



Transparency and Completeness: Using Notation Keys in the U.S. GHG Inventory

19th Workshop on Greenhouse Gas Inventories in Asia (WGIA 19)

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Inventory Completeness

Completeness: Estimates are reported for all relevant categories of sources and sinks, and gases. Geographic areas within the scope of the national greenhouse gas inventory are recommended in these Guidelines. **Where elements are missing their absence should be clearly documented together with a justification for exclusion.**

- 2006 IPCC Guidelines, Volume 1, Chapter 1, Section 1.4 Inventory Quality

- Notation keys are shorthand documentation to explain completeness
 - First introduced in Revised 1996 IPCC Guidelines
 - Reflected in guidance for reporting national communications (MPGs)
 - Commonly used for activity data, emission factors, or other parameters

National Inventory Report under ETF/Paris

- Notation keys are required in common reporting tables to transparently convey completeness and can also be used in report or document

Common Reporting Tables (CRTs)

TABLE 1 SECTORAL REPORT FOR ENERGY (Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	NO _x	CO	NMVOC	SO ₂	Total GHG emissions ⁽¹⁾
1.A.2.a. Chemicals								
1.A.2.a. Poly. paper and print								
1.A.2.a. Food processing, beverages and tobacco								
1.A.2.a. Non-metallic minerals								
1.A.2.g. Other								
1.A.3. Transport								
1.A.3.a. Domestic aviation								
1.A.3.b. Road transportation								
1.A.3.c. Railways								
1.A.3.d. Domestic navigation								
1.A.3.e. Other transportation								
1.A.4. Other sectors								
1.A.4.a. Commercial institutional								
1.A.4.b. Residential								
1.A.4.c. Agriculture forestry fishing								
1.A.4. Other								

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY (Sheet 1 of 4)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA	IMPLIED EMISSION FACTORS				EMISSIONS			AMOUNT CAPTURED ⁽²⁾
		Consumption (TJ)	NCV/GCV ⁽³⁾	CO ₂ ⁽⁴⁾	CH ₄	CO ₂ ⁽⁵⁾	CH ₄	N ₂ O	CO ₂
1.B.1. Solid fuels									
1.B.1.a. Coal mining and handling	Gasous fuels ⁽⁶⁾								
1.B.1.b. Fuel transformation	Other fossil fuels ⁽⁷⁾								
1.B.1.c. Other									
1.B.2. Oil and natural gas and other liquids	Peat ⁽⁸⁾								
1.B.2.a. Oil									
1.B.2.b. Natural gas									
1.B.2.c. Venting and flaring									
1.B.2.d. Other									
1.C. CO ₂ Transport and storage	Solid fuels								
1.C.1. Transport of CO ₂	Gasous fuels ⁽⁶⁾								
1.C.1.1. In-situ and pre-combustion	Other fossil fuels ⁽⁷⁾								
1.C.1.2. In-situ and pre-combustion	Peat ⁽⁸⁾								
1.C.1.3. In-situ and pre-combustion	Biomas ⁽⁹⁾								
1.A.1.a. Electricity generation									
1.A.1.a.1. Electricity generation	Liquid fuels								
1.A.1.a.1.1. Electricity generation	Solid fuels								
1.A.1.a.1.2. Electricity generation	Gasous fuels ⁽⁶⁾								
1.A.1.a.1.3. Electricity generation	Other fossil fuels ⁽⁷⁾								
1.A.1.a.1.4. Electricity generation	Peat ⁽⁸⁾								
1.A.1.a.1.5. Electricity generation	Biomas ⁽⁹⁾								
1.A.1.a.2. Electricity generation	Thermoelectric fuel								
1.A.1.a.2.1. Electricity generation	Liquid fuels								
1.A.1.a.2.2. Electricity generation	Solid fuels								
1.A.1.a.2.3. Electricity generation	Gasous fuels ⁽⁶⁾								
1.A.1.a.2.4. Electricity generation	Other fossil fuels ⁽⁷⁾								
1.A.1.a.2.5. Electricity generation	Peat ⁽⁸⁾								
1.A.1.a.2.6. Electricity generation	Biomas ⁽⁹⁾								
1.A.1.a.3. Combined heat and power generation									
1.A.1.a.3.1. Combined heat and power generation	Liquid fuels								
1.A.1.a.3.2. Combined heat and power generation	Solid fuels								
1.A.1.a.3.3. Combined heat and power generation	Gasous fuels ⁽⁶⁾								
1.A.1.a.3.4. Combined heat and power generation	Other fossil fuels ⁽⁷⁾								
1.A.1.a.3.5. Combined heat and power generation	Peat ⁽⁸⁾								
1.A.1.a.3.6. Combined heat and power generation	Biomas ⁽⁹⁾								

