternative methodological approaches for different audiences? Is the wider adoption of consistent reporting methods necessary, or a good idea? Are the IPCC guidelines currently being used to calculate the emissions reductions that can be achieved – mitigation? Are there lessons to learn from the style and form of other guidance that the IPCC could consider adopting?

Issues on the Use of IPCC 2006 GL for Sub-national Scale Land Use Mitigation Activities

Viorel Nelu Bellmondo Blujdea
Forest Research and Management Institute, Romania

This presentation is more an analysis on how sub-national, i.e. regional, mitigation contribution might be quantified within the countries with GL 2006. Regions should be encouraged and methodologically supported to take lead in reducing emissions, serving as examples for the other regions within the country. For land use based mitigation, regional approaches might be more meaningful because of large assessment scale or/and diverse interregional cultural/traditional/ land resources management patterns. Current analysis looks to risks of biased estimates (by use of IPCC methods and default factors, wrong application of IPCC formulas), implementation scale (land vs. activity based, better compensation of errors when multiple land uses over larger areas are included), estimation methodology (e.g. stock change difference vs. gain-loss, land vs. activity based), conservativeness (how to implement GL 2006 to avoid overestimation of sink or/and underestimation of emission), leakages risks (complete or partial inventories, consideration of key activities, pools/sources in/exclusion) and permanence issues (anthropogenic contribution vs. disturbance related). A couple of examples (land conversion for wooded areas, soil management for croplands) would show how default factors and methodologies can be used to demonstrate, the trend at least, in emissions/removals inventory, as a basis for improved land management at regional level.

City-level GHG Emissions Accounting and Reporting

Ana Cristina Alves Marques
ICLEI - Local Governments for Sustainability

ICLEI – Local Governments for Sustainability as a membership association which represents over 1000 Local Governments worldwide, and as the focal point for Local Governments and Municipal Authorities at the UNFCCC, proposes to give a presentation with two sections: the first giving the background on greenhouse gas (GHG) measurement, reporting and verification (MRV) by Local Governments, and the second focusing on the technical aspects which are critical at subnational level, and particularly for cities.

The background section addresses the drivers for GHG MRV by Local Governments, and how the absence of a universally accepted methodology for subnational GHG inventories, compliant with national inventory requirements, has been a barrier for integrated climate action across the different levels of government.

The technical section identifies typical deviations from strict use of IPCC Guidelines for National Greenhouse Gas Inventories at local level, and on the additional difficulties encountered by Local Governments while developing their GHG inventories. Typical deviations from IPCC Guidelines at local level derive from boundary setting issues, methodological limitations, and access to data / quality data.

ICLEI also draws on its experience operating the carbon*n* Cities Climate Registry to report on difficulties encountered in horizontal aggregation of local data to arrive at the inventories of wider regions or country-level. Different approaches to boundary setting and the use of different methodologies impairs automatic aggregation as it lead to risk of double counting and/or carbon leakage.

A brief reference is also made to how difficulties are being tackled, through ICLEI's resources and tools, linking to the Global Protocol for Community-scale Greenhouse Gas Emissions, a joint effort of WRI, ICLEI and C40 (presentation by WRI).

GHG Measurement Standards for Cities

Michael Doust
C40 Cities Climate Leadership Group, UK

The ability of city leaders and other stakeholders to take effective action depends on access to good quality data on GHG emissions. Measurement enables cities to assess their risks and opportunities, create a strategy to reduce GHG emissions in a quantifiable and transparent way, and track their progress.

The C40 Cities Climate Leadership Group (C40) is a network of the world's megacities committed to addressing climate change. We believe cities have a critical role to play in tackling climate change, both because of their contribution to global GHG emissions, and, more significantly, the influence Mayors have in facilitating and enabling action from businesses and residents.

Cities are asking for clear, robust, consistent and comprehensive guidance on:

- Developing a GHG inventory that covers the primary urban emission sources and enables benchmarking with other cities. This is being addressed by the Global Protocol for Community-scale GHG emissions (GPC).

- Identifying and quantifying out of boundary GHG emissions using LCA and I-O approaches to generate consumption-based assessments and help identify opportunities for realizing more efficient urban supply chains.

