
Plan d'assurance et de
contrôle qualité (AQ/CQ)
de l'inventaire des gaz à
effet de serre (GES)
1990–2022 : Energie

Initiative pour la transparence de l'action climatique – ICAT

Plan d'assurance et de contrôle qualité (QA/QC) de l'inventaire des gaz à effet de serre (GES) 1990–2022 : Energie

Livrable 2.d

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PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF THE ENVIRONMENT AND QUALITY OF LIFE

QA/QC Plan
to the
GHG inventory 1990-2022
- Energy -

November 2025

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1 Energy (CRT sector 1)

1.1 Overview of the sector and background information

In the Energy Sector, emissions originating from fuel combustion activities in road traffic, in the energy and manufacturing industry, in the commercial, agricultural, and residential sector (Category 1.A) as well as fugitive emissions from fuels (Category 1.B) are considered.

Emissions from the energy sector are the main source of GHGs in Algeria. In the year 2022, about 82.6% of national total GHGs emissions and 86.1% of national total CO₂ emissions from Algeria originated from the energy sector.

1.2 Fuel combustion (1.A)

Methodological issues

In the following figure is provided the decision tree and the decision (highlighted) for estimating CO₂, CH₄ and N₂O emissions from

- 1.A.1 *Energy industries*
- 1.A.2 *Manufacturing Industries and Construction*
- 1.A.3 *Transport*
- 1.A.4 *Other Sectors*

Figure 1-1 Decision tree for estimating GHG emission from 1.A Fuel Combustion Activities

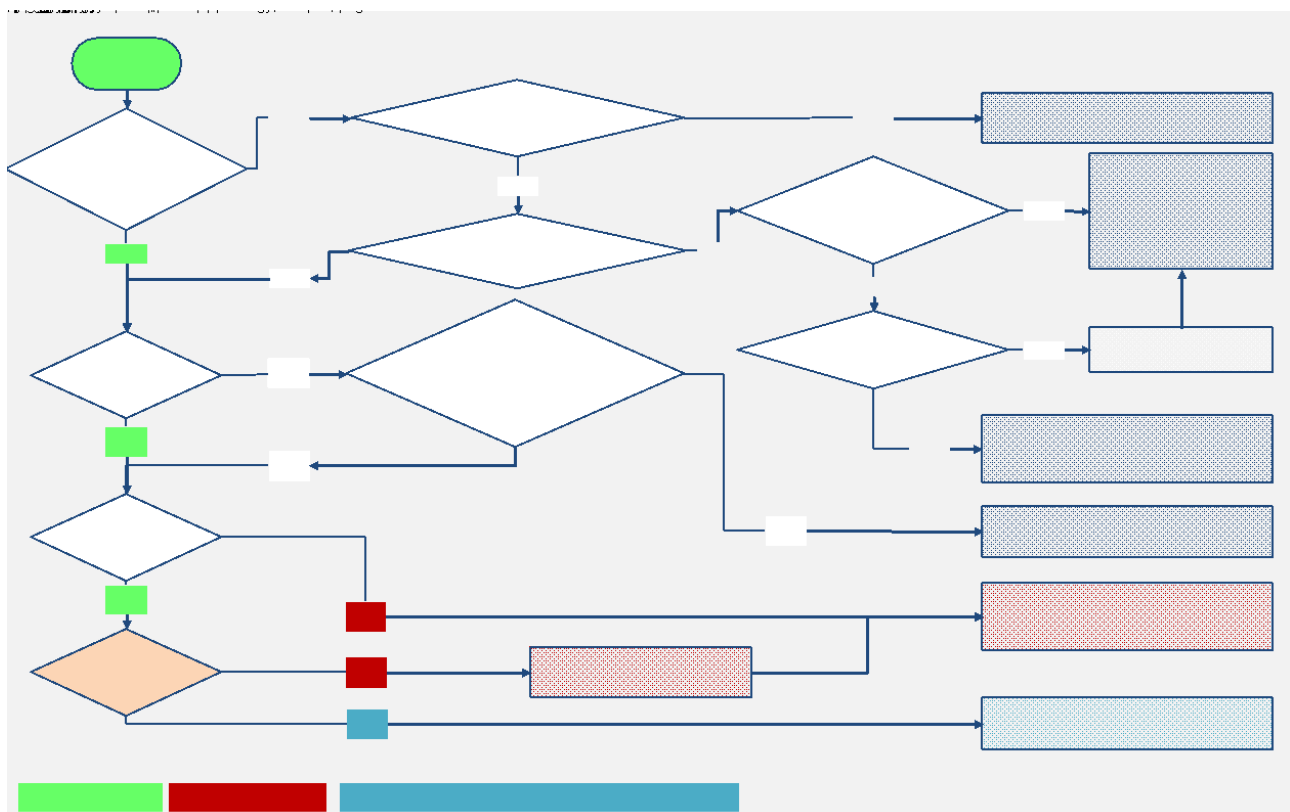


Table 1-1 Sample calculation – Tier1 1.A.1.a.i Electricity Generation

1.A.1.a.i Electricity Generation	Unit	Formula	Source	Source - Description	Comments	1990
Fuel						
Natural Gas (including LNG)	Mio m3		Sonelgaz	BilansEnergetique_1990-2022.xlsx	„GHG“\06_Inventory\2024_submission\01_Energy\EnergyBalance\	4,638
AD (GJ) (net)	GJ	=Fuel(Mio m3)*NCV*1000				165,175,537.9
AD (TJ) (net)	TJ	=Fuel(Mio m3)*NCV				165,175.5379
NCV (net calorific value)	TJ/Mio m3	39.57*0,9	Décision ministériel N°271 /2012; Annexe 3	GCV=39.57	0.9: OECD/IEA, 2005: Energy Statistics Manual, Table A3.12 GCV versus NCV of Natural Gas	35.61
Type of NCV						CS
EF CO2	kg CO2/TJ		TABLE 2.2 (page 2.16)	Vol. 2, Chapter 2: Stationary Combustion; 2006 IPCC Guidelines	Sheet EF IPCC_1A	56,100
Type of EF						D
CO2	Gg = kt	=AD(TJ) * EF _{CO2} / 10^6	EQUATION 2.1 (page 2.11)	Vol. 2, Chapter 2: Stationary Combustion; 2006 IPCC Guidelines		9,266
Method (Tier)						T1
EF N2O	kg N2O/TJ		TABLE 2.2 (page 2.16)	Vol. 2, Chapter 2: Stationary Combustion; 2006 IPCC Guidelines	Sheet EF IPCC_1A	0.1
Type of EF						D
N2O	Gg = kt	=AD(TJ) * EF _{N2O} / 10^6	EQUATION 2.1 (page 2.11)	Vol. 2, Chapter 2: Stationary Combustion; 2006 IPCC Guidelines		0.02
Method (Tier)						T1
EF CH4	kg CH4/TJ		TABLE 2.2 (page 2.16)	Vol. 2, Chapter 2: Stationary Combustion; 2006 IPCC Guidelines	Sheet EF IPCC_1A	1.0
Type of EF						D
CH4	Gg = kt	=AD(TJ) * EF _{CH4} / 10^6	EQUATION 2.1 (page 2.11)	Vol. 2, Chapter 2: Stationary Combustion; 2006 IPCC Guidelines		0.17
Method (Tier)						T1

1.2.1 Comparison of the Sectoral Approach (SA) with the Reference Approach

Folder	\06_Inventory\2024_submission\01_Energy\Reference_App
File	ReferenceApproach_DZA_2022.xlsx
NID CHAPTER	3.2.1 Comparison of the Sectoral Approach (SA) with the Reference Approach

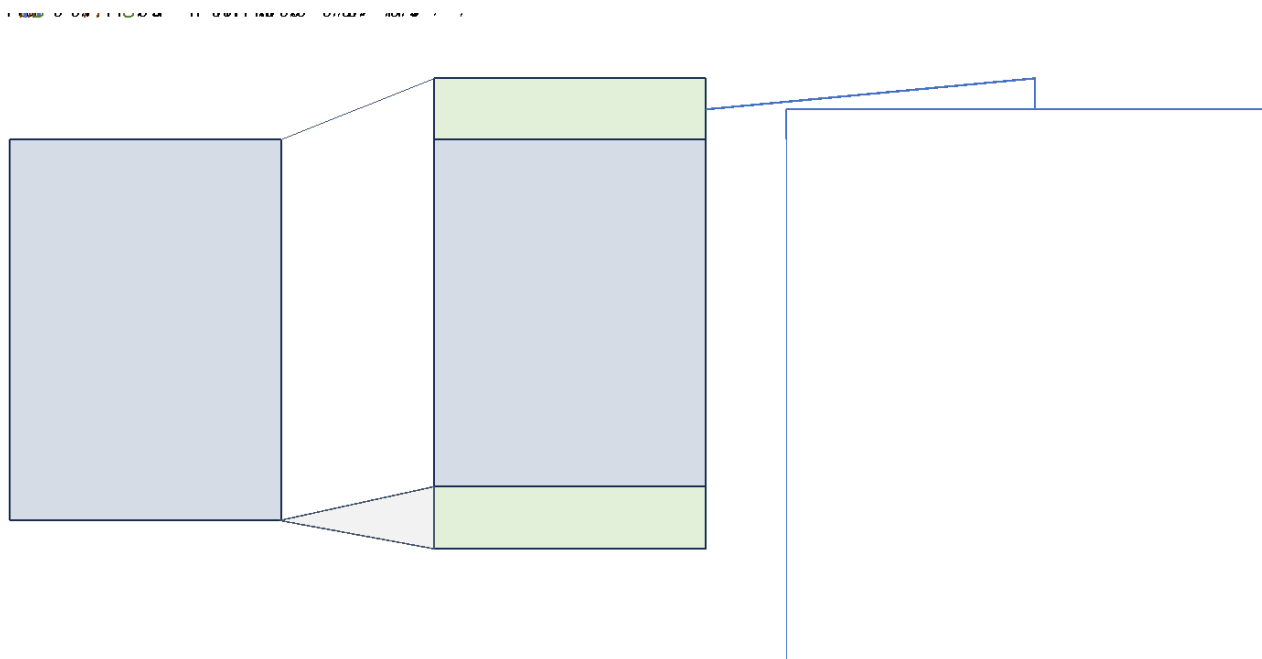


Figure 1-2 Reference approach versus sectoral approach

Sources: 2006 IPCC Guidelines, Vol. 2, Chapter. 6 (6.8), Figure 6.1.

Explanation of differences between reference approach and sectoral approach

- Time series data consistency: Different data sources are used to estimate CO₂ emissions by the sectoral and reference approaches which makes time series incoherent mainly for the following reasons:
 - Energy balance is used to extract time series data for the reference approach for all years 1990-2022. The energy balance includes some data aggregated for the time period of 1990-2009. Data from UNDS are used to fill up the gaps of the missing data in the energy balance.
 - The methodology of energy balance development and data categories in the energy balance changed in year 2010 with more disaggregated categories.
 - Sectoral data were missing for years 1990 – 2009, therefore data from UNSD database were used.
 - All data of fuels used by the power generation are provided by the company Sonelgaz for the whole period 1990- 2022.
 - The ministry of Energy provided data for the period of 2010-2022 and the gaps have been completed using data from UNSD¹ for this period.
- Use of country specific NCVs (CS NCV) which were partly significant different to default NCV provided by 2006 IPCC guidelines and UN default for natural gas (TJ / 10⁶ m³) (see table below).
- Use of different CS NCVs for natural gas which are based on CS Gross Calorific Value (GCV) due to

¹ United Nations Statistics Division (UNSD) <https://unstats.un.org/UNSDWebsite/>; UNSD energy statistics <https://unstats.un.org/unsd/energystats/>.

Decision No. 271 of December 27, 2012 of the Ministry of Energy and Mines setting the units of measurement and conversion rates used. Annex 3.²

- Gaseous fuels:
 - Use of 2006 IPCC EF for CO₂ for natural gas: 56.10 tCO₂/TJ.
 - In sectoral approach the non-energy use of natural gas for ammonia, methanol and other petrochemical production is not included.
 - In sectoral approach, additional data collected for refining, liquification and extraction of oil and gas were used; these data were not included in the Energy balance published by MEM.
- Solid fuels: Use of blast furnace gas and coke oven gas was provided in all years.