+

National Inventory Document (NID)

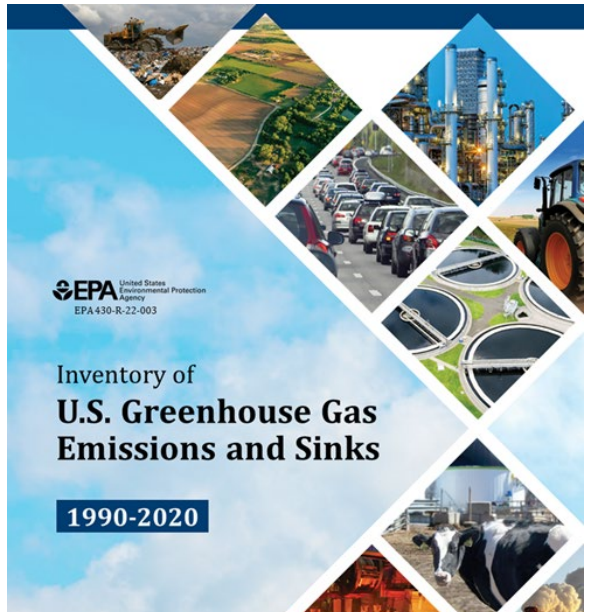


Table 3-46: N₂O Emissions from Petroleum Systems (Metric Tons CO₂ Eq.)

Activity	1990	2005	2016	2017	2018	2019	2020
Exploration	179	193	700	811	1,503	1,017	419
Production	5,518	6,145	14,370	15,069	28,724	29,734	24,386
Transportation	NE	NE	NE	NE	NE	NE	NE
Crude Refining	9,130	10,363	11,582	10,801	10,786	14,905	12,730
Total	14,827	16,702	26,652	26,680	41,012	45,656	37,534

Notation Key Definitions from MPGs

31. Each Party shall use notation keys where numerical data are not available when completing common reporting tables, indicating the reasons why emissions from sources and removals by sinks and associated data for specific sectors, categories and subcategories or gases are not reported. These notation keys include:

- (a) “NO” (not occurring) for categories or processes, including recovery, under a particular source or sink category that do not occur within a Party;
- (b) “NE” (not estimated) for activity data and/or emissions by sources and removals by sinks of GHGs that have not been estimated but for which a corresponding activity may occur within a Party;
- (c) “NA” (not applicable) for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas;
- (d) “IE” (included elsewhere) for emissions by sources and removals by sinks of GHGs estimated but included elsewhere in the inventory instead of under the expected source/sink category;
- (e) “C” (confidential) for emissions by sources and removals by sinks of GHGs where the reporting would involve the disclosure of confidential information.

NO (Not Occurring) Example

- In the U.S., rice is cultivated using continuous irrigation and other practices are “not occurring,” so subcategories are reported as “NO”

TABLE 3.C SECTORAL BACKGROUND DATA FOR AGRICULTURE
Rice Cultivation
 (Sheet 1 of 1)

