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Introduction to Methodologies for GHG emissions inventories and Paris Agreement reporting



Part 3. Sectoral methodologies

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Web-access to sectoral methodology

ESCAP IGCE

ESCAP  Русский  English



Supporting countries in Asia-Pacific to meet commitments to the Paris Agreement


Methodological recommendations on the calculation of greenhouse gas emissions and preparation of reports for the countries of Central Asia, taking into account the Paris Agreement



Main reporting rules



Main inventory and calculation principles



Guidance per sectors



Paris Agreement

Sector guidelines

- 1 Energy Sector
- 2 Industrial Processes and Product Use
- 3 Agricultural Sector
- 4 Land Use, Land Use Change, and Forestry (LULUCF)
- 5 Waste Sector



Main goals of the Practical sectoral guidelines

1. Provide clear and simple explanation of main IPCC principles for each sector and category of the Inventory
2. Share the 20th years experience of the IGCE inventory team in preparation and reviewing of GHGs inventories in all sectors
3. Underline possible challenges which organizations responsible for the estimations and preparation of national GHG inventories could meet on
 - Inventory preparation
 - Activity data collection
 - Chose of estimation parameters and development of country specific emission factors
 - Inventory reporting

Methodological basis

2006 IPCC Guidelines for National Greenhouse Gas Inventories

Additional methodologies adopted by the UNFCCC Conference of Parties also referred as appropriate

The Guidance contains references, clarifications, and useful tips to support the estimation and inventory efforts.

All links in the interactive version lead directly to the required section pages, original data sources, or useful supplementary resources

Where appropriate, approaches to, and examples of, using national methodologies which best reflect the national circumstances are provided, on condition that such methodologies are consistent with the IPCC Guidelines, scientifically based and properly documented.

Energy

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Автоматически

Sector. Overall (total) national emission only includes CO₂ emissions from the combustion of fossil fuel wastes, but not CO₂ from biogenic material, which is reported separately as an information item. The emissions of CH₄ and N₂O from the combustion of biomass are estimated and included in the Energy Sector and national totals. For more detail about the principles of biomass accounting in the Energy Sector see Section 2.3.3.4, [Chapter 2, Volume 2, 2006 IPCC Guidelines](#). The methodology for estimating emissions from waste incineration is provided in the ['Waste'](#) section, and for more detail see [Volume 5, 2006 IPCC Guidelines](#).

Emissions from fuel used in international aviation and maritime transport (*bunker fuels*) are estimated separately from national greenhouse gas emission totals and are included in the inventory as information items. The methodology for estimating emissions from bunker fuels correlates with the methodology for estimating national emissions from aviation and maritime transport and is provided in the relevant sections.

Energy

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Chapter 2: Stationary Combustion

CHAPTER 2

STATIONARY COMBUSTION

Structure of sectors/categories presentation

- Category description
- Methodological approaches to emission/absorption estimation
- Availability and short description of methodological Tiers
- Activity data
- Estimation parameters
- Cross-cutting issues
- Quality control procedures; uncertainties
- Reporting Tables
- Expert recommendations: problems related to calculations and common mistakes
- Availability of a refinement for a specific source category in 2019 Refinement to the 2006 IPCC Guidelines

Energy sector

1A. FUEL COMBUSTION

Sectoral approach

- Stationary combustion (1A1, 1A2, 1A4, 1A5),
- Mobile combustion (1A3, 1.A.4.c.ii, 1.A.4.c.iii, 1.A.5.b)
- Memo items:
bunker fuel, biofuel