- Standards for assessing progress towards GHG emission reduction goals and quantifying GHG emissions from specific policies and other interventions.

Presentation will focus on the latter two as the GPC is already being addressed by ICLEI/WRI, showing examples from cities and demonstrating challenges.

Global Protocol for Community-scale Greenhouse Gas Emission Inventories (GPC)

Wee Kean Fong
World Resources Institute

The GPC is jointly developed by World Resources Institute (WRI), C40 Cities Climate Leadership Group (C40) and ICLEI – Local Governments for Sustainability (ICLEI).

It is for use by anyone assessing the GHG emissions of a geographically defined subnational area. Although the GPC is primarily designed for cities, the accounting framework can also be used for boroughs or wards within a city, as well as towns, districts, counties, prefectures, provinces, states, and other subnational entities.

The GPC builds upon the knowledge, experiences, and practices of existing standards, guidance, and tools used by cities to measure community-scale GHG emissions. It sets out requirements, and provides guidance, for calculating and reporting community-scale GHG inventories, consistent with the *2006 IPCC Guidelines* for National Greenhouse Gas Inventories with additional guidance to suit the needs of cities such as detailed guidance on for allocating trans-boundary emissions and bottom-up accounting methodologies to facilitate local climate action planning.

GHG emissions associated with activities taking place in a city can occur inside the city boundary as well outside the city boundary. To recognize this distinction, GHG emissions are categorized as scope 1, scope 2 or scope 3 emissions based on the scope framework used in the GHG Protocol. This allows city inventories to be aggregated at regional and national level. This will help to improve the data quality of a national inventories, measure the contribution of city-scale actions to regional or national GHG emission reduction targets, as well as identify innovative trans-boundary and cross-sectorial strategies for GHG mitigation.

Regular Fugitive Emission Characteristics of HFC-134a from Mobile Air Conditioners (MACs) of Korea-Made Passenger Vehicles in Korea

Seungdo Kim
Hallym University, Korea

This research describes the regular emission characteristics and model of HFC-134a from the Mobile Air Conditioners (MACs) of passenger vehicles excluding Van and Sports Utility Vehicle (SUV) at the use- and disposal-phase. The fugitive emission model of HFC-134a from MAC developed here assumed that the emission process would be expressed by the first-order kinetics. The apparent fugitive emission constant of HFC-134a from MAC in passenger vehicles is estimated to be 0.0526±0.0024 yr^{-1} within a confidence interval of 95%, leading to the emission factor (EF) of 5.1±0.4% yr^{-1}. The average residual rate of HFC-134a is 55.6±1.1% in scrap passenger vehicles with an average age of 12.4 years. The average emission rate per vehicle is determined to be 24.6 g yr^{-1} at the use-phase and 383.4 g per scrap passenger. Based on the excellent duplication of the measured residual rates of scrap passenger vehicles by the predicted ones by the emission model developed here, it is concluded that the emission model and apparent fugitive emission constants are reasonably appropriate for representing the regular emission characteristics of HFC-134a from MAC of passenger vehicles.

Indonesia's mitigation potential project: Energy sector

Rohmadi Ridlo
The Agency for the Assessment and Application of Technology (BPPT), Indonesia

The Indonesian government has committed to reduce greenhouse gas emissions by 26% and reaches 41% (if there is international funding support) in 2020 from the condition without an action plan (bussines as usual / BAU). This commitment is expressed in Presidential Decree No. 61 Year 2011 about the National Action Plan for Greenhouse Gas Emission Reduction (RAN GRK).

RAN GRK activity include in sector: Agriculture, forestry and peat land, energy and transportation, industry, waste management industry, and other supporting activities.

Energy sector is one of sources of GHG emission, reached 369.8 million tons CO_2eq or contributing 21% (Agriculture for 12%, waste for 9% and Land Use, Land Use Change and Forestry and peat fire for 63%) of the emissions in 2005 (Indonesia SNC, 2010).
According to base scenario, total CO_2eq from fuels combustion and fugitive emissions in 2011 reached 511 million tons and increased to 1563 million tons by 2030 at a growth rate of 6.1% per year.