Many improvements are planned (see sectoral sections of Chapter 3 or Chapter 10) and are included in the National Inventory Improvement Plan (NIIP) to reduce the differences between reference approach and sectoral approach.

In the following table are presented the applied country specific (CS) net calorific values (NCVs) and conversion factors applied for conversion to energy units in CRT sector 1.

Table 1-2 Country specific (CS) Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT sector 1

Fuel type	Fuel	Unit	Net calorific value (NCV)		Difference	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison		
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 =	39.02 UN default	8.7%	3.41
		TJ / Gg	35.61	48.0 2006 IPCC default		
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 =	43.0	4.2%	1.79
			41.21			
	Motor Gasoline*	TJ / Gg	44.75 * 0.95 =	44.3	4.0%	1.79
			42.51			
	Residual Fuel Oil	TJ / Gg	42.18 * 0.95 =	40.4	0.8%	0.33
			40.07			
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 =	47.3	7.6%	3.58
			43.72			
	Other Kerosene	TJ / Gg	43.92 * 0.95 =	43.8	4.7%	2.08
			41.72			
	Other Petroleum Products	TJ / Gg	-	40.2		
Conversion from GCV to NCV			Default			
Natural gas			1 NCV = 0.9 x GCV			
Petroleum products			1 NCV = 0.95 x GCV			
Source	CS Gross Caloric Value (GCV)		Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ³			
	Default Net Calorific values (NCVs)		2006 IPCC Guidelines, Vol. 2, Chap. 1 (1.4.1.3), Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)			

² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines.

³ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines.

Fuel type	Fuel	Unit	Net calorific value (NCV)		Difference
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
Conversion from GCV to NCV			International Recommendations for Energy Statistics (IRES) (2018) ⁴ : Table 4 Difference between net and gross calorific values for selected fuels		
Note:					
D	Default	CS	Country specific	PS	Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.					

1.2.1.1 Methodology

The default methodology is applied according to 2006 IPCC Guidelines⁵. The Reference Approach methodology breaks the calculation of carbon dioxide emissions from fuel combustion into 5 steps:

Step 1: Estimate apparent fuel consumption in original units,

Step 2: Convert to a common energy unit,

Step 3: Multiply by carbon content to compute the total carbon,

Step 4: Compute the excluded carbon,

Step 5a: Correct for carbon unoxidized,

Step 5b: Convert to CO₂ emissions,

These steps are expressed in the following equation.

Equation 6.1: CO₂ Emissions from fuel combustion using the Reference approach
(2006 IPCC GL, Vol. 2, Chap. 6.3)

$$CO_2\text{emi} = \sum_{\text{all fuels}} \left[\left((AppCons_{fuel} \times ConvFactor_{fuel} \times CC_{fuel}) \times 10^{-3} - ExclCarbon_{fuel} \right) \times COF_{fuel} \times \frac{44}{12} \right]$$

Where:

CO ₂ emi	= CO ₂ emissions (Gg CO ₂)
Fuel	= liquid fuels (motor gasoline, gas/diesel oil etc.), solid fuels (coking coal, other bituminous coal, etc.), gaseous fuels, other fossil fuel (solid waste, etc.), biomass (fuelwood, etc), peat
AppCons	= production + imports – exports – international bunkers - stock change
Conv Factor basis	= conversion factor for the fuel to energy units (TJ) on a net calorific value basis
CC	= carbon content (tonne C/TJ) Note that tonne C/TJ is identical to kg C/GJ
Excluded Carbon	= carbon in feedstocks and non-energy use excluded from fuel combustion emissions (Gg C)
COF	= fraction of carbon oxidized.

⁴ <https://unstats.un.org/unsd/energystats/methodology/ires/>

⁵ 2006 IPCC Guidelines, Volume 2: Energy, Chapter 6: Reference Approach, sub-chapter 6.3 ALGORITHM, page 6.5

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Usually the value is 1, reflecting complete oxidation. Lower values are used only to account for carbon retained indefinitely in ash or soot
= molecular weight ratio of CO₂ to C

1.2.1.1.1 Activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx
	UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx
	BEN 2021 & 2022.xlsx

1.2.1.1.2 Apparent consumption of fuels

According to 2006 IPCC Guidelines, the supply of fuels is calculated based on data for each fuel and inventory year:

- ⇒ the amounts of primary fuels **produced**⁶ (production of secondary fuels and fuel products are not included);
- ⇒ the amounts of primary and secondary fuels **imported**;
- ⇒ the amounts of primary and secondary fuels **exported**;
- ⇒ the amounts of primary and secondary fuels **used in international bunkers**;
- ⇒ the net **increases or decreases in stocks** of primary and secondary fuels.

The production of secondary fuels should be ignored in the calculations because the carbon in these fuels is already included in the supply of primary fuels from which they were derived.

The **apparent consumption of a primary fuel** is calculated as follows:

Equation 6.2: Apparent consumption of primary fuel (2006 IPCC GL, Vol. 2, Chap. 6.3)

$$\begin{aligned}
 \text{Apparent Consumption}_{fuel} &= \text{Production}_{fuel} \\
 &+ \text{Imports}_{fuel} \\
 &- \text{Exports}_{fuel} \\
 &- \text{International Bunkers}_{fuel} \\
 &- \text{Stock Change}_{fuel}
 \end{aligned}$$

The **apparent consumption of a secondary fuel** is calculated as follows:

Equation 6.3: Apparent consumption of secondary fuel (2006 IPCC GL, Vol. 2, Chap. 6.3)

$$\begin{aligned}
 \text{Apparent Consumption}_{fuel} &= \text{Imports}_{fuel} \\
 &- \text{Exports}_{fuel} \\
 &- \text{International Bunkers}_{fuel}
 \end{aligned}$$

⁶ Production of coal includes the quantities extracted or produced calculated after any operation for removal of inert matter.

– $Stock\ Change_{fuel}$

1.2.1.1.3 Conversion to energy units

Step 1: Convert to a common energy unit.

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. For estimation of emissions that arise from combustion of fossil fuels, the default net calorific values (NCVs) have been used according to 2006 IPCC Guidelines and presented in the following table.

1.2.1.1.4 Excluded carbon

Step 2: Compute the excluded carbon

The amount of carbon which does not lead to fuel combustion emissions has to be excluded, because the aim is to provide an estimate of fuel combustion emissions (category 1A).

Carbon excluded from fuel combustion is either emitted in another sector of the inventory (for example as an industrial process emission) or is stored in a product manufactured from the fuel. In the 1996 Guidelines, carbon in the apparent consumption that does not lead to fuel combustion emissions has been referred to as “stored carbon” but, as the above definition makes clear, stored carbon is only part of the carbon to be excluded from “total carbon” in the 2006 IPCC Guidelines. The main flows of carbon concerned in the calculation of excluded carbon are those used as feedstock, reductant or as non-energy products. Table 3.8 sets out the main products in each group. If countries have other fossil fuel carbon products which should be excluded, they should be taken into consideration and documented.

Table 1-3 Fuel used as feedstock, reductant and/or non-energy products in Algeria.

	Fuel	Fuel used as feedstock, reductant and/or non-energy products	Emissions are assumed to be included in	Not reported in Energy balance
Feedstock	Naphtha	x	Polymer industries	x
	LPG (butane/propane)	NO		
	Refinery gas	NO		
	Gas/diesel oil and Kerosene	NO		
	Natural gas	x	2.B.1. Ammonia production 2.B.2. Nitric acid production 2.B.8.a. Methanol production 2.B.8.b. Ethylene production	
	Ethane	x		
Reductant	Coke oven coke (metallurgical coke)	x	2.C.1. Iron and steel production	x
	Petroleum coke	NO		
	Coal and coal tar/pitch	NO		
	Natural gas	NO		
Non-energy products	Bitumen	Use	2.D.3.b. Road paving with asphalt 2.D.3.c. Asphalt roofing	x

QA/QC Plan

	Fuel	Fuel used as feedstock, reductant and/or non-energy products	Emissions are assumed to be included in	Not reported in Energy balance
		Disposal	5.A. Solid waste disposal 5.C.1.b Waste Incineration - Non-biogenic	
	Lubricants	Use	2.D.1. Lubricant use 5.C	x
		Disposal	5.A. Solid waste disposal 5.C.1.b Waste Incineration - Non-biogenic	
	Paraffin waxes	x	2.D.2. Paraffin wax use	x
	White spirit	x		x

1.2.1.1.5 Emission factor**1.2.1.1.5.1 Carbon content**

Step 3: Multiply by carbon content to compute the total carbon

For estimation of emissions that arise from combustion of fossil fuels, the default carbon content has been used according to 2006 IPCC Guidelines and presented in the following table.

1.2.1.1.5.2 Fraction of carbon oxidized

Step 5a: Correct for carbon unoxidized

For estimation of emissions that arise from combustion of fossil fuels, the default fraction of carbon oxidized has been used according to 2006 IPCC Guidelines and presented in the following table.

A small part of the fuel carbon entering the combustion process escapes oxidation. This fraction is usually small (99 to 100 % of the carbon is oxidized) and it is assumed that 100% is oxidized.

Table 1-4 Reference approach: Default net calorific values (NCVs), default values of carbon content (CC), default fraction of carbon oxidized and indication which fuel was used in Algeria

Fuels		Default Net Calorific Values (NCVs)	Default values of Carbon Content (CC)	Default Fraction of carbon oxidized	Fuel provided in Energy balance
		TJ/kt	kg/GJ	%	
LIQUID (Crude oil and petroleum products)					
Crude Oil		42.3	20	1	X
Natural Gas Liquids		44.2	17.5	1	X
Gasoline	Motor Gasoline	44.3	18.9	1	X
	Navigation Gasoline	44.3	19.1	1	
	Jet Gasoline	44.3	19.1	1	
Jet Kerosene		44.1	19.5	1	X
Other Kerosene		43.8	19.6	1	
Gas/Diesel Oil		43.0	20.2	1	X
Residual Fuel Oil		40.4	21.1	1	X
Liquefied Petroleum Gases		47.3	17.2	1	X
Ethane		46.4	16.8	1	
Naphtha		44.5	20	1	

Fuels		Default Net Calorific Values (NCVs)	Default values of Carbon Content (CC)	Default Fraction of carbon oxidized	Fuel provided in Energy balance
		TJ/kt	kg/GJ	%	
Bitumen		40.2	22	1	X
Lubricants		40.2	20	1	
Refinery Feedstocks		43.0	20	1	
Other Oil	Refinery Gas ²	49.5	15.7	1	X
	White Spirit and SBP	40.2	20	1	
	Other Petroleum Products	40.2	20	1	
SOLID (Coal and coal products)					
Anthracite		26.7	26.8	1	
Coking Coal		28.2	25.8	1	X
Other Bituminous Coal		25.8	25.8	1	
Sub-Bituminous Coal		18.9	26.2	1	
Lignite		11.9	27.6	1	
Patent Fuel		20.7	26.6	1	
Coke	Coke Oven Coke and Lignite Coke	28.2	29.2	1	x
	Gas Coke	28.2	29.2	1	
Coal Tar		28.0	22.0	1	
Derived Gases	Gas Works Gas ⁴	38.7	12.1	1	
	Coke Oven Gas ⁵	38.7	12.1	1	X
	Blast Furnace Gas ⁶	2.5	70.8	1	X
	Oxygen Steel Furnace Gas ⁷	7.1	49.6	1	
GAS (Natural Gas)					
Natural Gas		48.0	15.3	1	X
OTHER FOSSIL FUELS					
Municipal Wastes (non-biomass fraction)		10.0	25.0	1	
Industrial Wastes		NA	39.0	1	
Waste Oil ⁸		40.2	20.0	1	
PEAT					
Peat		9.8	28.9	1	
BIOMASS					
Solid Biofuels	Wood/Wood Waste ⁹	15.6	30.5	1	X
	Charcoal ¹²	29.5	30.5	1	
Source: 2006 IPCC Guidelines, Volume 2, Chapter 1. Footnote (above) in this tables are referred to footnotes provided in tables in 2006 IPCC Guidelines.		TABLE 1.2 ⁷	TABLE 1.3 ⁸	TABLE 1.4 ⁹	

⁷ 2006 IPCC Guidelines, Volume 2: Energy, Chapter 1: Introduction, sub-chapter 1.4.1.3 ACTIVITY DATA SOURCES, page 1.17

⁸ 2006 IPCC Guidelines, Volume 2: Energy, Chapter 1: Introduction, sub-chapter 1.4.2.1 CO₂ EMISSION FACTORS, page 1.20

⁹ 2006 IPCC Guidelines, Volume 2: Energy, Chapter 1: Introduction, sub-chapter 1.4.2.1 CO₂ EMISSION FACTORS, page 1.23

1.2.2 International bunker fuels

International bunkers are relevant for

- International navigation: international airports;
- International navigation on Mediterranean Sea.