Reference approach

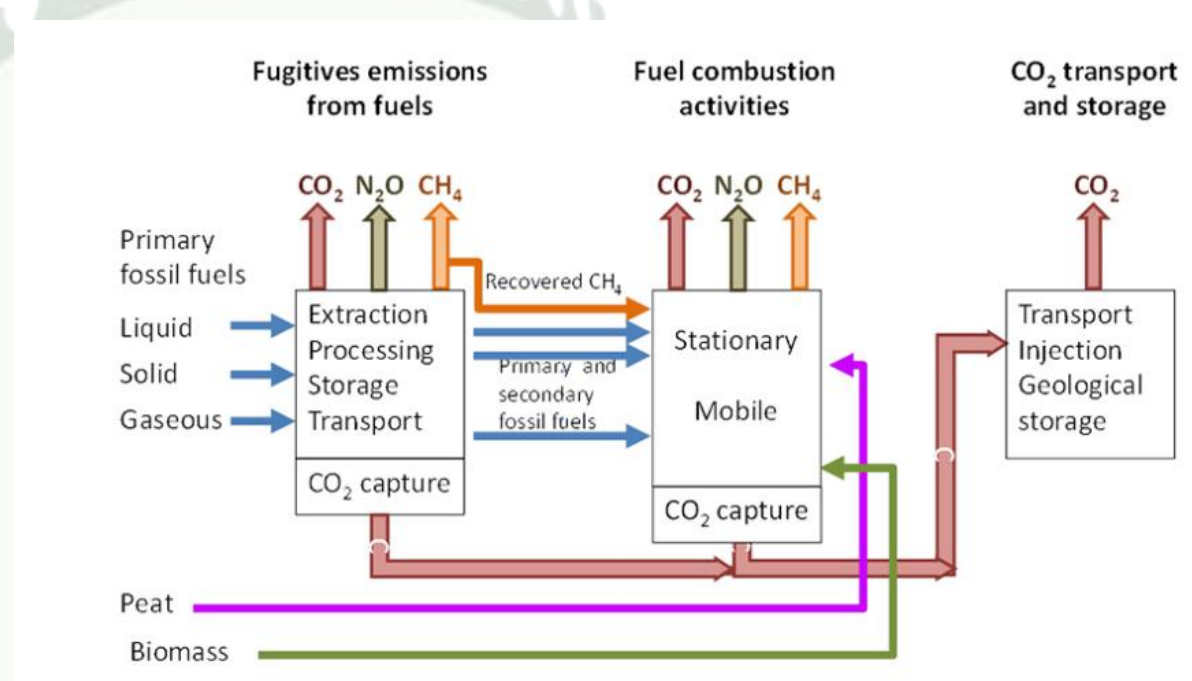
1B. Fugitive emissions:

- Solid fuels (1.B.1)
- Oil and gas (1.B.2)

1C. CO₂ transport and storage

GHGs considered in IPPU sector:

Carbon dioxide (CO₂)
Methane (CH₄)
Nitrogen oxide (N₂O)



The energy sector mainly comprises:

- exploration and exploitation of primary energy sources,
- conversion of primary energy sources into more useable energy forms in refineries and power plants
- transmission and distribution of fuels
- use of fuels in stationary and mobile applications.

1A Fuel combustion

For inventory purposes, **fuel combustion** may be defined as the intentional oxidation of materials within an apparatus that is designed to provide heat or mechanical work to a process, or for use away from the apparatus.

Sectoral approach- the main method for estimating emissions from the combustion of fuel and energy resources is the calculation of emissions by sectors of the economy

Reference approach - based on the total consumption of fuel and energy resources in the country and is used to independently verify the completeness and correctness of the calculations of the sectoral approach

Methodological approaches to estimating emissions for the sectoral approach differ for

Stationary fuel combustion sources

- Energy industries (1.A.1)
- Manufacturing industries and construction (1.A.2)
- Other sources (1.A.4), including
 - commercial and institutional,
 - residential,
 - forestry, agriculture and fishing
- Other (1.A.5)

Mobile sources (1.A.3)

- Civil aviation
- Road transport
- Railway transport
- Navigation
- Other transportation (including pipelines)

Fuel type

Solid fuel

Primary fuels: Anthracite, coking coal, hard coal, lignite

Secondary fuels: coal briquettes, oil shale, combustible artificial coke oven gas, combustible artificial blast-furnace gas, metallurgical coke, coal tar

Other fuels

Abiogenic waste
Industrial waste
Oil waste

Gas fuel

Natural gas

Liquid (Crude oil and petroleum products)

Primary fuels: Crude Oil

Secondary fuels: gasoline, kerosene, diesel fuel, fuel oil, liquefied petroleum gas, other motor fuels, refinery gas, petroleum coke, other petroleum products

Peat

Biomass

Fuel wood, charcoal, biogenic waste

It is important to understand that the type of secondary fuels is determined not by the state of aggregation, but by the type of fuel from which they are produced.