To achieve the target cutting GHG emissions in energy sector in around 4% by 2020, it is important to evaluate quantitatively and specify types and amounts of countermeasures with high mitigation potentials and countries/regions which we should put priority on. In 2020, in BaU case, total GHG emission in energy is expected to be 903 million tCO_2eq.

Various actions proposed in the RAN GRK Energy Sector include energy conservation and renewable energy usage which is in line with the Indonesian energy policy.

1. Energy Conservation to improve efficiency in energy utilization from up-stream up to down-stream (*Demand Side*) i.e. industrial, transportation, household and commercial sector

2. Energy Diversification to increase new renewable energy share in national energy mix (*Supply Side*)

This presentation will discuss the GHG emissions and mitigation potentials in energy sectors in Indonesia.

Chevron Corporation Quantification of GHGs Based on Methods from the American Petroleum Institute

David Shen
Chevron Corporation, USA

Chevron has been tracking and disclosing its greenhouse gas (GHG) emissions since early 2000s, as part of its corporate responsibility reporting. Under its corporate reporting protocol, Chevron makes use of the American Petroleum Institute (API) Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry as a standard set of quantification methods for the corporation. Flexibility is given for business units to use regulatory methods so long as those methods do not represent less than what would be required through the API methodology. A public version of Chevron's GHG protocol can be made available to the IPCC Experts Meeting, as well as the latest Chevron Corporate Responsibility report for discussion.

Chevron business units in the past have requested their Corporate Health, Environment and Safety department for assistance comparing the IPCC's GHG quantification methods against API or a quantification method required by a host government. Chevron has dissuaded its business units from the use of IPCC methods as its original intent has been for country-level GHG estimations. Where high level comparisons have been done between API and IPCC methodologies, it was found that similarities could be found especially for simple stationary combustion sources such as boilers or gas turbines. However, for inherently more uncertain emission calculations such as for fugitive gas emissions, the similarities broke down. IPCC GHG guidelines can be used as a foundation and consultative tool for industries developing GHG quantification methodologies, but not necessarily used as a standalone tool.

A Spatially Explicit Visualisation of Global GHGs for the AFOLU Sector

Rosa Maria Roman-Cuesta
Centre for Geo-Information, Wageningen University, Netherlands

Since year 2000, and in spite of the mitigation options in place, emissions have been growing at larger rates for all sectors except for the AFOLU sector (Agriculture, Forestry and Other Land Uses), that has remained similar. AFOLU accounts for a quarter (ca. 24%) of the net anthropogenic greenhouse gases (GHG) emissions (in 2010). Because effective mitigation will not be achieved if emission sources are tackled individually, integrated assessments of GHGs need to be pursued. This is particularly true for the AFOLU sector where emissions are particularly intertwined (e.g. different land uses act as the driving forces of the emissions in the others: agriculture expansion increases forest emissions). The IPCC 2006 Good Practice Guidelines for National Greenhouse Gas Inventories offer a good framework where to identify key GHGs and emissions sources of the different land uses of the AFOLU sector, in an integrative manner, minimizing the risk of double counting, and improving the understanding of drivers and feedbacks. Using the IPCC 2006 GPG framework, we have developed a pantropically explicit map of AFOLU emissions which will assist in the identification of regions with larger AFOLU emissions. Understanding where are the hotspots of emissions will allow a better characterization of their biophysical, economic and social contexts and will navigate the selection of most appropriate mitigation options (e.g. in terms of maximized returns on investment, adaptation-mitigation trade-offs, ease of implementation, etc).

National Greenhouse Gas Inventory for Thailand's Second National Communication and Mitigation Aspects

Jakapong Pongthanaisawan

National Science Technology and Innovation Policy Office, Ministry of Science and Technology, Thailand

In 2010, as the non-annex I country, Thailand has to submit national greenhouse gas inventory as part of the Second National Communication (SNC) to United Nation of Convention in Climate Change (UNFCCC) secretariat. The inventory is done in accordance with 1996 IPCC Revised Guidelines on National Greenhouse Gas Inventories, prepared by the Intergovernmental Panel on the Climate Change (IPCC). The SNC reports the inventory of base year 2000 covers emission by source and reduction by sink of greenhouse gases in 5 sectors including energy sector, industrial process sector, agriculture sector, land use, and forestry sector and waste sectors.