Emissions from International Bunkers are not included in the National Total.

1.2.2.1 International Aviation (International bunkers)

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3ai_TransportTool_DZA.xlsx
NID CHAPTER	3.2.2.1 International Aviation (International bunkers)

As described in the 2006 IPCC Guidelines, the CRT category International Aviation (International bunkers) includes emissions from flights that depart in one country and arrive in a different country. Also, International navigations include take-offs and landings for these flight stages. It is good practice, that emissions from *Domestic navigation* are reported separately from international navigation and it is good practice to apply the definition presented in the following table.

Table 1-5 Criteria for defining international or domestic Aviation

Criteria for defining international or <i>Domestic navigation</i> (applies to individual legs of journeys with more than one take-off and landing)		
Journey type between two airports	Domestic	International
• Departs and arrives in same country.	Yes	No
• Departs from one country and arrives in another.	No	Yes
Source: 2006 IPCC Guidelines, Volume 2, Chapter 3: Mobile Combustion, 3.6.1.3 Choice of activity data, TABLE 3.6.		

1.2.2.1.1 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3ai_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.2.1.1.1 Choice of methods – TIER 1

For estimating the CO₂, CH₄ and N₂O emissions, the 2006 IPCC Guidelines Tier 1 approach¹⁰ has been applied:

Equation 3.6.1: Aviation equation (2006 IPCC GL, Vol. 3, Chap. 3.6.1.1)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions_{GHG, fuel} = emissions of a given GHG by type of fuel (kg GHG)

¹⁰ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 3: Mobile Combustion - 3.6.1.1 Methodological issues - Choice of method

Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., jet kerosene, aviation gasoline

1.2.2.1.1.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\1A3\1A3a
File	AD_flight-movement.xlsx
Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx
	UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx
	BEN 2021 & 2022.xlsx

The following fuels are used in international aviation:

Liquid fuels: • Jet Kerosene

Fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics¹¹ ;
- 2008 – 2022 are provided by the MEM (Naftal).

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tons or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category International Bunkers - International Navigation are provided.

Table 1-6 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category International Bunkers - International aviation

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV *
liquid	Jet Kerosene	TJ / Gg	43.92 * 0.95 = 41.72	44.1
Conversion from GCV to NCV			Default	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)		Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹²	
	Default Net Calorific values (NCVs)		2006 IPCC Guidelines, Vol. 2, Chap. 1 (1.4.1.3), Table 1.2	
Note:				
D	Default	CS	Country specific	PS Plant specific
*	For comparison			

¹¹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

¹² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'Énergie et des mines.

1.2.2.1.1.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3ai_TransportTool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-7 GHG Emission factor TIER 1 for CRT category International Bunkers - International aviation

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
liquid	Jet Kerosene	71 500	D	0.5	D	2	D
Source	2006 IPCC Guidelines Vol. 2, Chap. 3 (3.6.1.2) Table 3.6.4 CO ₂ emission factors and Table 3.6.5 NON-CO ₂						

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.2.1.2 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3ai_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in NID chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category International Bunkers - International aviation are presented in the following table.

Table 1-8 Uncertainty for CRT category International Bunkers - International aviation.

Uncertainty	Jet Kerosene			Reference
	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	10%	10%	10%	2006 IPCC GL, Vol. 2, Chap. 3.6.1.7
Emission factor (EF)	5%	82%	133%	
Combined Uncertainty (U)	11%	83%	133%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics¹³
- 2008 – 2022 are provided by MEM (Naftal).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹⁴;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹⁵.

The activity Data related to Jet kerosene consumed in International Bunkers - International aviation for the period between 2008 and 2022 were revised by using the data provided by Naftal.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be done for future submissions.

1.2.2.1.3 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3ai_TransportTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-9 Planned improvements for CRT category International Bunkers - International Aviation

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.a.i 1.A.3.a.ii	Preparation of a consistent timeseries of activity data - National Energy balance - for the period 1990 – 2007 for all aviation related fuels: Jet Kerosene, Aviation Gasoline, Jet Gasoline, Other	AD	Accuracy Comparability Transparency Consistency	high
1.A.3.a.i 1.A.3.a.ii	Investigation regarding fuel consumption of aviation gasoline used by small planes and helicopters.	AD	Accuracy Completeness	high
1.A.3.a.i 1.A.3.a.ii	Application of good practice approach to separate the activity data (fuel consumption) consistent with the definition of Table 3.6 of the 2006 IPCC GL, Vol. 2, Chapter 3 Mobile Combustion (3.6.1.3 Choice of activity data). ⇒ Improvement of Energy balance: allocation of Jet kerosene used in international aviation and Jet kerosene exported	AD	Accuracy Completeness Comparability Transparency Consistency	high
1.A.3.a.i 1.A.3.a.ii	Collection of data on aircraft movement for Tier 2 or 3 methodology and verification activities	AD	Accuracy Completeness Transparency	medium

¹³ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

¹⁴ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹⁵ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

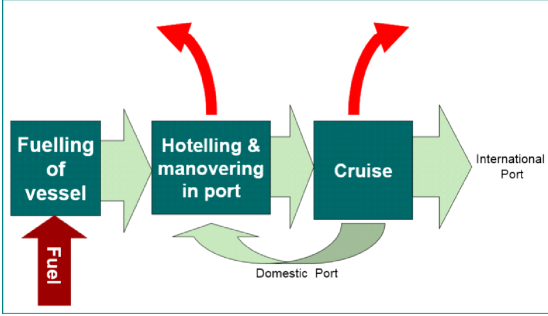
GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.a.i 1.A.3.a.ii	Application of Tier 2 methodology - Estimate fuel consumption for LTO and cruise for - international aviation - domestic aviation - Estimate emissions from LTO and cruise phases for - international aviation - domestic aviation	M EF	Accuracy Completeness Comparability Transparency Consistency	high

1.2.2.2 International navigation (International bunkers)

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File	1A3di_TransportTool_DZA.xlsx
NID CHAPTER	3.2.2.2 International navigation (International bunkers)

As described in the 2006 IPCC Guidelines, the CRT category International Water-borne Navigation (International bunkers) includes emissions from fuels used by vessels of all flags that are engaged in international water-borne navigation. The international navigation may take place at sea, on inland lakes and waterways and in coastal waters. This category excludes emissions from journeys that depart in one country and arrive in a different country. The category exclude consumption by fishing vessels (see here Other Sector - Fishing). It is good practice, that emissions from *Domestic navigation* are reported separately from international navigation and it is good practice to apply the definition presented in the following table.

Table 1-10 Criteria for defining international or domestic water-borne navigation

Criteria for defining international or domestic water-borne navigation (applies to each segment of a voyage calling at more than two ports)			
Journey type between two ports	Domestic	International	
Departs and arrives in same country	Yes	No	
Departs from one country and arrives in another	No	Yes	
Source: 2006 IPCC Guidelines, Volume 2, Chapter 3: Mobile Combustion, 3.5.1.3 Choice of activity data, TABLE 3.5.4. ¹⁶			Source: EMEP/EEA air pollutant emission inventory guidebook 2019, Chapter 1.A.3.d Navigation (shipping) 2019, Figure 2 – 1 Flow diagram for the contribution from navigation to mobile sources combustion emissions ¹⁷

Algeria stretches for 1,622 km along the coastline including eleven commercial ports:

- 3 oil ports: Arzew, Skikda and Béjaïa ports.
- 3 main multifunctional ports: Algiers, Oran and Annaba ports.
- 2 medium ports: Djen Djen and Mostaganem ports.

¹⁶ https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf

¹⁷ Source: EMEP/EEA air pollutant emission inventory guidebook 2016, Part B: sectoral guidance chapters, 1. Energy, 1.A Combustion, Chapter 1.A.3.d Navigation (shipping) 2016
<https://www.eea.europa.eu/publications/emep-eea-guidebook-2016/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-d-navigation/view>

- 3 small ports: Ghazaouet, Dellys and Ténès ports.

In Algeria, there is almost no short sea shipping for goods, except for oil and petroleum products, neither short sea shipping for passengers. As presented in the following figure, the marine cargo and passenger transport increased significantly between 1995 and 1997.

1.2.2.2.1 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3di_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.2.2.1.1 Choice of methods

For estimating the CO₂, CH₄ and N₂O emissions the 2006 IPCC Guidelines Tier 1 approach¹⁸ has been applied:

Equation 3.5.1: Water-borne navigation equation (2006 IPCC GL, Vol. 3, Chap. 3.5.1.1)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kg GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., Residual fuel oil, Gas/diesel oil

1.2.2.2.1.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used in international navigation:

- Liquid fuels:**
- Gas/Diesel Oil
 - Residual fuel oil

Fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics¹⁹;
- 2008 - 2022 are provided by the company Naftal (MEM).

¹⁸ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 3: Mobile Combustion - 3.5.1.1 Methodological issues - Choice of method

¹⁹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

In energy statistics production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g. in tons or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category International Bunkers - International Navigation are provided.

Table 1-11 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category International Bunkers - International Navigation

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV*
liquid	Residual fuel oil	TJ / Gg	42.18 * 0.95 = 40.07	40.4
liquid	Gas/diesel oil	TJ / Gg	43.38 * 0.95 = 41.21	43.0
Conversion from GCV to NCV			Default	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)		Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²⁰	
	Default Net Calorific values (NCVs)		2006 IPCC Guidelines, Vol. 2, Chap. 1 (1.4.1.3), Table 1.2	
Note:				
D	Default	CS	Country specific	PS Plant specific
*	For comparison			

1.2.2.2.1.3 Choice of emission factors

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File	1A3di_TransportTool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-12 GHG Emission factor TIER 1 for CRT category International Bunkers - International Navigation

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
liquid	Gas/diesel oil	74,100	D	7	D	2	D
liquid	Residual Fuel Oil	77,400	D	7	D	2	D
Source	2006 IPCC Guidelines Vol. 2, Chap. 3 (3.5.1.2) Table 3.5.2 CO ₂ EF and Table 3.5.3 NON-CO ₂ EF						
Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.2.2.2 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
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²⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'Énergie et des Mines.

File	1A3di_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category International Bunkers - International Navigation are presented in the following table.

Table 1-13 Uncertainty for CRT category International Bunkers - International Navigation.

Uncertainty	Gas/Diesel Oil			Residual Fuel Oil			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	+/-5%	+/-5%	+/-5%	+/-5%	+/-5%	+/-5%	2006 IPCC GL, Vol. 2, Chap. 3.5.1.7
Emission factor (EF)	1.5%			3.0%	+/-50 %		
		+/-50%				-40% to 140%	
			-40% to 140%				
Combined Uncertainty (U)	7%	71%	134%	7%	71%	134%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics²¹ ;
- 2008 - 2022 are provide by Naftal (MEM).
- In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the
- International Standard Industrial Classification of all Economic Activities (ISIC)²²;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities²³.

A revision of the years 1990-2007 is still pending. Activity Data for the period 2008-2022 are revised by collecting data from Naftal.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be done for future submissions.