Inventory 2020
 Submission 2022 v1

UNITED STATES OF AMERICA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTOR ⁽¹⁾	EMISSIONS
	Harvested area ⁽²⁾ (10 ⁹ m ² /yr)	Organic amendments added ⁽³⁾		CH ₄ (g/m ²)	CH ₄ (kt)
		type	(t/ha)		
1. Irrigated					629.61
Continuously flooded	16.19	straw, farmyard manure	8.78	38.88	629.61
Intermittently flooded Single aeration	NO	NO	NO	NO	NO
Intermittently flooded Multiple aeration	NO	NO	NO	NO	NO
2. Rainfed					NO
Flood prone	NO	NO	NO	NO	NO
Drought prone	NO	NO	NO	NO	NO
3. Deep water					NO
Water depth 50–100 cm	NO	NO	NO	NO	NO
Water depth > 100 cm	NO	NO	NO	NO	NO
4. Other (please specify)					NA
Upland rice ⁽⁴⁾	NO				
Total ⁽⁴⁾	16.19				



NE (Not Estimated) Example

- Assess significance using proxy data consistent with current GL and MPGs (paragraph 32)
 - Is the likely level of emissions below 0.05% of the national total GHG emissions, excluding LULUCF, or 500 kt CO₂ eq, whichever is lower?
 - Flexibility provision
 - Higher thresholds for assessing category-level significance, i.e., 0.1% of total GHG emissions, excluding LULUCF, or 1,000 kt CO₂ eq.
 - Total estimated emissions for all gases from categories considered insignificant should be below 0.2% of the national total GHG emissions excluding LULUCF
- In the U.S., CH₄ from Enteric Fermentation from some livestock types (e.g., camels) is NE
 - Limited data, expert knowledge indicates not a large population

Agriculture		Justification		Annual estimate (kt CO ₂ Eq.)
3.A Livestock				
3.A.4	Enteric Fermentation: Camels	CH ₄	Enteric fermentation emissions from camels are not estimated because there is no significant population of camels in the United States. Due to limited data availability (no population data are available from the USDA Agricultural Census), the estimates are based on use of IPCC defaults and population data from Baum, Doug (2010). ¹³⁰ Based on this source, a Tier 1 estimate of enteric fermentation CH ₄ emissions from camels results in a value of approximately 2.8 kt CO ₂ Eq. per year from 1990 to 2020. See Chapter 5.1 for more information.	2.8
3.A.4	Enteric Fermentation: Poultry	CH ₄	No IPCC method has been developed for determining enteric fermentation CH ₄ emissions from poultry. See Chapter 5.1.	No method provided in 2006 IPCC Guidelines
3.B.1.4, 3.B.2	Manure Management: Camels	CH ₄ and N ₂ O	Manure management emissions from camels are not estimated because there is no significant population of camels in the United States. ¹³¹ Due to limited data availability and disproportionate effort to collect time-series data (i.e., no population data is available from the Agricultural Census), this estimate is based on population data from Baum, Doug (2010). ¹³² Based on this source, a Tier 1	0.1

- Proxied enteric fermentation CH₄ emissions
- Below level of significance for US

NE (Not Estimated) Example (continued)

- Report “NE” for camels in Enteric Fermentation in CRT Background data tables for activity data and other related information and emissions,
- Include explanation in CRT Table 9

**Excerpt of TABLE 3.A SECTORAL
BACKGROUND DATA FOR
AGRICULTURE
Enteric Fermentation
(Sheet 1 of 2)**

Inventory 2020
Submission 2022 v1
UNITED STATES OF
AMERICA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTORS	EMISSIONS
	Population size ⁽¹⁾	Average gross energy intake (GE)	Average CH ₄ conversion rate (Y _m) ⁽²⁾	CH ₄	CH ₄
4. Other livestock ⁽⁵⁾	2275348.73			0.04	87.14
Camels	NE	NE	NE	NE	NE
Goats	2744.91	NA	NA	9.00	24.70
Horses	2382.85	NA	NA	18.00	42.89
Mules and Asses	332.55	NA	NA	10.00	3.33
Poultry	2269691.12	NE	NE	NE	NE
Other (please specify)	197.29			82.19	16.22
Other	197.29	NA	NA	82.19	16.22



NA (Not Applicable) Example

- Common uses of notation key NA

- Reporting “NA” for gases that are not applicable to a specific activity (e.g., process CH₄ and N₂O are “not applicable” to Ammonia Production, non-emissive processes are used)
- Recovery and capture are not applicable for some activity