Based on information and data base from the SCN and by employing the 2006 IPCC guideline, Thailand Greenhouse Gas Management Organization (TGO) sponsored the Joint Graduate School of Energy and Environment to conduct a study of Thailand Greenhouse Gas Emissions Model: Mitigation Aspects. The study aimed to forecast the GHG emissions from five major GHG emitted sectors under the base line business-as-usual (BAU) scenario to the year 2030. In addition, the various technologies and measures in order to mitigate GHG emission in all selected sector were also assessed in two alternative scenarios, including power development plan scenario – promotion of technologies for electricity generation from renewable energy and low-carbon fossil fuel - and climate plan scenario – introduction of high energy efficiency technology and renewable energy for heat in industrial sector, building sector and transport sector.

Quantifying the Biophysical Climate Change Mitigation Potential of Canada's Forest Sector

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The potential of forests and the forest sector to mitigate greenhouse gas (GHG) emissions is widely recognized, but challenging to quantify at a national scale. Forests and their carbon (C) sequestration potential are affected by management practices, where wood harvesting transfers C out of the forest into products, and subsequent regrowth allows further C sequestration. Here we determine the mitigation potential of the 2.3 x 106 km^2 of Canada's managed forests from 2015 to 2050 using the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3), a harvested wood products (HWP) model that estimates emissions based on product half-life decay times, and an account of emission substitution benefits from the use of wood products and bioenergy. We examine several mitigation scenarios with different assumptions about forest management activity levels relative to a base-case scenario, including improved growth from silvicultural activities, increased harvest and residue management for bioenergy, and reduced harvest for conservation. We combine forest management options with two mitigation scenarios for harvested wood product use involving an increase in either long-lived products or bioenergy uses. Results demonstrate large differences among alternative scenarios, and we identify potential mitigation scenarios with increasing benefits to the atmosphere for many decades into the future, as well as scenarios with no net benefit over many decades. The greatest mitigation impact was achieved through a mix of strategies that varied across the country and had cumulative mitigation of 254 Tg CO_2e in 2030, and 1180 Tg CO_2e in 2050. There was a trade-off between short-term and long-term goals, in that maximizing short-term emissions reduction could reduce the forest sector's ability to contribute to longer-term objectives. We conclude that (i) national-scale forest sector mitigation options need to be assessed rigorously from a systems perspective to avoid the development of policies that deliver no net benefits to the atmosphere, (ii) a mix of strategies implemented across the country achieves the greatest mitigation impact, and (iii) because of the time delays in achieving carbon benefits for many forest-based mitigation activities, future contributions of the forest sector to climate mitigation can be maximized if implemented soon.

Global and Regional Assessments of GHG Emissions and Mitigation Potential in Livestock Supply Chains: Modelling management interventions

Anne Mottet

Food and Agriculture Organization of the United Nations

The Global Livestock Environmental Model (GLEAM) was developed by the Livestock Information, Sector Analysis and Policy branch (AGAL) of the FAO to improve the quantification of GHG emissions from livestock supply chains and to identify low emission pathways. GLEAM is used to produce disaggregated assessments of emissions and mitigation potential and to carry out economic analyses of mitigation costs and benefits. This analytical work supports the engagement in multi-stakeholder initiatives on methods and practice change.

GLEAM is a Life Cycle Assessment model, from cradle to retail, and includes all major sources of emissions from livestock supply chains. It computes emissions at local level (cells on a map). The GHG emission factors applied in GLEAM are a combination of IPCC (2006) Tier 1 and Tier 2 approaches. Despite the existence of country-specific EFs, the study applied the same approach to all countries, to ensure consistency and comparability of results across regions and farming systems.

IPCC Tier 2 approaches were used to calculate emissions related to enteric fermentation as well as manure management and storage. The Tier 1 method was used where data was generally lacking, e.g. estimation of carbon stocks from LUC and N_2O emissions from feed production.

GLEAM can generate averages and ranges at different scales and, because it mostly relies on Tier 2 approach, can be used to analyse mitigation intervention, such as feeding practices, health or manure management.