²¹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²² (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

²³ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

1.2.2.2.3 Category-specific planned improvements

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File	1A3di_TransportTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-14 Planned improvements for CRT category International Bunkers - International Navigation

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.d.i 1.A.3.d.ii	Revision of the energy balance (1990-2007) improvement of time series completeness and consistency (consumption and production, NCV, carbon content) for all navigation related fuels: motor gasoline, gas/diesel oil, fuel oil	AD	Accuracy Comparability Transparenc y Consistency	high
1.A.3.d.i 1.A.3.d. ii	Application of good practice approach to separate the activity data (fuel consumption) consistent with the definition of Table 3.6 of the 2006 IPCC Guidelines, Volume 2, Chapter 3: Mobile Combustion, 3.5.1.3 Choice of activity data.	AD	Accuracy Comparability Transparenc y Consistency	high
1.A.3.d.i 1.A.3.d.ii	Data on fuel consumption by fuel type and engine type - Surveys of shipping companies (including ferry and freight) - Surveys of individual port and marine authorities	AD	Accuracy Transparenc y	medium
1.A.3.d.i 1.A.3.d.ii	- Ship movement data and standard passenger and freight ferry schedules - Fishery boat movements	AD	Transparenc y	medium
1.A.3.d.i 1.A.3.d.ii	Application of Tier 2 methodology - Estimate fuel consumption for movements and cruise for navigation. - Estimate emissions for movements and cruise for navigation.	M EF	Accuracy Comparability Transparenc y Consistency	medium

1.2.3 Energy industries (CRT category 1.A.1)

Energy industries are defined as consisting of economic units whose principal activity is primary energy production, transformation of energy or distribution²⁴. This section describes GHG emissions resulting from fuel combustion activities (fuel extraction or energy-producing industries) in Energy industries, which, originate from

- *public electricity and heat production plants* (CRT category 1.A.1.a);
- *Petroleum Refining* (CRT category 1.A.1.b);
- *Manufacturing of solid fuels* (CRT category 1.A.1.c).

²⁴ For more information see <https://unstats.un.org/unsd/energy/ires/IRES-web.pdf>

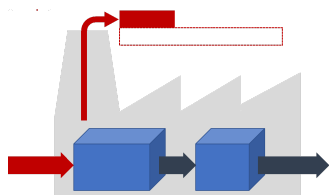
1.2.3.1 Main Activity Electricity and Heat Production (CRT category 1.A.1.a)

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File	1A1ai_EnergyInd_Tool_DZA.xlsx 1A1aii_EnergyInd_Tool_DZA.xlsx 1A1aiii_EnergyInd_Tool_DZA.xlsx	
NID CHAPTER	3.2.3.1 Main Activity Electricity and Heat Production (CRT category 1.A.1.a)	
ToDo	Check for updated reasons for trend in sectoral chapter Update GHG emissions and AD in tables & graphs from sheet 1A1ai_NIR_tables_&_graphs	
	AD	emissions
	Table B-H	Column E--R
	Graph BT	J-BL
	Check for updated reasons for trend in chapter - Trend -> 2.2.1 Energy - Executive Summary	

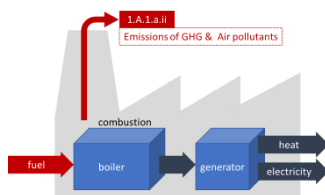
1.2.3.1.1 Category description

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	Industrial	sol	gaseous	Other fossil fuel	Peat	biomass	Industrial	sol	gaseous	Other fossil fuel	Peat	biomass	Industrial	sol	gaseous	Other fossil fuel	Peat	biomass
Estimated																		
1.A.1.a.i	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
1.A.1.a.ii	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1.A.1.a.iii	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Key Category	-	-	LA 1990 & 2022 TA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere, NO – not occurring, NE - not estimated, NA - not applicable, C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

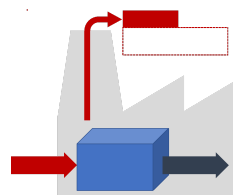
The following sub-categories are defined in the 2006 IPCC Guidelines:

1.A.1.a.i Electricity Generation

Comprises emissions from all fuel use for electricity generation from main activity producers except those from combined heat and power plants.

1.A.1.a.ii Combined Heat and Power Generation (CHP)

Emissions from production of both heat and electrical power from main activity producers for sale to the public, at a single CHP facility.

1.A.1.a.iii Heat Plants

Production of heat from main activity producers for sale by pipe network.

This section describes GHG emissions resulting from fuel combustion activities in Energy industries which originate from public electricity and heat production plants. Two types of producers can be distinguished: Main activity producer and auto-producer. According to 2006 IPCC Guidelines main activity producers are defined as those undertakings whose primary activity is to supply the public. Electricity Generation is a key source with regards to CO₂ emissions from gaseous fuels.

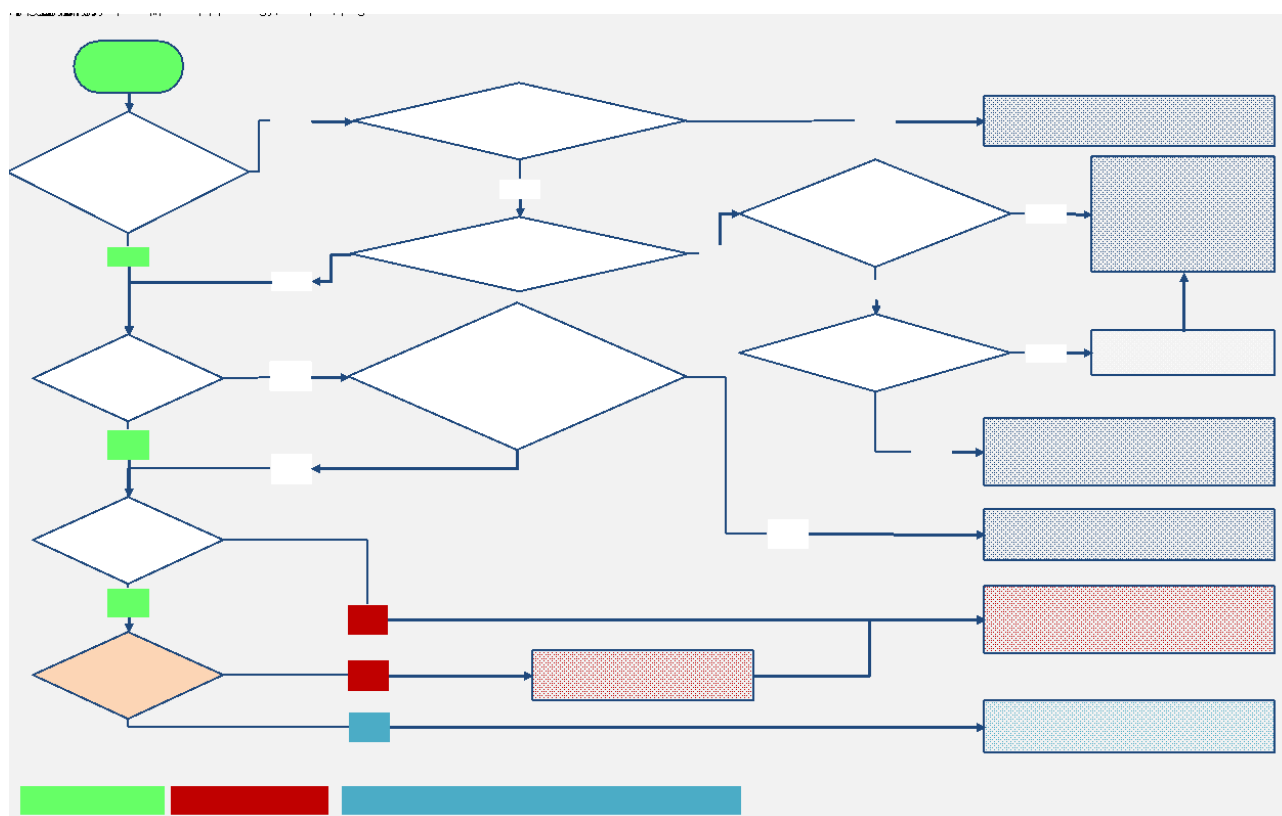
Type of producer	Reporting	Electricity plant	Heat plant	Remark
Main activity producer	1.A.1.a	● units that produce electricity or heat as their principal activity;		They may be in public or private ownership.
Auto-producer	1.A.2.m	● units that produce electricity but for which the production is not their principal activity;	units that produce heat for sale but for which the production is not their principal activity;	Emissions from own on-site use of fuel are also included.

1.2.3.1.2 Methodological issues

Folder	\\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ai_EnergyInd_Tool_DZA.xlsx 1A1aii_EnergyInd_Tool_DZA.xlsx 1A1aiii_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethology

In the following figure is provided the decision tree and the decision (highlighted) for Tier 1 method for estimating CO₂, CH₄ and N₂O emissions from 1.A.1.a *Main Activity Electricity and Heat Production*.

Figure 1-3 **Decision tree for estimating GHG emission from 1.A Fuel Combustion Activities**



1.2.3.1.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach²⁵ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.1.a.i Electricity Generation is a key category.

1.2.3.1.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for electricity production:

Liquid fuels: • Gas/Diesel Oil

Gaseous fuels: • Natural gas

Fuel consumption used for estimating the GHG are provided by Sonelgaz for the period 1990-2022.

The following tables provides an overview of installed capacity and produced electricity per technology in Algeria. During the period between 1990 and 2017, the installed capacity increased by 463% and the electricity produced increased by 418%.

Table 1-15 Installed capacity and produced electricity per technology

	Unit	1990	2000	2006	2010	2016	2022
SPE ²⁶	MW	4,686		6,736	8,446	12,702	57,189
SKTM ²⁷	MW	-		-	-	1,007	

²⁵ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

²⁶ SPE – Société Algérienne de Production de l'Électricité

²⁷ SKTM – Shariket Kahraba wa Taket Moutajadida

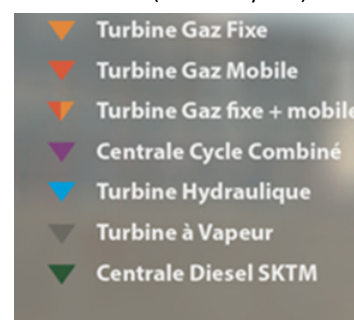
Energy (CRT sector 1)

QA/QC Plan							
Other producers	MW	-		1,170	3,036	5,412	27,884
Total	MW	4,686		7,906	11,482	19,121	19,586
Thermal steam	GWh	8,397	15,757	14,558	9,692	11,511	3,724
Thermal gas	GWh	6,704	8,830	16,463	19,564	24,441	33,971
Combined cycle	GWh	-	-	3,419	15,341	29,664	47,134
Hydraulic	GWh	135	54	218	173	72	16
Diesel	GWh	216	368	264	403	281	243
Wind	GWh	-	-	-	-	264	
Photovoltaic	GWh	-	-	-	-		665
Total	GWh	15,452	25,008	34,922	45,174	70,997	91,231 (*)

(*) Y compris les injections des tiers (29,607 GWh)

Source : MEM (2022) : Tableau 1 - Evolution de la puissance installée 1980- 2017 par producteur (MW)

Source : MEM (different years) : Tableau 1.B - Bilan Global toutes formes d'énergie confondues (en unité spécifique).



Electrification rate	98 %
Installed Capacity	24,561 MW
Transmission network	32,720 km
Distribution network	367,573 km
Length of the electricity network	400,293 km
Number of customers	10,983,538

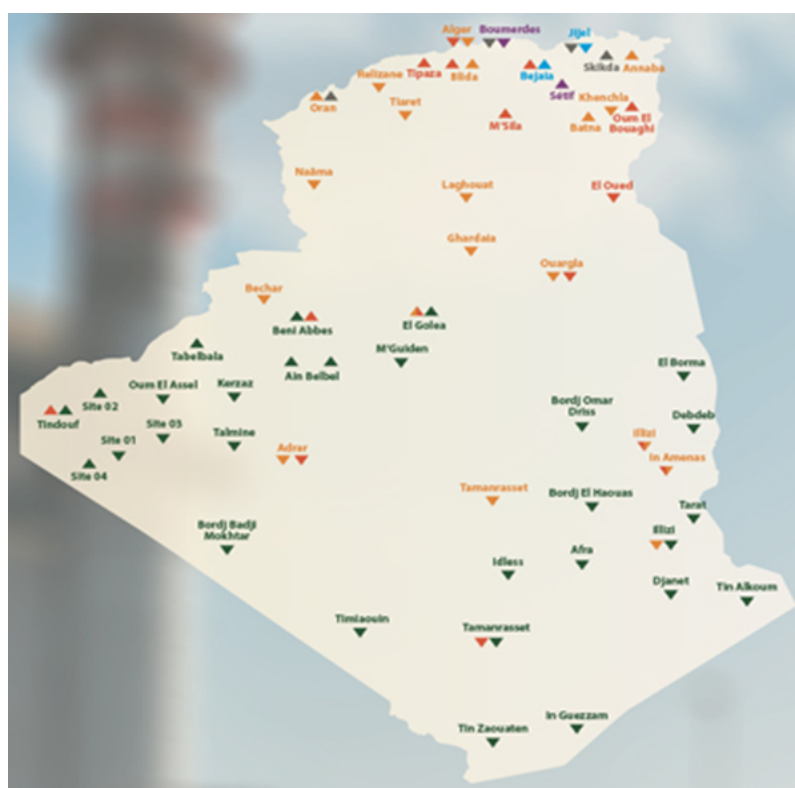


Figure 1-4 Map of power plants. Source: Sonelgaz²⁸

In energy statistics production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units. e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table, are presented the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.1.a *Main Activity Electricity and Heat Production*.