Excerpt of TABLE 2(I).A-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE

Emissions of CO₂, CH₄ and N₂O

(Sheet 1 of 2)

Inventory 2020
Submission 2022 v1
UNITED STATES OF AMERICA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS ⁽²⁾			EMISSIONS					
	Production/Consumption quantity		CO ₂	CH ₄	N ₂ O	CO ₂		CH ₄		N ₂ O	
						Emissions ⁽³⁾	Recovery ⁽⁴⁾	Emissions ⁽³⁾	Recovery ⁽⁴⁾	Emissions ⁽³⁾	Recovery ⁽⁴⁾
	Description ⁽¹⁾	(kt)	(t/t)			(kt)					
B. Chemical industry						57573.33	8433.30	13.05	NO,NE,NA	63.12	NO,NE,NA
1. Ammonia production ⁽⁵⁾	Ammonia Production	16855.00	1.25	NO,NA	NO,NA	12717.28	8433.30	NA	NO	NA	NO



IE (Included Elsewhere) Example

- For natural gas and petroleum systems, emissions from venting and flaring are not disaggregated
 - Available country-specific emission factors include all emissions (flaring, venting, and leaks) and cannot be disaggregated
 - Include explanation in CRT table 9 (i.e., these emissions are reported under 1.B.2.a. Oil)

Excerpt of TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY

Oil, natural gas and other emissions from energy production

Inventory 2020

Submission 2022 v1

(Sheet 1 of 1)

UNITED STATES OF AMERICA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA ⁽¹⁾			IMPLIED EMISSION FACTORS			EMISSIONS			
	Description ⁽¹⁾	Unit ⁽¹⁾	Value	CO ₂ ⁽²⁾	CH ₄	N ₂ O	CO ₂		CH ₄ ⁽⁴⁾	N ₂ O
							Emissions ⁽³⁾	Amount captured		
	<i>(kg/unit)</i> ⁽⁵⁾						<i>(kt)</i>			
1. B. 2. a. Oil⁽⁶⁾							30160.29	NA	1827.71	0.04
1. B. 2. c. Venting and flaring							IE	NA	IE	0.12
Venting							IE	NA	IE	
i. Oil	Production	NA	NA	IE,NA	IE		IE	NA	IE	
ii. Gas	Production	NA	NA	IE,NA	IE		IE	NA	IE	
iii. Combined	Production	NA	NA	IE,NA	IE		IE	NA	IE	
Flaring⁽⁸⁾							IE	NA	IE	0.12
i. Oil	Production	NA	NA	IE,NA	IE	NA	IE	NA	IE	0.08
ii. Gas	Production	NA	NA	IE,NA	IE	NA	IE	NA	IE	0.03
iii. Combined	Gas Flared	10 ⁹ ft ³	NA	IE,NA	IE	IE	IE	NA	IE	IE

C (Confidential) Example

- Common use is for Activity Data considered confidential information
- Emissions and removals are typically not considered confidential, but may be aggregated differently depending on national circumstances

Excerpt of TABLE 2(I).A-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE

Inventory 2020

Emissions of CO₂, CH₄ and N₂O
(Sheet 1 of 2)

Submission 2022 v1

UNITED STATES OF AMERICA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS ⁽²⁾			EMISSIONS					
	Production/Consumption quantity		CO ₂	CH ₄	N ₂ O	CO ₂		CH ₄		N ₂ O	
	Description ⁽¹⁾	(kt)				Emissions ⁽³⁾	Recovery ⁽⁴⁾	Emissions ⁽³⁾	Recovery ⁽⁴⁾	Emissions ⁽³⁾	Recovery ⁽⁴⁾
			(t/t)			(kt)					
A. Mineral industry						63637.74	NO,NE,IE				
B. Chemical industry						57573.33	8433.30	13.05	NO,NE,NA	63.12	NO,NE,NA
1. Ammonia production ⁽⁵⁾	Ammonia Production	16855.00	1.25	NO,NA	NO,NA	12717.28	8433.30	NA	NO	NA	NO
2. Nitric acid production	Nitric Acid Production	7970.00			0.00					31.20	NO
3. Adipic acid production	Adipic Acid Production	C	NA		C	NA	NA			27.87	NO
4. Caprolactam, glyoxal and glyoxylic acid production						NE,NA	NE,NA			4.05	NO,NE
a. Caprolactam	Production	450.00	NA		0.01	NA	NA			4.05	NO
b. Glyoxal	Production	NE	NE		NE	NE	NE			NE	NE
c. Glyoxylic acid	Production	NE	NE		NE	NE	NE			NE	NE