Fugitive emissions (1B)

Sources of greenhouse gas emissions in this subsector are oil and gas facilities and the coal mining industry. They emit direct greenhouse gas emissions of the following types: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), as well as non-volatile organic compounds of the non-methane series (NVOC), sulfur dioxide (SO₂) and oxides of nitrogen (NO_x) .

Methodologies for estimating fugitive emissions from the Energy Sector are very different from those used for fossil fuel combustion. Fugitive emissions tend to be diffuse and may be difficult to monitor directly. In addition, the methods are quite specific to the type of emission release.



Solid fuels(1.B.1)

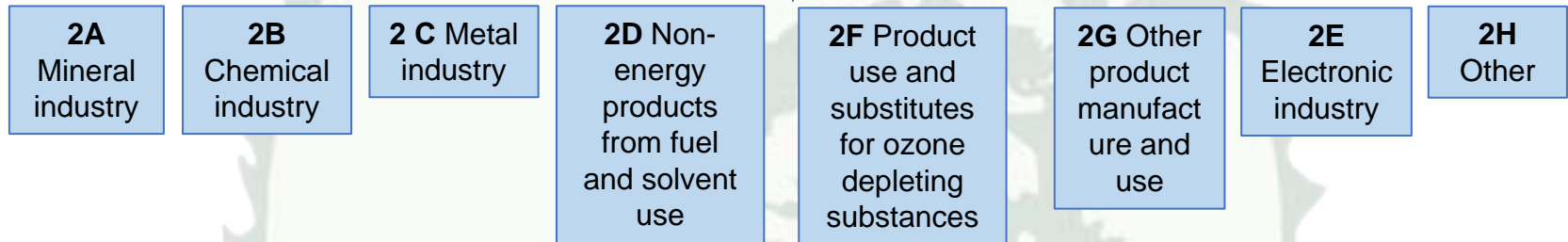
- 1.B.1.a Coal mining and handling:
 - 1.B.1.a.1 underground mines
 - 1.B.1.a.2 surface mines
- 1.B.1.b Emissions from uncontrolled burning and burning of coal deposits;
- 1.B.1.c Other;

Oil and gas(1.B.2)

- 1.B.2. a Oil
- 1.B.2. b Gas
- 1.B.2. c Venting and flaring

Industrial Processes and Product Use

IPPU consider emissions greenhouse gas emissions occurring from industrial processes, from the use of greenhouse gases in products, and from non-energy uses of fossil fuel carbon.



GHGs considered in IPPU sector:

Carbon dioxide (CO_2)

Methane (CH_4)

Nitrogen oxide (N_2O)

hydrofluorocarbons (HFC)

perfluorocarbons (PFC)

sulphur hexafluoride (SF_6)