Table 1-16 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.1.a *Main Activity Electricity and Heat Production*

²⁸ Sonelgaz (2022): Carte des centrales electricité; Available at 23.09.2022 on <https://www.sonelgaz.dz/fr/3434/electricite-2>

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02	UN default
		TJ /Gg		48.0	2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0	2006 IPCC default

Conversion from GCV to NCV	Default
Natural gas	1 NCV = 0.9 x GCV
Petroleum products	1 NCV = 0.95 x GCV

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²⁹
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ³⁰ : Table 4 Difference between net and gross calorific values for selected fuels

Note:			
D	Default	CS	Country specific
PS	Plant specific		
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.			

1.2.3.1.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ai_EnergyInd_Tool_DZA.xlsx 1A1aii_EnergyInd_Tool_DZA.xlsx 1A1aiii_EnergyInd_Tool_DZA.xlsx
Sheet	EF IPCC_1A

For liquid and gaseous fuels, the default emission factors for CO₂, CH₄ and N₂O were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-17 GHG Emission factor TIER 1 for CRT category 1.A.1.a Main Activity Electricity and Heat Production

Fuel		Fuel type	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
			EF	type	EF	type	EF	type
Natural gas		gaseous	56,100	D	1	D	0.1	D
Gas / Diesel Oil		liquid	74,100	D	3	D	0.6	D
Source		2006 IPCC Guidelines. Vol. 2. Chap. 2 (2.3.2.1) Table 2.2 Default emission factors for stationary combustion in the Energy industries (page 2.16)						
Note:								
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor	

1.2.3.1.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A1
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²⁹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'Energie et des Mines.

³⁰ <https://unstats.un.org/unsd/energystats/methodology/ires/>

File	1A1ai_EnergyInd_Tool_DZA.xlsx 1A1aii_EnergyInd_Tool_DZA.xlsx 1A1aiii_EnergyInd_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.1.a *Main Activity Electricity and Heat Production* are presented in the following table.

Table 1-18 Uncertainty for CRT category 1.A.1.a Main Activity Electricity and Heat Production.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	1%	1%	1%	1%	1%	1%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	2%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	2%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are consistent as

- the same methodology is applied to the whole period,
- the activity data for the period 1990 - 2022 were provided by Sonelgaz, which is the national electricity producer.

1.2.3.1.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ai_EnergyInd_Tool_DZA.xlsx 1A1aii_EnergyInd_Tool_DZA.xlsx 1A1aiii_EnergyInd_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,

- record keeping, use of write protection,
- unique use of formulas, special cases are documented/highlighted,
- quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - Sonelgaz: Chiffres Clés (different years)³¹
 - Sonatrach: Rapport Annuel (different years)³²
 - national statistic published by MEM and Office National des Statistiques (ONS)³³ and
 - international energy statistics of UN statistics³⁴ and International Energy Agency (IEA)³⁵
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.3.1.5 Category-specific planned improvements including tracking of those identified in the review process

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ai_EnergyInd_Tool_DZA.xlsx 1A1aii_EnergyInd_Tool_DZA.xlsx 1A1aiii_EnergyInd_Tool_DZA.xlsx
Sheet	PlannedImprovements

The following table presents the main category-specific planned improvements including tracking of those identified in the review process. Considering the potential contribution of identified improvements in the total GHG emissions and removals and the corresponding resources needed to make these improvements effective, will be explored.

Table 1-19 Planned improvements for CRT category 1.A.1.a Main Activity Electricity and Heat Production

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.a.i	Application of higher TIER methodology as it is a key category	meth	Accuracy	high
1.A.1.a.i	Preparation of country specific emission factor (CS EF) for natural gas for CO ₂ based on plant specific data for each year	EF	Accuracy	high
1.A.1.a.i	Preparation of country specific GCV and NCV per annum instead of using a constant value for the whole timeseries	AD	Accuracy	high
1.A.1.a.i	Further investigation of the fuel consumption for 1990 – 2006	AD	Transparency	high
1.A.1.a.i	Collection of Carbon content (%) of gas/diesel oil for preparing country specific emission factor (CS EF) ⇒ $CS\ EF_{CO_2} [t/TJ] = (C [\%] \cdot 44 \cdot Ox) / (NCV [TJ/t] \cdot 12 \cdot 100)$	EF	Accuracy Transparency	medium
1.A.1.a.i	Investigation of carbon oxidation factor and destruction efficiency (completeness of combustion of the fuel): carbon oxidation factor is intended to reflect carbon that is emitted as soot or ash	EF	Accuracy Comparability	high

³¹ <https://www.sonelgaz.dz/fr>

³² <https://sonatrach.com/rapports>

³³ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

³⁴ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

³⁵ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.a.i	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	Medium
1.A.1.a	Input – output analysis: Electricity supply, gross production, imports, exports and net imports [GWh]	AD	Transparency	High
1.A.1.a.i 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Comparability Transparency	low

1.2.3.2 Petroleum Refining (CRT category 1.A.1.b)

Folder	\06_Inventory\2024_submission\01_Energy\1A1		
File	1A1b_EnergyInd_Tool_DZA.xlsx		
NID CHAPTER	3.2.3.2 <i>Petroleum Refining</i> (CRT category 1.A.1.b)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
		AD	emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter		
	● Trend -> 2.2.1 Energy ● Executive Summary		

1.2.3.2.1 Category description

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	Other fossil fuel	Peat	biomass	liquid	solid	gaseous	Other fossil fuel	Peat	biomass	liquid	solid	gaseous	Other fossil fuel	Peat	biomass
Estimated																		
1.A.1.b	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	LA 1990	-	LA 1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

A '✓' indicates: emissions from this category have been estimated.

Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential

LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF

This section describes GHG emissions resulting from all combustion activities supporting the refining of petroleum products including on-site combustion for the generation of electricity and/or heat for own use. Fugitive emissions (evaporative emissions) occurring at the refinery are not included and should be reported separately under 1.B.2.a category. *Petroleum Refining* is a key source with regards to CO₂

emissions from liquid and gaseous fuels. It is important to specify that oil refining and petrochemical production are physically distinct because they are produced by two different divisions (activities).

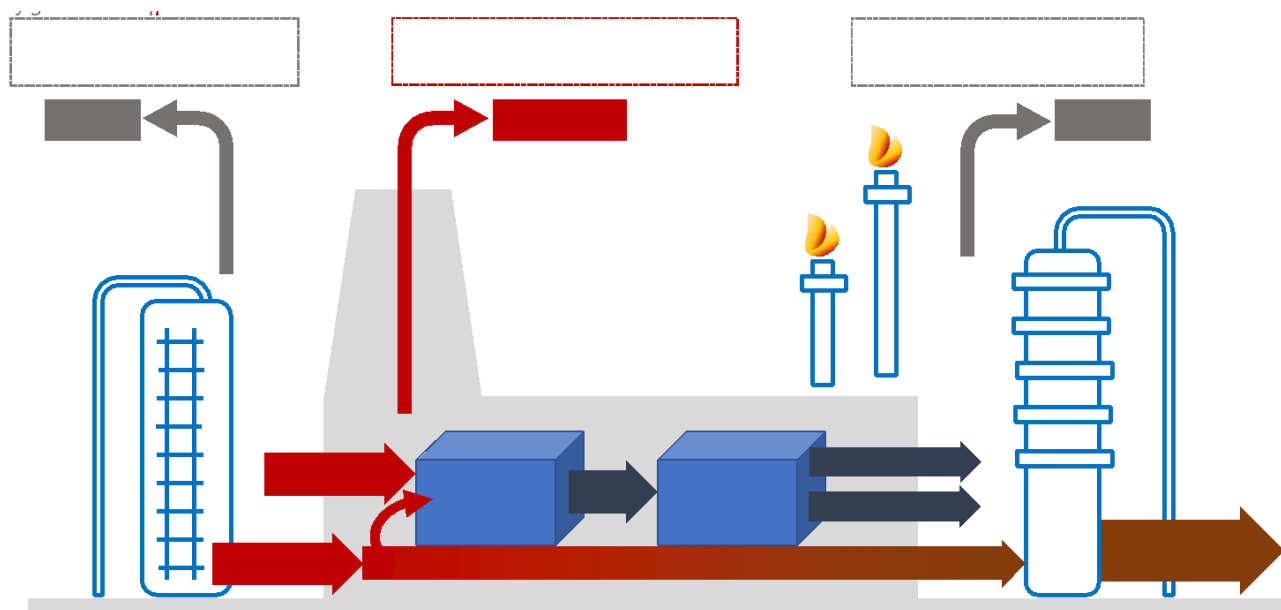


Figure 1-5 Reporting of emission from refinery: fuel combustion and fugitive emissions.

The overall increasing trend of emissions is the result of the increase in *Petroleum Refining* capacity in Algeria due to the implementation of two new refineries, namely Adrar (RA1D) with a production capacity of 0.6 Mt per year and Skikda (RA2K) with a production capacity of 5 Mt per year. In addition, the extension of the production capacities of the refineries of ARZEW (RA1Z), Skikda (RA1K) and Algiers (RA1G) in 2012, 2013 and 2019 successively, contributed to the increase of emissions from *Petroleum Refining*.

1.2.3.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.3.2.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach³⁶ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO_2\ equivalent}] = \sum_{fuel} emissions_{CO_2, fuel} [kt] + \sum_{fuel} emissions_{CH_4, fuel} [kt] \times GWP_{CH_4} + \sum_{fuel} emissions_{N_2O, fuel} [kt] \times GWP_{N_2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)

³⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.1.b. Oil refining is a key category.

1.2.3.2.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for *Petroleum Refining*:

Gaseous fuels:

- Natural gas, Fuel gas

Fuel consumption used for estimating the GHG and non-GHG emissions for the years:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics³⁷;
- 2010 – 2022 are taken from the data provided by MEM³⁸.

The increase in fuel consumption could be due to the commissioning of two new refineries, Adrar (RA1D) and Skikda (RA2K), with production capacities of 0.6 Mt and 5 Mt per year, respectively. In addition, the rehabilitation and extension of the production capacities of the refineries of ARZEW (RA1Z), Skikda (RA1K) and Algiers (RA1G) in 2012, 2013 and 2019 respectively contributed to the increase in fuel consumption.

For 2012, it is mentioned in the energy balance that Arzew refinery had a rehabilitation, which decreased the use of crude oil and condensates. It explains the decrease of production between 2011 and 2012. But for 2013 energy balance, it mentioned that the rehabilitation induced an increase even for Arzew and Skikda refineries (which is clear in figure 2.23). For 2019, it is mentioned in the Energy Balance that the decline in oil processing is explained in particular by the suspension of oil processing operations abroad since the second half of 2019 (which is clear in the figure 2.22 if we compare with 2015).

Additionally, the following figure provides an overview of installed capacity of the Algerian refineries.

³⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

³⁸ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

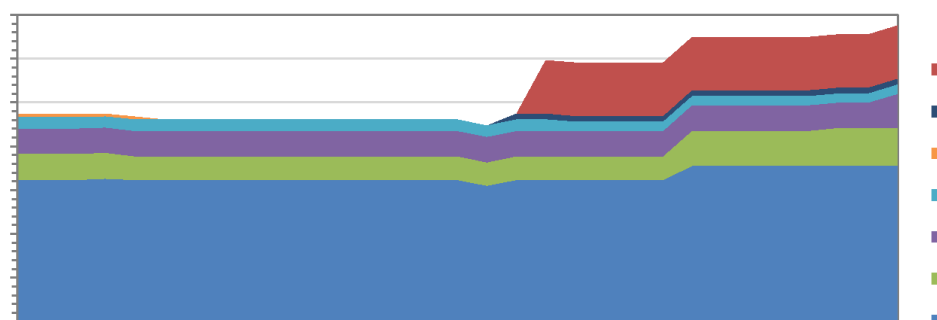


Figure 1-6 Refinery capacity. Source: OPEC³⁹

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table, the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.1.b *Petroleum Refining*.