Annex 2. Agenda

Tuesday 1 July	09:00 - 9:30	Registration
	09:30 - 10:00	Welcome • IPCC TFI Co-Chairs • Vanya Grigorova, Executive Director of the Executive Environment Agency
	10:00 - 12:30	Presentations • *Introduction* (**Kiyoto Tanabe, TSU**) • *Introduction to the 2006 IPCC Guidelines* (**Baasansuren Jamsranjav, TSU**) • *Application of IPCC Guidance to REDD+: Advice from GFOI* (**Jim Penman, UK**) • *U.S. EPA Experience in Applying the IPCC Guidelines* (**Melissa Weitz, USA**) • *Experience Using 2006 GL AFOLU Methods for Estimating Mitigation Potential for Agriculture and Carbon Footprint of Primary Agricultural Products* (**Brian McConkey, Canada**) • *Lessons Learned from the Application of Emission Factors Defined in 2006 IPCC Guidelines to the Clean Development Mechanism (CDM)* (**Kazuhisa Koakutsu, Japan**)
	12:30 - 14:00	*Lunch break*
	14:00 - 17:00	• *Implementing IPCC Methodology in Model CASMOFOR to Estimate the Forest Carbon Sink (**Zoltan Somogyi, Hungary**)* • *Implementation of IPCC and Other Carbon Certification Guidelines in Climate Change Mitigation Projects: Experiences from 20 subnational initiatives in six countries (**Shijo Joseph, CIFOR**)* • *Calculation of Mitigation Potential/Carbon Footprint/ Life Cycle Assessment (LCA), including Application of 2006 IPCC Guidelines (**John David Watterson, UK**)* • *Issues on the Use of IPCC 2006GLs for Sub-national Scale Land Use Inventories and Mitigation Activities (**Viorel Blujdea, Romania**)* • *City-level GHG Emissions accounting and reporting (**Ana Cristina Alves Marques, ICLEI**)* • *GHG Measurement Standards for Cities (**Michael Doust, UK**)* • *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) (**Michael Doust** on behalf of **Wee Kean Fong, WRI**)* • *Regular Fugitive Emission Characteristics of HFC-134a from Mobile Air Conditioners (MACs) of Korea-Made Passenger Vehicles in Korea (**Seungdo Kim, Korea**)*

Wednesday 2 July	09:00 - 12:30	• *Indonesia's Mitigation Potential Project: Energy sector* (*Rohmadi Ridlo, Indonesia*) • *Chevron Corporation Quantification of GHGs Based on Methods from the American Petroleum Institute* (*David Shen, USA*) • *A Spatially Explicit Visualization of Global GHGs for the AFOLU Sector* (*Rosa Maria Roman-Cuesta, Netherlands*) • *National Greenhouse Gas Inventory for Thailand's Second National Communication and Mitigation Aspects* (*Jakapong Pongthanaisawan, Thailand*) • *Quantifying the Biophysical Climate Change Mitigation Potential of Canada's Forest Sector* (*Carolyn Smyth, Canada*) • *Global and Regional Assessments of GHG Emissions and Mitigation Potential in Livestock Supply Chains: Modelling management interventions* (Anne Mottet, FAO)
	12:30 - 14:00	*Lunch break*
	14:00 - 17:00	Discussions in break-out groups (BOGs) All BOGs will discuss the respective topics highlighting issues and good practices in application of the *2006 IPCC Guidelines*. • BOG1: *Estimation of GHG emissions/removals in sub-national/ corporate/project level reporting and performance standard-setting, on non-annual basis* • BOG2: *Estimation of mitigation potential/carbon footprint/ Life Cycle Assessment (LCA)* • BOG3: *Estimation of GHG emissions/removals in mitigation projects and programmes*
Thursday 3 July	09:00 - 12:30	Discussions in the BOGs
	12:30 - 14:00	*Lunch break*
	14:00 - 17:00	Reporting by BOGs and plenary discussion

Coffee break: 10:30 and 15:30 on 1-3 July

Annex 3. Questions and Answers

1. Can the methods and default data of the IPCC Guidelines for National Greenhouse Gas Inventories be used in estimation of emissions/removals at scales other than national?

