

Appendix A: IPCC Inventory Approach to Accounting for All Anthropogenic Greenhouse Gas Emissions

Table of Contents

1. Background on IPCC Guidelines	A-1
2. Application of the IPCC Approach to Stationary Sources.....	A-2
3. References.....	A-3

1. Background on IPCC Guidelines

The Intergovernmental Panel on Climate Change (IPCC) developed a common system for countries to inventory all anthropogenic greenhouse gas (GHG) emissions, including fossil and biogenic carbon dioxide (CO₂) emissions, across all sectors in a way that reflects net physical additions of GHGs to the atmosphere in a year (IPCC, 2006). The IPCC system classifies source and sink categories into sectors, e.g., Energy, Industrial Processes, Agriculture, Land-Use Change and Forestry, and Waste.¹ In classifying specific source and sink categories, the IPCC needed to make decisions in cases where a category could reasonably be included in more than one sector. For example, the carbon dioxide emissions from the consumption of limestone during cement production are assigned to the Industrial Processes Sector, whereas carbon dioxide emissions from fossil fuel consumption used to provide useful heat for cement production are assigned to the Energy Sector. The IPCC system works because, as long as each country estimates all anthropogenic sources and sinks and classifies them in the same way, national greenhouse inventories are comparable and can facilitate international efforts and agreements to reduce emissions.

Recognizing that many anthropogenic factors influence emissions and sequestration in biological systems, the IPCC opted to reflect these factors comprehensively and holistically in an assessment of the entire Land-Use Change and Forestry (LUCF) sector as part of the Revised 1996 IPCC Guidelines, (Apps et al., 1997) and continued with this approach for the Agriculture, Forestry and Other Land Use (AFOLU) Sector in the updated 2006 IPCC Guidelines (IPCC, Vol. 4, 2006;).

As a result, net biogenic CO₂ emissions related to terrestrial carbon stocks, were “assigned” to the land sector (Land Use, Land Use Change and Forestry, or LULUCF), even if the emissions actually take place at facilities typically associated with a different IPCC sector.² Using this approach, countries have been able to communicate the contribution of their land areas to the global build-up of GHG concentrations through their Inventories in a consistent manner.

¹ The 2006 IPCC Guidelines merged the Agriculture with Land-Use Change and Forestry into a single sector: Agriculture, Forestry and Other Land-Use (AFOLU).

² For example, anthropogenic activities that influence GHG storage and fluxes within biological systems, including terrestrial biomass that sequesters and stores carbon, are counted the land or LULUCF sector. Even if biomass is burned for energy, those biogenic CO₂ emissions are accounted for in the LULUCF sector where the carbon was stored, not the Energy sector.

The IPCC recommends that countries also calculate direct CO₂ emissions from bioenergy, but these estimates are not to be added to national total emissions. These CO₂ emissions should instead be itemized and presented separately to promote an overall understanding of a country's energy sector profile:

Biomass Fuels: Biomass fuels are included in the national energy and emissions accounts for completeness. These emissions should not be included in national CO₂ emissions from fuel combustion. If energy use, or any other factor, is causing a long-term decline in the total carbon embodied in standing biomass (e.g., forests), this net release of carbon should be evident in the calculation of CO₂ emissions described in the Land-Use Change and Forestry chapter. (IPCC, 1996)³

The 2006 Guidelines state:

Biomass is a special case:

- *Emissions of CO₂ from biomass fuels are estimated and reported in the AFOLU sector as part of the AFOLU methodology. In the reporting tables, emissions from combustion of biofuels are reported as information items but not included in the sectoral or national totals to avoid double counting...*
- *For biomass, only that part of the biomass that is combusted for energy purposes should be estimated for inclusion as an information item in the Energy sector. (IPCC, 2006)⁴*

This system, in which CO₂ emissions from bioenergy are not directly added to national totals has, on occasion, been interpreted as an IPCC conclusion on the carbon neutrality of bioenergy. The IPCC Guidelines do not, however, provide any conclusions about the GHG mitigation benefits of bioenergy—they explain that biomass used for energy cannot not be automatically considered “carbon neutral” even if the biomass is thought to be produced sustainably (IPCC, 1996; 2006). The IPCC recognizes that biomass use for energy could have an impact on the net atmospheric contribution of emissions and that a comprehensive approach to account for all sources and sinks at the national level would be inclusive of that impact occurring within a country's borders.

2. Application of the IPCC Approach to Stationary Sources

Application of the IPCC classification system to CO₂ emissions from the consumption of biologically based feedstocks for an individual stationary source would lead to an outcome that excludes impacts on land-based emissions and sequestration. Stationary source emissions (fossil fuel emissions) are captured in one IPCC sector (Energy) and terrestrial fluxes (biomass fuels, such as fuelwood, and related emissions, along with other terrestrial biogenic carbon and carbon-based gases) in the Agriculture, Forestry and Other Land Use sector (AFOLU). In essence, if there is no

³ Page 1.10. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual.

⁴ These bullets are taken directly from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2: Energy, Chapter 2: Stationary Combustion, Section 2.3.3.4 Treatment of Biomass. See www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf.

corresponding accounting (i.e., of both the Energy and AFOLU sectors) or only incomplete accounting of land-based fluxes, then application of the IPCC national inventory approach to stationary source emissions estimation does not provide a complete picture of the true net atmospheric contribution associated with the biogenic CO₂ emissions from the stationary source (Pena et al., 2011).

The IPCC recognizes this limitation:

The IPCC methodologies are intended to estimate national, anthropogenic emissions and removals rather than life cycle emissions and removals. However the IPCC Guidelines can be used, with care for different purposes. For calculating emissions from substitutions, all the changes in emissions and removals must be accounted for. (IPCC, 1996; 2006)

As noted above, the success of the IPCC approach relies on the completeness of the accounting for all emissions sources and sinks across all sectors. IPCC methods are built for national-level emissions inventory accounting for general full-sector coverage inventory use, whereas the framework presented in this report provides a more granular accounting method. For this reason, the IPCC classification approach is not designed to address the specific needs and questions that this framework addresses: how assess the net atmospheric contribution of biogenic CO₂ emissions associated with the production, processing and use of biogenic feedstocks at stationary sources, taking into account factors related to the biological carbon cycle.

3. References

- Apps, M., T. Karjalainen, G. Marland, and B. Schlamadinger. 1997. *Accounting System Considerations: CO₂ Emissions from Forests, Forest Products, and Land-Use Change—A Statement from Edmonton*. Paris, France: International Energy Agency, Office of Energy Technology, Efficiency and R&D.
- Intergovernmental Panel on Climate Change (IPCC). 1996. Introduction to Volume 3: Reference Manual. In *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Bracknell, UK: IGES, Japan, National Greenhouse Gas Inventories Programme, Intergovernmental Panel on Climate Change, WGI Technical Support Unit.
- Intergovernmental Panel on Climate Change (IPCC). 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. H.S. Eggleston, L. Buendia, K. Miwa, T. Ngara, and K. Tanabe (eds). Bracknell, UK: IGES, Japan, National Greenhouse Gas Inventories Programme. <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm>.
- Pena, N., D.N. Bird, and G. Zanchi. 2011. *Improved Methods for Carbon Accounting for Bioenergy: Descriptions and Evaluations*. Bogor, Indonesia: Center for International Forestry Research (CIFOR). Occasional Paper 64. www.cifor.org/publications/pdf_files/OccPapers/OP64.pdf.