Table 1-20 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.1.b *Petroleum Refining*

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02	UN default
		TJ /Gg		48.0	2006 IPCC default
gaseous	Fuel gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	49.5	2006 IPCC default
		TJ / Gg	MEM/Sonatrach	it does not exist	
Conversion from GCV to NCV			Default		
Natural gas			1 NCV = 0.9 x GCV		
Petroleum products			1 NCV = 0.95 x GCV		
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ⁴⁰			
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)			
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ⁴¹ : Table 4 Difference between net and gross calorific values for selected fuels			
Note:					
D	Default	CS	Country specific	PS	Plant specific

³⁹ OPEC (2022): Oil data: downstream - Table 4.1: Refinery capacity in OPEC Members by company and location; Available at 23.09.2022 on https://asb.opec.org/data/ASB_Data.php

⁴⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines.

⁴¹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.				

1.2.3.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	EF IPCC_1A

For gaseous fuels the default emission factors for CO₂, CH₄ and N₂O were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-21 GHG Emission factor TIER 1 for CRT category 1.A.1.b Petroleum Refining

Fuel	Fuel type	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
Natural gas	gaseous	56 100	D	1	D	0.1	D
Fuel Gas	gaseous	56 100	D	1	D	0.1	D
Source		2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.2 Default emission factors for stationary combustion in the Energy industries (page 2.16)					

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.3.2.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.1.b *Petroleum Refining* are presented in the following table.

Table 1-22 Uncertainty for CRT category 1.A.1.b Petroleum Refining.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13

QA/QC Plan

		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics⁴² ;
- 2010 - 2022 are taken from the National Energy balance provided by MEM⁴³.
- In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the
- International Standard Industrial Classification of all Economic Activities (ISIC)⁴⁴;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities⁴⁵. A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.3.2.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - Sonatrach RAPPORT ANNUEL (different years)⁴⁶

⁴² United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

⁴³ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

⁴⁴ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities.
<https://unstats.un.org/unsd/classifications/Econ/isic>

⁴⁵ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

⁴⁶ <https://sonatrach.com/rapports>

- national statistic published by MEM and Office National des Statistics (ONS)⁴⁷ and
- international energy statistics of UN statistics⁴⁸, and Joint Organizations Data Initiative - Oil and Gas Data⁴⁹. International Energy Agency (IEA)⁵⁰
- Organization of the Petroleum Exporting Countries (OPEC)⁵¹
- cross checks with other relevant sectors are performed to avoid double counting or omissions.
- time series consistency - plausibility checks of dips and jumps.

1.2.3.2.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	PlannedImprovements

The following table presents the main category-specific planned improvements including tracking of those identified in the review process. Considering the potential contribution of identified improvements in the total GHG emissions and removals and the corresponding resources needed to make these improvements effective, will be explored.

Table 1-23 Planned improvements for CRT category 1.A.1.b Petroleum Refining

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.b	Preparation of country specific GCV and NCV per year instead of using a constant value for whole timeseries.	AD	Completeness Transparency	high
1.A.1.b	Revision of the energy balance (1990-2009): improvement of time series consistency by collection of plant specific data: Consumption of various fuels for combustion.	AD	Completeness Transparency	high
1.A.1.b	Further refinement of the country specific CO ₂ emission factor (CS EF) for natural gas based on plant specific data for each year.	EF	Accuracy Transparenc y Consistency Completeness Comparability	high
1.A.1.b	Carbon content (%) of gas/diesel oil, residual fuel oil and natural gas etc. for preparing country specific emission factor (CS EF) ⇒ $CS\ EF_{CO_2} [t/TJ] = (C [\%] \cdot 44 \cdot Ox) / (NCV [TJ/t] \cdot 12 \cdot 100)$	EF	Accuracy Transparenc y	medium
1.A.1.b	Investigation of carbon oxidation factor and destruction efficiency (completeness of combustion of the fuel): carbon oxidation factor is intended to reflect carbon that is emitted as soot or ash.	EF	Accuracy Transparenc y Consistency Completeness	high

⁴⁷ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

⁴⁸ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

⁴⁹ <https://www.jodidata.org/>

⁵⁰ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

⁵¹ https://asb.opec.org/data/ASB_Data.php

GHG source & sink category	Planned improvement		Type of improvement	Priority
			Comparability	
1.A.1.b	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion.	EF non-G HG	Accuracy Transparenc y	Medium
1.A.1.b	Preparation of an overview of national refinery sector - processes and functional units including related emissions ⁵² • fundamental processes. • separation processes. • conversion processes • refining processes • extractions • other processes	AD	Transparenc y Completeness Accuracy	high

⁵² For e.g. according to Table 3.1: Environmental accounts of refinery processes, Best Available Techniques (BAT) Reference Document for the Refining of Mineral Oil and Gas (2015); available on 22.09-2022 on https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/REF_BREF_2015.pdf

1.2.3.3 Manufacture of Solid Fuels and Other Energy industries (CRT category 1.A.1.c)

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1c_EnergyInd_Tool_DZA.xlsx

The CRT category 1.A.1.c *Manufacture of Solid Fuels and Other Energy industries* is divided in three sub-categories:

1.A.1.c.i *Manufacture of Solid Fuels*

Coke production

1.A.1.c.ii Oil and gas extraction

1.A.1.c.iii Other Energy industries

1.A.1. c.iii.1 Wood charcoal production

- 1.A.1. c.iii.2
- Refinery gas: SH-Raffinage et Pétrochimie⁵³
 - LPG. Motor gasoline. Gas/Diesel Oil: SH Liquefaction et séparation⁶⁵
 - Natural_gaz_includ_LNG: 12.3-Unites_de liquefaction⁵⁴

1.A.1. c.iii.3 Consumption in Energy industries under “Other” in the Energy balance

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s	Other fossil fuel	P e a t	B i o m a s s	l i q u i d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s
Estimated																		
1.A.1.c.i	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO
1.A.1.c.ii	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO
1.A.1. c.iii																		
1.A.1. c.iii.1	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	✓	NO	✓	NO	NO	NO
1.A.1. c.iii.2	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
1.A.1. c.iii.3	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

⁵³ consommation énergétique du secteur de l'énergie finale le 03.06.2021.xlsx]

⁵⁴ 1990-2009 : Energy balance UNE stat ;

2010-2020 : consommation énergétique du secteur de l'énergie finale le 03.06.2021.xlsx

1.2.3.3.1 Manufacture of Solid Fuels – Coke production (CRT category 1.A.1.c.i)

Folder	\06_Inventory\2024_submission\01_Energy\1A1	
File	1A1ci_EnergyInd_Tool_DZA.xlsx	
NID CHAPTER	3.2.3.3.1 Manufacture of Solid Fuels – Coke production (CRT category 1.A.1.c.i)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	1A1ai_NIR_tables_&_graphs
	AD	emissions
Table	B-H	Column E--R
Graph	BT	J-BL
	Check for updated reasons for trend in chapter	
	• Trend -> 2.2.1 Energy • Executive Summary	

1.2.3.3.1.1 Category description

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	l	s	g	Other fossil fuel	P	b	l	s	g	Other fossil fuel	P	b	l	s	g	Other fossil fuel	P	b
Estimated	iquid	olid	ases		eat	iomass	iquid	olid	ases		eat	iomass	iquid	olid	ases		eat	iomass
1.A.1.c.i	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	NA	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

This section describes the emissions arising during the production of coke. As described in the 2019 IPCC Refinements to the 2006 IPCC GL.

[1] Coke is the most important reducing agent used in primary metal production. Other uses of coke include as a heating fuel and feedstock.

(1) Coal handling and preparation, including transportation, discharge, storage, crushing, bed blending, that in all cases cause dust emissions, but not GHG emissions.

(2) Coke oven battery operations, including coal charging, chamber heating and firing, coking, coke pushing and quenching and coke handling (i.e., storing, transporting, crushing and screening).

The coke is produced by the pyrolysis of coal in so called “coke oven battery operations”. This is a managed thermal treatment of the coal which limits combustion or oxidation of the coal or coke product. Coal pyrolysis at high temperature is called carbonization. The process produces coke, volatile compounds, and a range of other gases. In the coke production process, the coal is heated indirectly up to 1 000 – 1 100°C for 14 – 28 hours.

(3) Fugitive emissions, which have to be reported in 1. B.1.b.ii., can occur during coking operations from leakages at the battery, for example, because of leakage from vessels, oven doors, flanges, or at the by-product plant. Fugitive emissions occur also from the ascension pipe and charging hole sealings.

(4) Coke oven gas treatment.

The following table 3-53 presents a summary of the allocation of emissions from metallurgical coke production.

Table 1-24 Emission allocation from metallurgical coke production

Processes	Gases	GHG emissions from		Fugitive GHG emissions	
		carbonisation	combustion	diffuse	flaring
Coal charging	CO ₂	NO	NO	NO	NO
	CH ₄	NO	NO	1.B.1c ⁽³⁾	NO
	N ₂ O	NO	NO	NO	NO
Chamber heating and firing	CO ₂	NO	1.A.1.c	NS	NO
	CH ₄	NO		1.B.1c ⁽³⁾	NO
	N ₂ O	NO		NO	NO
Coking	CO ₂	1.A.1.c	NO	NS	NO
	CH ₄			1.B.1c ⁽³⁾	NO
	N ₂ O			NO	NO
Coke pushing	CO ₂	NO	NO	NS	NO
	CH ₄	NO	NO	1.B.1c ⁽³⁾	NO
	N ₂ O	NO	NO	NO	NO
Coke quenching	CO ₂	NO	NO	NS	NO
	CH ₄	1.A.1.c ⁽¹⁾	NO	1.B.1c ⁽³⁾	NO
	N ₂ O	NO	NO	NO	NO
Emergencies and Coke oven gas (COG) consumer maintenance among other reasons	CO ₂	NO	NO	NS	1.B.1c ⁽³⁾ and 1.A.1.c ⁽¹⁾ ⁽⁴⁾
	CH ₄	NO	NO	1.B.1c ⁽³⁾	1.B.1c
	N ₂ O	NO	NO	NS	

Note: (1) Methodology described in this Chapter 4 Volume 3 of the 2019 Refinement

(2) Methodology described in Chapter 2. Volume 2 of 2006 IPCC Guidelines

(3) Methodology described in Chapter 4 Volume 2 of the 2019 Refinement

(4) When simplified carbon balance approach is used (Tier 1.b)

Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential. NS: Not significant

Source: 2019 Refinement to the 2006 IPCC GL. Volume 3: Energy. Chapter 4: Metal Industry Emissions – 4.2.2 Methodological issues. TABLE 4.1A (NEW). Page 4.12.

Fugitive emissions (evaporative emissions) occurring during coke production are not included and should be reported separately under CRT category 1.B.1.b.ii.

1.2.3.3.1.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ci_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.3.3.1.2.1 Choice of methods – TIER 1 for CO₂ and CH₄

For estimating the CO₂, CH₄ and N₂O emissions, the Tier 1a: Production based method⁵⁵ of the 2019 Refinements to the 2006 IPCC Guidelines has been applied:

Equation 4.1: CO₂ emissions from coke production (TIER 1a) (2006 IPCC GL. Vol. 3. Chap. 4)

$$Emissions_{CO_2, coke} = CK \times Emission Factor_{coke}$$

Equation 4.1a: CH₄ emissions from coke production (TIER 1A) (2006 IPCC GL. Vol. 3. Chap. 4)

$$Emissions_{CH_4, coke} = CK \times Emission Factor_{coke}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG} = \sum emissions_{GHG, coke}$$

Where:

Emissions _{GHG}	= emissions of GHG (kg CO ₂ eq)
Emissions _{CH₄}	= emissions of CH ₄ (kg CH ₄)
Emissions _{CO₂}	= emissions of CO ₂ (kg GHG)
CK	= quantity of coke produced nationally, tonnes
Emission factor _{CO₂, coke}	= Coke production using by-product recovery technology (tonne of CO ₂ /tonne of coke)
Emission factor _{CH₄, coke}	= default emission factor of Coke Production (kg CH ₄ /tonne of coke produced)
GHG	= CO ₂ , CH ₄

1.2.3.3.1.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for *Manufacture of Solid Fuels* – Coke production:

Solid fuels: • Hard coal / coking coal transformed to coke oven coke

The amount of coking coal imported is used for estimating the GHG and non-GHG emissions for the years:

- 1990 – 2009 are taken from the plant operator SIDER (Complexe Sidérurgique d'El Hadjar), which was only the coke producer in the country.