Summary

- Use notation keys to add transparency to your reporting.
- Notation keys continue to be required in the MPGs under the Paris Agreement.
- Document the rationales for your choices.
- A category using NE may be a key category.
 - Review all categories reported as NE to guide inventory improvements and focus on those that are significant.



Resources

- 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 1, Chapter 8, Section 8.2.5: Notation keys and completeness information, available at <https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>
- Technical handbook for developing country Parties on Preparing for implementation of the enhanced transparency framework under the Paris Agreement, available at <https://unfccc.int/documents/267112>
- Transparency Reporting Guidelines (i.e., MPGs)
 - Katowice decisions: Annex to 18/CMA.1, Chapter II, Section C, Subsection 5 Assessment of completeness, available at https://unfccc.int/sites/default/files/resource/CMA2018_03a02E.pdf
 - Glasgow decisions: 5/CMA.3, available at <https://unfccc.int/documents/460951>



Thank you!

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MPG Notation Definitions, 18/CMA.1 (Katowice)

Modalities, Procedures and Guidelines (MPGs) for the transparency framework for action and support referred to in Article 13 of the Paris Agreement found in Annex to 18/CMA.1, Chapter II, paragraphs 31 and 32:

31. Each Party shall use notation keys where numerical data are not available when completing common reporting tables, indicating the reasons why emissions from sources and removals by sinks and associated data for specific sectors, categories and subcategories or gases are not reported. These notation keys include: (a) “NO” (not occurring) for categories or processes, including recovery, under a particular source or sink category that do not occur within a Party;

(b) “NE” (not estimated) for activity data and/or emissions by sources and removals by sinks of GHGs that have not been estimated but for which a corresponding activity may occur within a Party;

(c) “NA” (not applicable) for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas;

(d) “IE” (included elsewhere) for emissions by sources and removals by sinks of GHGs estimated but included elsewhere in the inventory instead of under the expected source/sink category;

(e) “C” (confidential) for emissions by sources and removals by sinks of GHGs where the reporting would involve the disclosure of confidential information.

32. Each Party may use the notation key “NE” (not estimated) when the estimates would be insignificant in terms of level according to the following considerations: emissions from a category should only be considered insignificant if the likely level of emissions is below 0.05 per cent of the national total GHG emissions, excluding LULUCF, or 500 kilotonnes of carbon dioxide equivalent (kt CO₂ eq), whichever is lower. The total national aggregate of estimated emissions for all gases from categories considered insignificant shall remain below 0.1 per cent of the national total GHG emissions, excluding LULUCF. Parties should use approximated activity data and default IPCC emission factors to derive a likely level of emissions for the respective category. Those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO₂ eq, whichever is lower. The total national aggregate of estimated emissions for all gases from categories considered insignificant, in this case, shall remain below 0.2 per cent of the national total GHG emissions, excluding LULUCF.

Noting the Use of Flexibility, 5/CMA.3 (Glasgow)

The decision 5/CMA.3 (Glasgow) notes the following in para. 5(1):

5. Decides that those developing country Parties that need flexibility in the light of their capacities may, when reporting on a provision for which they have a capacity constraint, choose one or more of the following options, as applicable, to reflect the application of the specific flexibility provisions included in the annex to decision 18/CMA.1 in the common reporting tables and common tabular formats, as contained in annexes I and II, respectively:

(a) Use the new notation key “FX” (flexibility) in the relevant common reporting tables or common tabular formats, providing an explanation of how the specific flexibility provision has been applied in the corresponding documentation box;