Aspects of the emissions estimation methods of the IPCC Guidelines are often applicable for use at a regional, corporate, facility or project level and their use for these purposes often assists in fostering consistency between estimation methods within a country's emissions estimation and reporting system.

Categorization of sources/sinks may not directly apply for GHG accounting at level other than national (e.g. corporate-level), particularly where boundaries are different, and where it is necessary to take account of emissions offsite (e.g. from electricity generation and waste disposal). In national GHG inventories such offsite emissions affecting the national total are allocated to the sector in which they occur (e.g. energy and waste). To take account of offsite emissions it may be necessary to attribute a part of emissions elsewhere in the national GHG inventory, using some rule or procedure to decide what is appropriate, for example a proportional or marginal share.

It is also possible that more detailed information available at the corporate, facility or project level can give results that are more accurate or precise than if, for example, IPCC defaults are used. Practical approaches to using such detailed information are discussed in the following publications available at http://www.ipcc-nggip.iges.or.jp/public/index.html:

- TFI Technical Bulletin: Use of Facility–Specific Data in National Greenhouse Gas Inventories (2012)
- Expert meeting report: Use of Models and Facility-Level Data in Greenhouse Gas Inventories (2011)

The Global Protocol for Community-Scale GHG Emission Inventories (GPC) - a GHG Protocol standard for cities (http://ghgprotocol.org/city-accounting) references methods in the IPCC Guidelines and recommends for some source categories to use IPCC default factors if local, regional, or country-specific sources are unavailable.

2. What are the major types of GHG inventories and what are their key differences?

In addition to national GHG inventories, there are inventories which are prepared at other geographic scales, e.g. sub-national inventories for administrative regions, or cities, or at the corporate or facility level. GHG assessments may also be made on a product life cycle basis. In general, key differences in the inventories include inventory boundary, categorization of emissions/removals, reporting period and approach used (e.g. top-down, bottom-up) in estimation of emissions/removals. Life-cycle estimates are likely to introduce additional complexities because of interactions and feed-backs between categories.

3. Where can we find EFs and parameters other than IPCC default values that can be used in estimation of emissions and removals?

Research conducted at a national level, by industries or trade associations and by environment agencies are useful sources. Users of the IPCC Guidelines should also consult the IPCC Emission Factor Database (EFDB), which is a library of various emission factors and other parameters with background technical information that can

be used for estimation of GHG emissions/removals. The database is developed and maintained by IPCC Task Force on National Greenhouse Gas Inventories (TFI). The EFDB can be accessed at http://www.ipcc-nggip.iges.or.jp/EFDB/main.php and the EFDB user manual can be downloaded from http://www.ipcc-nggip.iges.or.jp/EFDB/documents.php. Experts with country-specific data not currently represented in the EFDB, are encouraged to submit the data/information for consideration by the EFDB Editorial Board.

4. What is a conservative estimate of emissions/removals? Do the IPCC Guidelines provide methodological guidance for conservative estimates?

The IPCC Guidelines do not provide methodological guidance for conservative estimates. According to the IPCC Guidelines, inventories consistent with good practice are those which contain neither over- nor under-estimates so far as can be judged, and in which uncertainties are reduced as far as practicable. This means that the IPCC Guidelines are intended to provide guidance for developing inventory estimates that are accurate, but not conservative.

Conservativeness aims at minimizing the environmental risk of under-estimation or in some cases (e.g. base year estimates) over-estimation for specific accounting applications. For example:

- Under the Kyoto Protocol, in the case that expert review teams cannot agree with national estimates, an adjustment procedure applied to a Party's national GHG inventory according to the Article 5.2 shall result in estimates that are conservative for the Party concerned so as to ensure that anthropogenic emissions are not underestimated and anthropogenic removals by sinks and anthropogenic base year emissions are not overestimated.
- For a CDM project activity which is not afforestation or reforestation, the establishment of a baseline is considered conservative if the resulting projection of the baseline does not lead to an overestimation of GHG emission reductions attributable to the CDM project activity.

The rules for producing these conservative estimates are sometimes derived from consideration of IPCC uncertainty ranges.