The Coke oven coke production stopped in 2009 and was substituted by imported coke.

1.2.3.3.1.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A1
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⁵⁵ Source: 2019 Refinement to the 2006 IPCC GL, Volume 3: Energy, Chapter 4: Metal Industry Emissions – 4.2.2.1 Choice of method: metallurgical coke production – non fugitive emissions. Page 4.12.

File	1A1ci_EnergyInd_Tool_DZA.xlsx
Sheet	EF IPCC_1A

For liquid fuels the default emission factors for CO₂, CH₄ and N₂O were taken from 2019 Refinement to the IPCC 2006 Guidelines and are presented in the following table.

Table 1-25 GHG Emission factor TIER 1 for CRT category 1.A.1.c.i Manufacture of Solid Fuels – Coke production

Fuel	CO ₂ *		CH ₄ **		N ₂ O	
	(tonne of CO ₂ /tonne of coke)		(CH ₄ /tonne of coke produced)			
	EF	type	EF	type	EF	type
Coke Production	0.51	D	0.089	D	NO	
Source	2019 Refinement to the 2006 IPCC Guidelines. Vol. 3. Chap. 4.2.2.3 Choice of emission factors. Table 4.1 (updated) Tier 1 default CO ₂ emission factors for coke production Table 4.2 (updated) Tier 1 default CH ₄ emission factors for coke production (non-fugitives). <i>Iron and steel</i> production					
Note:						
D	Default	CS	Country specific	PS	Plant specific	IEF Implied emission factor
*	Coke production using by-product recovery technology					

1.2.3.3.1.3 Uncertainties and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.1.c.i Coke production are presented in the following table

Table 1-26 Uncertainty for CRT category 1.A.1.c.i Manufacture of Solid Fuels – Coke production

Uncertainty	CO ₂	CH ₄	N ₂ O	Reference
Activity data (AD)	10%	10%	NA	2019 Refinement to the 2006 IPCC GL. Vol.3. Chap. (4.2.3 Uncertainty assessment) TABLE 4.4 (UPDATED)
Emission factor (EF)	10%	400%	NA	
Combined Uncertainty (U)	14%	400%	NA	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied and same data set is used to the whole period.

1.2.3.3.1.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross checks with category 1.A.2.a and 2.C.1 are performed to avoid double counting or omissions;
- cross-checked from different sources (see **Error! Reference source not found. & Error! Reference source not found.**):
 - national statistic published by MEM and Office National des Statistiques (ONS)⁵⁶ and
 - international energy statistics of UN statistics⁵⁷ and International Energy Agency (IEA)⁵⁸
- time series consistency - plausibility checks of dips and jumps.

1.2.3.3.1.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1b_EnergyInd_Tool_DZA.xlsx
Sheet	PlannedImprovements

The following table presents the main category-specific planned improvements including tracking of those identified in the review process. Considering the potential contribution of identified improvements in the total GHG emissions and removals and the corresponding resources needed to make these improvements effective, will be explored.

Table 1-27 Planned improvements for CRT category 1.A.1.c.i *Manufacture of Solid Fuels – Coke production*

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.c.i	Revision of the energy balance (1990-2022): improvement of data set by collection of plant specific data: • Consumption of various fuels for combustion – hardcoal / coking coal, coke oven gas (COG), • Production data of coke oven coke, • Import and use of imported hardcoal / coking coal and	AD	Accuracy Transparency Consistency Completeness Comparability	high

⁵⁶ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

⁵⁷ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

⁵⁸ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
	coke oven coke.			
1.A.1.c.i	Investigation of carbon content of - coke oven coke produced, - imported coke oven coke (relevant for 2.C.1).	EF	Accuracy Transparency	high
1.A.1.c.i	Application of Tier 2 methodology of 2019 Refinement to the 2006 IPCC Guidelines.	EF	Accuracy	high
1.A.1.c.i	Investigation of the guidance of the - by-product recovery technology in coke production, - outputs of coke production process: - products, - by-products: coke oven gas (COG), tars and benzenes. flaring of coke oven gas (COG).	EF	Accuracy Transparency Consistency Completeness Comparability	high
1.A.1.c.i	Information about fitted/non-fitted equipment for flue gas cleaning. improvement in combustion.	EF non-G HG	Accuracy Transparency	Medium

1.2.3.3.2 Oil and gas extraction (CRT category 1.A.1.c.ii)

Folder	\06_Inventory\2024_submission\01_Energy\1A1		
File	1A1cii_EnergyInd_Tool_DZA.xlsx		
NID CHAPTER	3.2.3.3.2 Oil and gas extraction (CRT category 1.A.1.c.ii)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
	AD		emissions
Table	B-H		Column E--R
Graph	BT		J-BL
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

1.2.3.3.2.1 Category description

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	li q ui d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s	l i q ui d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s	l i q ui d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s
Estimated																		
1.A.1.c.ii	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO
Key Category	LA 2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

This section describes GHG emissions resulting from all combustion activities supporting the oil and gas extraction including on-site combustion for the generation of electricity and/or heat for own use. Fugitive emissions (evaporative emissions) occurring at the oil and gas extraction are not included and should be reported separately under 1.B.2.a. The CRT category 1.A.1.c.ii *Oil and gas extraction* is for CO₂ and gaseous fuels key category.

1.2.3.3.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1cii_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.3.3.2.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach⁵⁹ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG}[kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel}[kt] + \sum_{fuel} emissions_{CH4, fuel}[kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel}[kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.1.c.ii *Oil and Gas extraction* is a key category.

1.2.3.3.2.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for oil and gas extraction:

Gaseous fuels: • Fuel gas

Fuel consumption used for estimating the GHG and non-GHG emissions for the years:

- 2010 – 2022 are taken from the data provided by MEM⁶⁰.

⁵⁹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

⁶⁰ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.1.c.ii Oil and Gas Extraction is presented.

Table 1-28 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.1.c.ii Oil and Gas Extraction

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
Gaseous	Fuel Gas	TJ / Gg	MEM/Sonatrach	49.5
Source			MEM (2012) Décision n°271	2006 IPCC GL. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
Conversion from GCV to NCV			Default	
Natural gas			1 NCV = 0.9 x GCV	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)		Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ⁶¹	
	Default Net Calorific values (NCVs)		2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)	
	Conversion from GCV to NCV		International Recommendations for Energy Statistics (IRES) (2018) ⁶² : Table 4 Difference between net and gross calorific values for selected fuels	
	Note:			
D	Default	CS	Country specific	PS Plant specific

1.2.3.3.2.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1cii_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethology

For gaseous fuels, the default emission factors for CO₂, CH₄ and N₂O were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-29 GHG Emission factor TIER 1 for CRT category 1.A.1.c.ii Oil and Gas Extraction and processing

Fuel	Fuel type	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)			
		EF	type	EF	type	EF	type		
fuel gas	gaseous	-	-	56.100	D	1	D	0.1	D

<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

⁶¹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

⁶² <https://unstats.un.org/unsd/energystats/methodology/ires/>

QA/QC Plan

Fuel	Fuel type	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type

Source

2006 IPCC Guidelines

Vol. 2. Chap. 2 (2.3.2.1) Table 2.2 Default emission factors for stationary combustion in the Energy industries (page 2.16)

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.3.3.2.3 Uncertainties and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1cii_EnergyInd_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.1.c.ii *Oil and gas extraction* are presented in the following table.

Table 1-30 Uncertainty for CRT category 1.A.1.c.ii *Oil and gas extraction*.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. For 1990 – 2009 no activity data were available. For 2010 - 2022 activity data were provided by Sonatrach (MEM).

1.2.3.3.2.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1cii_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethodology

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)⁶³ and
 - national data related to the energetic consumption provided by MEM;
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.3.3.2.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1cii_EnergyInd_Tool_DZA.xlsx
Sheet	PlannedImprovements

The following table presents the main category-specific planned improvements including tracking of those identified in the review process. Considering the potential contribution of identified improvements in the total GHG emissions and removals and the corresponding resources needed to make these improvements effective, will be explored.

Table 1-31 Planned improvements for CRT category 1.A.1.c.ii Oil and Gas Extraction and processing

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.c.ii	Preparation of country specific GCV and NCV per year instead of using a constant value and/or default NCV for whole timeseries	AD	Completeness Transparency	high
1.A.1.c.ii	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of plant specific data: Consumption of various fuels for combustion – refinery gas, natural gas, etc.	AD	Completeness Transparency	high
1.A.1.c.ii	Investigation of carbon oxidation factor and destruction efficiency (completeness of combustion of the fuel): carbon oxidation factor is intended to reflect carbon that is emitted as soot or ash	EF	Accuracy Transparency Consistency Completeness Comparability	high
1.A.1.c.ii	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	Medium

⁶³ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.c.ii	Preparation of an overview of segment Oil and gas extraction - processes and equipment used including related emissions ⁶⁴	AD	Transparency Completeness Accuracy	high

1.2.3.3.3 Other Energy Industries (CRT category 1.A.1.c.iii)

Folder	\06_Inventory\2024_submission\01_Energy\1A1		
File	1A1cii_EnergyInd_Tool_DZA.xlsx		
Based on	1A1cii1_EnergyInd_Tool_DZA.xlsx 1A1cii2_EnergyInd_Tool_DZA.xlsx 1A1cii3_EnergyInd_Tool_DZA.xlsx		
NID CHAPTER	3.2.3.3.3 Other Energy Industries (CRT category 1.A.1.c.iii)		
ToDo	Check for updated reasons for trend in sectoral chapter Update GHG emissions and AD in tables & graphs from sheet 1A1ai_NIR_tables_&_graphs		
	AD		emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter - Trend -> 2.2.1 Energy - Executive Summary		

1.2.3.3.3.1 Category description

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s	Other fossil fuel	P e a t	b i o m a s s
Estimated																		
1.A.1. c.iii																		
1.A.1. c.iii.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA
1.A.1. c.iii.2	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
1.A.1. c.iii.3	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	-	-	LA 1990 & 2022 TA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

⁶⁴ For e.g. according to Table 3.1: Environmental accounts of refinery processes, Best Available Techniques (BAT) Reference Document for the Refining of Mineral Oil and Gas (2015); available on 22.09-2022 on https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/REF_BREF_2015.pdf

1.A.1. c.iii.1	Wood charcoal production	This category was not estimated due to lack of data and resources.
1.A.1. c.iii.2	- Refinery gas: SH-Raffinage et Pétrochimie⁶⁵ - LPG. Motor gasoline. Gas/Diesel Oil: SH Liquefaction et séparation⁶⁵ - Natural gas including LNG: 12.3-Unites_de liquefaction⁶⁶	These categories were estimated as described below. Activity data and emissions are summed up.
1.A.1. c.iii.3	Consumption in Energy industries under 'Other' in the Energy balance	

This section describes GHG emissions resulting from all combustion activities

- supporting the **gas liquefaction** and
- Other Energy industries** including on-site combustion for the generation of electricity and/or heat for own use.

The CRT category 1.A.1.c.iii *Other Energy industries* is for CO₂ and gaseous fuels key source.

Fugitive emissions (evaporative emissions) occurring at the oil and gas extraction are not included and are reported separately under 1.B.2.b.

1.2.3.3.3.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ciii_EnergyInd_Tool_DZA.xlsx
Based on	1A1ciii1_EnergyInd_Tool_DZA.xlsx 1A1ciii2_EnergyInd_Tool_DZA.xlsx 1A1ciii3_EnergyInd_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.3.3.3.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the CO₂, CH₄ and N₂O emissions, the 2006 IPCC Guidelines Tier 1 approach⁶⁷ has been applied:

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

- Emissions_{GHG, fuel} = emissions of a given GHG by type of fuel (kg GHG)
- Fuel consumption_{fuel} = amount of fuel combusted (TJ)
- Emission factor_{GHG, fuel} = default emission factor of a given GHG by type of fuel (kg/TJ)

⁶⁵ consommation énergétique du secteur de l'énergie finale le 03.06.2021.xlsx]

⁶⁶ 1990-2009: Energy balance UN stat;

2010-2020 : consommation énergétique du secteur de l'énergie finale le 03.06.2021.xlsx

⁶⁷ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

1.2.3.3.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for other Energy industries including Gas liquification and Other Energy industries:

Gaseous fuels:

- Natural gas, Fuel gas

Fuel consumption used for estimating the GHG for the years:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics⁶⁸ ;
- 2010 – 2022 are taken from the data provided by MEM ⁶⁹.