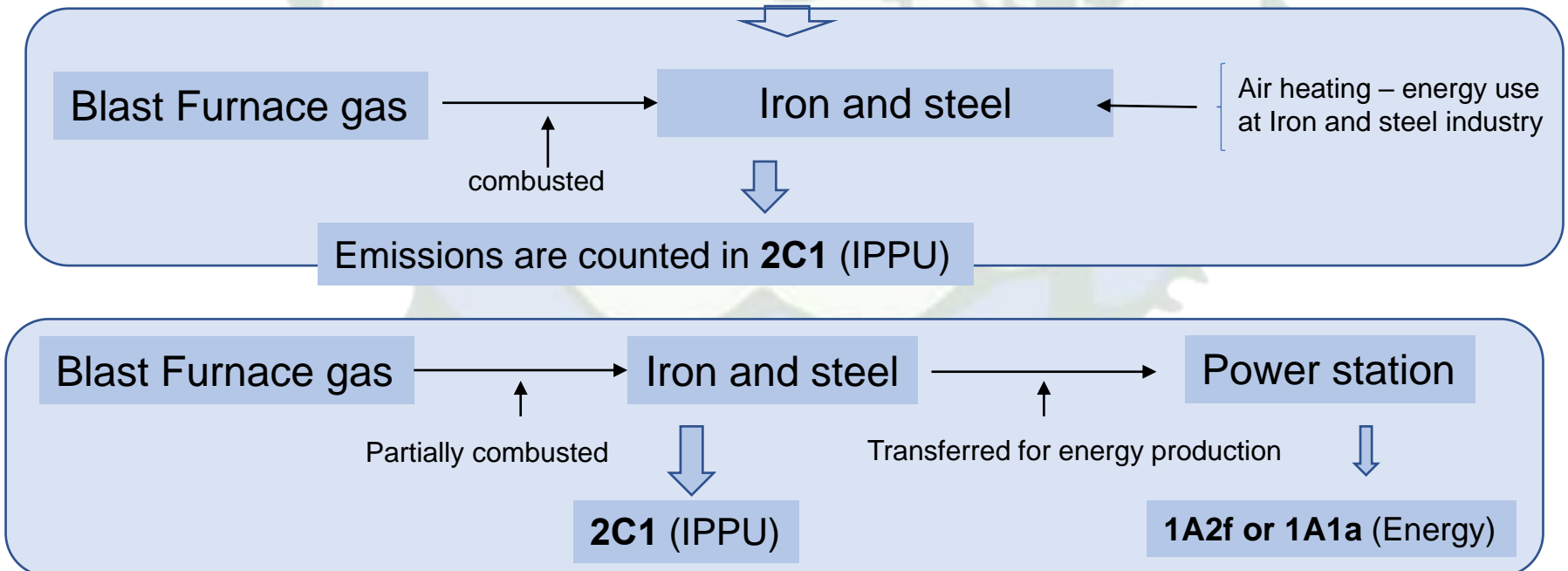


IPPU ↔ Energy cross-cutting issues

Allocating emissions from the use of fossil fuel between the Energy and IPPU Sectors can be complex. The feedstock and reductant uses of fuels frequently produce gases that may be combusted to provide energy for the process.

Can lead to underestimation or overestimation of emissions

Example: category **2C Metallurgy**



Agriculture sector

The Agricultural Sector deals with greenhouse gas emissions from animal husbandry and crop production.

The main GHGs emission are **CH₄**, **N₂O** and **CO₂**.

GHG emissions is carried out under 6 land-use categories:

1. Emissions from Enteric Fermentation (**CH₄**);
2. Emissions from Manure Management systems:
 - **CH₄** emissions;
 - Direct and Indirect **N₂O** emissions;
3. Direct and Indirect **N₂O** emissions from Managed Soils;
4. Emissions from rice cultivation (**CH₄**);
5. Greenhouse gas emissions from on-site burning of agricultural crop residues;
6. Emissions from lime and urea application in Managed Soils (**CO₂**).



1. Emissions from Enteric Fermentation (CH₄)

This category includes methane (CH₄) emissions which are produced by herbivores as a byproduct of enteric fermentation (a digestive process). The amount of methane that is released depends on the type of digestive tract, age, and weight of the animal, and the quality and quantity of the feed consumed.



2. Emissions from Manure Management systems:

CH₄ produced during the storage and treatment of manure deposited by animals on pastures. The term 'manure' is used here collectively to include both dung and urine (i.e., the solids and the liquids) produced by livestock.

Direct N₂O emissions occur via combined nitrification and denitrification of nitrogen contained in the manure.