5. What is good practice and where we can find good practice guidance in the IPCC Guidelines?

Inventories consistent with *good practice* are those which *contain neither over- nor under-estimates so far as can be judged, and in which uncertainties are reduced as far as practicable. Good practice* also entails producing inventories that are transparent, complete, consistent, comparable and accurate, and IPCC provides cross-cutting guidance on achieving these characteristics. The concept was defined and elaborated in the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (GPG 2000) via a collection of methodological principles, actions and procedures, and then retained in the *2006 IPCC Guidelines*. *Good Practice* has achieved general acceptance amongst countries as the basis for inventory development. Volume 1 (General Guidance and Reporting) of the *2006 IPCC Guidelines* provides good practice guidance on issues that are common to all the estimation methods covered by the sector-specific guidance provided in Volumes 2 to 5.

6. What is time series consistency of emissions/removals estimates and where I can find guidance in the IPCC Guidelines?

A time series is a central component of the GHG inventory. It provides information on emissions trends (e.g., annually from a base year to the most recent year) and tracks changes in emissions over the period covered. In order to reflect real changes in emissions/removals, all estimates in a time series should be estimated consistently, which means that as far as possible and appropriate, the time series should be calculated using the same method and data sources in all years. Developing a consistent time series is essential for establishing confidence in reported inventory trends. Chapter 5 (Time Series Consistency) of Volume1 of the *2006 IPCC Guidelines* provides methods for ensuring time-series consistency. This chapter also provides good practice guidance on when to recalculate estimates for previous years and methods for tracking changes in emissions and removals over time.

7. Are there any IPCC calculation tools for estimation of emissions/removals and can these tools be used in inventories other than national level?

The IPCC TFI produced new inventory software (IPCC Inventory Software) in 2012 to assist countries in compiling, documenting and archiving a national GHG inventory. The software is based on the *2006 IPCC Guidelines*. It can also be used for checking the estimates or estimating emissions/removals from particular sources/categories. This software cannot necessarily be used at sub-national scales, because of the coverage and other issues identified in Q.2 above. The IPCC Inventory Software and its user manual are freely available at http://www.ipcc-nggip.iges.or.jp/software/index.html

8. Where we can find in the IPCC Guidelines guidance on how to deal with confidential data/information when preparing inventories?

Chapter 2 (Approaches to Data Collection) of Volume1 of the *2006 IPCC Guidelines* provides guidance on how to use restricted data in compiling inventories while ensuring both confidentiality and methodological transparency.

9. What is a difference between direct and indirect emissions when these terms are used in the context of national inventories, as opposed to their usage in the context of corporate inventories?

In national GHG inventories, direct emissions are those taking place directly from a source as consequence of an activity resulting in the emissions while indirect emissions are those occurring through indirect pathways. For example, N_2O emissions from managed soils occur through both a direct pathway (i.e., directly from the soils to which the N is added/released), and through two indirect pathways: (i) following volatilisation of NH_3 and NO_x from managed soils and the subsequent redeposition of these gases and their products NH_4^+ and NO_3^- to soils and waters; and (ii) after leaching and runoff of N, mainly as NO_3^-, from managed soils.

By contrast the GHG Protocol produced by World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) (http://ghgprotocol.org/calculation-tools/faq#directindirect) defines direct and indirect emissions as follows:

- Direct GHG emissions are emissions from sources that are owned or controlled by the reporting entity

- Indirect GHG emissions are emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity

10. Is there a quick guide to the 2006 IPCC Guidelines?

The Overview Chapter and Chapter 1 of Volume 1 of the *2006 IPCC Guidelines* serve as a quick guide. The Overview Chapter (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/0_Overview/V0_1_Overview.pdf) broadly describes the background, structure and major features of the *2006 IPCC Guidelines*. Chapter 1 of Volume 1 (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_1_Ch1_Introduction.pdf) provides an introduction to the *2006 IPCC Guidelines* for a broad range of users, including countries and inventory compilers setting out to prepare inventory estimates for the first time.

In addition, a primer to the *2006 IPCC Guidelines*, available at TFI website (http://www.ipcc-nggip.iges.or.jp/support/support.html), introduces the *2006 IPCC Guidelines*, summarises the basic approach for inventory development, and provides guidance on their use. The primer helps the reader to understand the *2006 IPCC Guidelines*, but is not on its own IPCC guidance.

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