



URBAN GREENHOUSE GAS INVENTORY SPECIALIST TRAINING COURSE

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GHG AND CLIMATE CHANGE SPECIALIST CURRICULUM





INDUSTRIAL PROCESSES AND PRODUCT USE

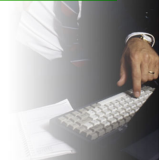
FOR GHG & CLIMATE CHANGE PROFESSIONALS

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WHAT SHOULD YOU LEARN





Categorizing IPPU emissions by scope

Defining industrial processes and product uses

Calculation guidance for industrial processes

Calculating product use emissions

INTRODUCTION

GHG emissions can result from non-energy related industrial activities and product uses. All GHG emissions occurring from industrial processes, product use, and non-energy uses of fossil fuel, shall be assessed and reported under IPPU.

✓Scope 1 (territorial): Emissions from industrial processes and product uses occurring within the city

✓Scope 2: Not applicable All emissions from the use of grid-supplied electricity in industrial or manufacturing facilities within the city boundary shall be reported under scope 2 in Stationary Energy, manufacturing industry and construction (I.3.2).

✓Scope 3: Other out-of-boundary emissions Emissions from IPPU outside the city are not included in the inventory boundary but may be reported under Other Scope 3 emissions as appropriate.

DEFINING INDUSTRIAL PROCESSES AND PRODUCT USES

GHG emission sources	Example industrial processes or product use
GHG emissions from industrial processes	<ul style="list-style-type: none">Production and use of mineral products (Section 9.3.1)Production and use of chemicals (Section 9.3.2)Production of metals (Section 9.3.3)
GHG emissions from product use	<ul style="list-style-type: none">Lubricants and paraffin waxes used in non-energy products (Section 9.4.1)FC gases used in electronics production (Section 9.4.2)Fluorinated gases used as substitutes for Ozone depleting substances (Section 9.4.3)

✓The industrial processes and product uses included in this category are summarized in Table 9.2.

✓Allocation of emissions from the use of fossil fuel between the Stationary Energy and IPPU sectors can be complex.

✓The GPC follows IPCC Guidelines,⁶² which define "fuel combustion" in an industrial process context as: "the intentional oxidation of material within an apparatus that is designed to provide heat or mechanical work to a process, or for use away from the apparatus."

CALCULATING MINERAL INDUSTRY EMISSIONS

Emission sources	GHG emissions	Simplest approach for quantifying emissions ⁶²	Source of active data	Link to default emission factor calculation
Cement production		Emission factor multiplied with weight (mass) of Clinker produced	<ul style="list-style-type: none">Consult the operators or owners of the industrial facilities at which the processes occur and obtain relevant activity data.	2.2.13 of Page 2.11 from Chapter 2 of Volume 3 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Lime production	CO ₂	Emission factor multiplied with weight (mass) of each type of lime produced	<ul style="list-style-type: none">Consult national inventory compiler to ask for specific production data within the city boundary.	Table 2.4 of Page 2.22 from Chapter 2 of Volume 3 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Glass production		Emission factor multiplied with weight (mass) melted for each type of glass produced		Table 2.6 of Page 2.30 from Chapter 2 of Volume 3 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories



GHG emissions are produced from a wide variety of industrial activities. The main emission sources are releases from industrial processes that chemically or physically transform materials

Equation 3.2 Emissions from cement production

CO ₂ emissions = $M_{\text{CE}} \times EF_{\text{CE}}$	
Description	Value
CO ₂ emissions = CO ₂ emissions in tonnes	Computed
M_{CE} = Weight (mass) of clinker produced in metric tonnes	User input
EF_{CE} = CO ₂ per mass unit of clinker produced (kg CO ₂ /tonne clinker)	User input or default value

Equation 3.3 Emissions from lime production

CO ₂ emissions = $2584 \times M_{\text{L}} \times (1 - \eta_{\text{L}})$	
Description	Value
CO ₂ emissions = CO ₂ emissions in tonnes	Computed
M_{L} = Weight (mass) of lime produced of one type in metric tonnes	User input
η_{L} = kg CO ₂ mass unit of lime produced of lime type	User input or default value
η_{L} = kg CO ₂ mass unit of lime produced of lime type	User input or default value

Equation 3.4 Emissions from glass production

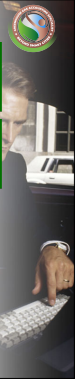
CO ₂ emissions = $M_{\text{G}} \times EF_{\text{G}} \times (1 - \eta_{\text{G}})$	
Description	Value
CO ₂ emissions = CO ₂ emissions in tonnes	Computed
M_{G} = Weight (mass) of glass produced of one type in metric tonnes	User input
η_{G} = kg CO ₂ mass unit of glass produced of one type	User input or default value
η_{G} = kg CO ₂ mass unit of glass produced of one type	User input or default value

CHEMICAL INDUSTRY EMISSIONS

GHG emissions arise from the production of various inorganic and organic chemicals, including: • Ammonia • Nitric acid • Adipic acid • Caprolactam, glyoxal, and glyoxylic acid • Carbide • Titanium dioxide • Soda ash

EMISSIONS FROM METAL INDUSTRY

GHG emissions can result from the production of iron steel and metallurgical coke, ferroalloy, aluminum, magnesium, lead, zinc, and rare earth metals.



CALCULATING PRODUCT USE EMISSIONS

Products such as refrigerants, foams or aerosol cans can release potent GHG emissions. HFCs, for example, are used as alternatives to ozone depleting substances (ODS) in various types of product applications. Similarly, SF6 and N2O are present in a number of products used in industry (e.g., electrical equipment and propellants)

CO₂ EMISSIONS FROM NON-ENERGY PRODUCT USE

CO₂ Emissions =

$$\sum_i (NEU_i \times CC_i \times ODU_i) \times 44/12$$

NEU_i

= non-energy use of fuel i, Tj

CC_i

= specific carbon content of fuel i, tonne C/Tj (e.g. C/Gj)

ODU_i

= ODU factor for fuel i, fraction

44/12

= mass ratio of CO₂/C

Source: Equation adapted from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 3 Industrial Processes and Product Use available at: www.ipcc-nggip-iges.org/pub/2006/vol3.html

SUBSTITUTES FOR OZONE-DEPLETING SUBSTANCES

Substances for ozone-depleting substances	GHG emissions	Eligible approach for quantifying emissions	Source of active data	Link to default emission factor calculation
Substitutes for ozone-depleting substances	HFCs PFCs	Emission factor approach: <ul style="list-style-type: none">• Data on chemical sales by application• Emission factors by application Mass balance approach: <ul style="list-style-type: none">• Data on chemical sales by application• Data on losses and current equipment sales adjusted for imports/exports by application	Quantity of each chemical sold as substitutes for ozone-depleting substances. Data on both domestic and imported substitute quantities should be collected from suppliers.	Users can search the IPCC 2019 Emission Factor Database (EFD) for defaults
Wasteport from electronic circuits	PFCs	Emission factor approach: <ul style="list-style-type: none">• Data on number of electric circuits manufactured• Emission factors by application	Number of electric circuits manufactured should be collected from industry	IPCC 2019 database or 2006 National Guidelines

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THANK YOU

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