Indirect emissions result from volatile nitrogen losses that occur primarily in the forms of ammonia and NO_x.



N₂O emissions from Managed Soils

Direct N₂O emissions from managed soils, i.e. direct emissions from soils to which nitrogen is added or supplied from the following sources:

- synthetic nitrogen fertilizers (FSN);
- organic nitrogen applied as fertiliser (e.g., animal manure, compost, sewage sludge, rendering waste) (FON);
- urine and dung nitrogen deposited on pasture, range and paddock by grazing animals, (FPRP);
- nitrogen in crop residues (above-ground and below-ground), including from nitrogenfixing crops and from forages during pasture renewal (FCR);
- nitrogen mineralisation associated with loss of soil organic matter resulting from change of land use or management of mineral soils (FSOM);
- drainage/management of organic soils (i.e., Histosols) (FOS).

Indirect N₂O emissions produced by:

- The volatilisation of nitrogen as NH₃ and oxides of nitrogen (NO_x), and the deposition of these gases and their products NH₄⁺ and NO₃⁻ onto soils;
- The leaching and runoff from land of nitrogen from synthetic and organic fertiliser additions, crop residues, mineralisation of nitrogen associated with loss of soil carbon in mineral and drained/managed organic soils through land-use change or management practices, and urine and dung deposition from grazing animals.



Land Use, Land Use Change and Forestry

The LULUCF sector covers C stock changes, associated CO₂ emissions and removals, as well as other GHG emissions due to the use and change in the use of lands. GHG emissions and CO₂ removals is carried out under 6 land-use categories:

- Forest Land
- Cropland
- Grassland
- Wetlands
- Settlements
- Other Land

The LULUCF sector differs from other sectors in that it covers C stocks in C pools.

Forest Land include all land with woody vegetation consistent with thresholds used to define Forest Land in the national GHG inventory.

This land use category is subdivided into:

- Forest land remaining Forest Land
- Land converted to Forest Land

Estimation of GHG fluxes is made for the following pools:

- Biomass (above-ground and below-ground biomass)
 - Dead organic matter (dead wood and litter)
 - Soil organic matter
- + estimation non-CO₂ gases (CH₄, CO, N₂O, NMVOC, NO_x)

Harvested wood products (HWP)

This category include all wood-based materials that has been removed from the harvesting site.

HWP are divided into two groups: **solid wood products** (sawnwood, wood based panels and round wood) and **paper products** (paper and paperboards).

HWPs are not really carbon sinks but carbon storage. The wood product value chain (from the forest to the end of the product's life) contributes to the removal of CO₂ from the atmosphere, because CO₂ removed by trees is stored as carbon in products in use and in well-managed landfills.

Carbon stock changes in the HWP pool were calculated for three semi-finished wood product categories: sawnwood, wood-based panels and paper and paperboard.

There are 3 approaches to estimate carbon stock changes in the HWP pool:

- stock-change
- production
- atmospheric-flow

Waste sector

Sector-reported greenhouse gases (GHG):

CH_4 N_2O CO_2 (in some cases).

GHG emission sources in the sector 5 «Waste»:

- 5.A. Solid Waste Disposal;
- 5.B. Biological Treatment of Solid Waste;
- 5.C. Incineration and Open Burning of Waste;
- 5.D. Wastewater Treatment and Discharge.

CO_2 emissions from landfilling and combustion of biowaste and biogas are **not included** in the national totals of GHG emissions and are considered in the sector **“Agriculture, forestry, and other land uses”**.

Biogas emitted from waste and effluent management can be burned, GHG emissions are **insignificant**, but **can be included** in the “Waste” sector.

GHG emissions from the use of wastes, effluents and biogas as fuels and feedstock are classified under the **“Energy” or “IPPU” sectors**.

Emissions from manure management are assigned to the **Agriculture sector**.

GHG emissions, the sources of which are not the waste itself, but the activities for handling them, should also be attributed to the relevant sectors.



Thank you for your attention

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