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.1.c.iii *Other Energy industries*.

Table 1-32 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.1.c.iii *Other Energy industries*

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
gaseous	Natural Gas, Fuel Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02	UN default
		TJ /Gg		48.0	2006 IPCC default
Conversion from GCV to NCV			Default		
Natural gas			1 NCV = 0.9 x GCV		
Petroleum products			1 NCV = 0.95 x GCV		
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ⁷⁰			
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)			

⁶⁸ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

⁶⁹ Ministère de l'Énergie et des Mines (MEM): ConsommationEnergetique_Secteur_Energie_03.06.2021.xlsx
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

⁷⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
Conversion from GCV to NCV		International Recommendations for Energy Statistics (IRES) (2018) ⁷¹ : Table 4 Difference between net and gross calorific values for selected fuels		
Note:				
D	Default	CS	Country specific	PS Plant specific
* No bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.				

1.2.3.3.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ciii_EnergyInd_Tool_DZA.xlsx
Based on	1A1ciii1_EnergyInd_Tool_DZA.xlsx 1A1ciii2_EnergyInd_Tool_DZA.xlsx 1A1ciii3_EnergyInd_Tool_DZA.xlsx
Sheet	EF IPCC_1A

For gaseous fuels, the default emission factors for CO₂, CH₄ and N₂O were taken from IPCC 2006 Guidelines and are presented in the following table. Of the fact that IPCC 2006 Guidelines do not provide a default factor for fuel gas, we consider that fuel gas has the same emission factor as natural gas.

Table 1-33 GHG Emission factor TIER 1 for CRT category 1.A.1.c.iii Other Energy industries

Fuel	Fuel type	CO ₂ (kg/TJ)	CH ₄ (kg/TJ)	N ₂ O (kg/TJ)			
	EF	type	EF	type			
Natural gas	gaseous	56 100	D	1	D	0.1	D
Fuel Gas	gaseous	56 100	D	1	D	0.1	D
Source	2006 IPCC Guidelines, Vol. 2. Chap. 2 (2.3.2.1) Table 2.2 Default emission factors for stationary combustion in the Energy industries (page 2.16)						
Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.3.3.3.3 Uncertainties and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ciii_EnergyInd_Tool_DZA.xlsx
Based on	1A1ciii1_EnergyInd_Tool_DZA.xlsx 1A1ciii2_EnergyInd_Tool_DZA.xlsx 1A1ciii3_EnergyInd_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph

⁷¹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Cross-check and/or update in chapter

1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals

11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.1.c.iii Other Energy industries are presented in the following table.

Table 1-34 Uncertainty for CRT category 1.A.1.c.iii Other Energy industries.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics⁷²
- 2010 - 2022 are taken from the National Energy balance provided by MEM⁷³.

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the:

- International Standard Industrial Classification of all Economic Activities (ISIC)⁷⁴;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities⁷⁵. A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.3.3.3.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ciii_EnergyInd_Tool_DZA.xlsx
Based on	1A1ciii1_EnergyInd_Tool_DZA.xlsx
	1A1ciii2_EnergyInd_Tool_DZA.xlsx
	1A1ciii3_EnergyInd_Tool_DZA.xlsx
Sheet	QC CHECKLIST

⁷² United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

⁷³ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

⁷⁴ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities.
<https://unstats.un.org/unsd/classifications/Econ/isic>

⁷⁵ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)⁷⁶ and
 - national data related to the energetic consumption provided by MEM;
 - international energy statistics of UN statistics⁷⁷ and International Energy Agency (IEA)⁷⁸
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.3.3.3.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A1
File	1A1ciii_EnergyInd_Tool_DZA.xlsx
Based on	1A1ciii1_EnergyInd_Tool_DZA.xlsx
	1A1ciii2_EnergyInd_Tool_DZA.xlsx
	1A1ciii3_EnergyInd_Tool_DZA.xlsx
Sheet	PlannedImprovements

The following table presents the main category-specific planned improvements including tracking of those identified in the review process. Considering the potential contribution of identified improvements in the total GHG emissions and removals and the corresponding resources needed to make these improvements effective, will be explored.

Table 1-35 Planned improvements for CRT category 1.A.1.c.iii Other Energy industries.

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.c.iii.1	Cross-check of national and international data sources on charcoal production (1) Raw materials for carbonization: fuelwood & wood residue, type of wood, (2) charcoal making technologies, (3) efficiencies of various types of kilns.	AD	Consistency Transparency	medium

⁷⁶ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

⁷⁷ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

⁷⁸ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.1.c.iii.1	Cross-check of national data and international data (e.g., FAO) on charcoal production.	AD	Consistency Transparency	medium
1.A.1.c.iii.2 1.A.1.c.iii.3	Preparation of country specific GCV and NCV per year instead of using a constant value and/or default NCV for whole timeseries.	AD	Completeness Transparency	high
1.A.1.c.iii.2 1.A.1.c.iii.3	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of plant specific data: Consumption of various fuels for combustion in Energy industries according to Energy balance.	AD	Completeness Transparency	high
1.A.1.c.iii.2	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion.	EF non-GHG	Accuracy Transparency	Medium
1.A.1.c.iii.2 1.A.1.c.iii.3	Preparation of an overview of segment Gas liquefaction - processes and equipment used including related emissions ⁷⁹ .	AD	Transparency Completeness Accuracy	High

⁷⁹ For e.g. according to Table 3.1: Environmental accounts of refinery processes, Best Available Techniques (BAT) Reference Document for the Refining of Mineral Oil and Gas (2015); available on 22.09-2022 on https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/REF_BREF_2015.pdf

1.2.4 Manufacturing Industries and Construction (CRT category 1.A.2)

This section describes GHG emissions resulting from fuel combustion activities in *Manufacturing Industries and Construction*. In CRT category 1.A.2 *Manufacturing Industries and Construction* is also including combustion for the generation of electricity and/or heat for own use in these industries. The GHG Emissions from the *Manufacturing Industries and Construction* sector should be specified by sub-categories that correspond to the International Standard Industrial Classification of all Economic Activities (ISIC)⁸⁰. The GHG emissions originate from the following sources:

IPCC code	Description	Occurrent			Not occurrent (NO)
		Estimated	Not estimated (NE)	Included elsewhere (IE)	
1.A.2.a	Iron and steel	✓			
1.A.2.b	Non-Ferrous Metals			1990-2022 in 1.A.2.m	
1.A.2.c	Chemicals	✓			
1.A.2.d	Pulp, Paper and Print	✓		1990-1999 in 1.A.2.m	
1.A.2.e	Food Processing, Beverages and Tobacco	✓		1990-1999 in 1.A.2.m	
1.A.2.f	Non-metallic minerals	✓			
1.A.2.g	Manufacturing of transport equipment				✓
1.A.2.h	Manufacturing of machinery				✓
1.A.2.i	Mining (excluding fuels) and Quarrying	✓		1990-1999 in 1.A.2.m	
1.A.2.j	Wood and wood products				✓
1.A.2.k	Construction	✓		1990-2005 in 1.A.2.m	
1.A.2.l	Textile and Leather	✓		1990-1999 in 1.A.2.m	
1.A.2.m	Other	✓			
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential					

⁸⁰ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

1.2.4.1 Iron and steel (CRT category 1.A.2.a)

Folder	\06_Inventory\2024_submission\01_Energy\1A2		
File	1A2a_IndustryManuf_Tool_DZA.xlsx		
NID CHAPTER	3.2.4.1 Iron and steel (CRT category 1.A.2.a)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
		AD	emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter		
	● Trend -> 2.2.1 Energy ● Executive Summary		

1.2.4.1.1 Category description

The CRT category 1.A.2.a *Iron and steel* includes GHG emissions resulting from fuel combustion activities in

- Manufacture of basic *Iron and steel* (ISIC Class 2410)
- Casting of *Iron and steel* (ISIC Class 2431).

The consumption of energy products in coke ovens and blast furnaces is excluded, as these plants are considered part of the Energy industries.

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass
1.A.2.a	✓	✓	✓	NO	NO	NO	✓	✓	✓	NO	NO	NO	✓	✓	✓	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

A '✓' indicates: emissions from this category have been estimated.
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential

LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF

IPCC code	Description	Occurrent			Not occurrent (NO)
		Estimated	Not estimated (NE)	Included elsewhere (IE)	
1.A.2.a	Iron and steel	✓		Emissions from liquid fuels 1990-1997 and 2009-2011 in 1.A.2.m	

The fluctuation in emissions (drop in emissions), in particular, since 2008 is mainly due to the decrease in production at El-Hadjar steel complex in the wilaya of Annaba as a result of the suspension of activities at

blast furnace n° 2 due to a malfunction in the supply of raw material. However, the increase in emissions from 2017 onwards is mainly due to the increase of steel and iron production following the commissioning of two new plants, namely the Tosyali plant in Oran and the Algerian Qatari Steel plant in Jijel in 2017 and 2018, respectively.

1.2.4.1.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2a_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.4.1.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach⁸¹ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.a. *Iron and steel* is a key category.

1.2.4.1.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

Liquid fuels:	- Gas/Diesel Oil* (only non-bio Gas/Diesel Oil) - Liquefied Petroleum Gas
Gaseous fuels:	Natural gas
Solid fuels	Blast furnace gas (BFG)

⁸¹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Liquid fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1998 - 2009 are taken from the Energy balance provided by MEM and UN statistics⁸² ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM⁸³.

Gaseous fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics⁸⁴ ;
- 2000 – 2022 are provided by SIDER EL HADJAR.

Solid fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics⁸⁵ ;
- 2000 – 2022 are provided by Sonelgaz (MEM)

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.a *Iron and steel* are provided.

Table 1-36 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.a *Iron and steel*

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ / Gg		48.0 2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72	47.3

Conversion from GCV to NCV		Default
Natural gas		1 NCV = 0.9 x GCV
Petroleum products		1 NCV = 0.95 x GCV

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ⁸⁶
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ⁸⁷ : Table 4 Difference between net and gross calorific values for selected fuels

⁸² United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

⁸³ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

⁸⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

⁸⁵ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

⁸⁶ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

⁸⁷ <https://unstats.un.org/unsd/energystats/methodology/i-res/>

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
Note:					
D	Default	CS	Country specific	PS	Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.					

1.2.4.1.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2a_IndustryManuf_Tool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas were taken from IPCC 2006 Guidelines.

For liquid fuels the default emission factors for greenhouse gases were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-37 GHG Emission factor TIER 1 for CRT category 1.A.2.a Iron and steel

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	1	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	3	D	0.6	D
	Liquefied Petroleum Gases (LPG)	63,100	D	1	D	0.1	D
Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor.						
	D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category						

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.4.1.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2a_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.2.a *Iron and steel* are presented in the following table.

Table 1-38 Uncertainty for CRT category 1.A.2.a Iron and steel.

Uncertainty	Gaseous fuels			Liquid fuels			Solid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			2%			based Table 2.13
		100%			100%			100%		based Table 2.12
			192%			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2000 are taken from the Energy balance provided by MEM and UN statistics⁸⁸.
- 2001 - 2022 are provided by Sonelgaz (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)⁸⁹.
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities⁹⁰. A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.4.1.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2a_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,

⁸⁸ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

⁸⁹ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

⁹⁰ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

- quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)⁹¹ and
 - international energy statistics of UN statistics⁹² and International Energy Agency (IEA)⁹³
- cross checks with sectors 1.A.c.i and 2.c.1 are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.4.1.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2a_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

The following table presents the main category-specific planned improvements including tracking of those identified in the review process. Considering the potential contribution of identified improvements in the total GHG emissions and removals and the corresponding resources needed to make these improvements effective, will be explored.

Table 1-39 Planned improvements for CRT category 1.A.2.a. Iron and steel

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.a	Revision of the energy balance (1990-1999): improvement of time series consistency by collection of plant specific data (production and consumption, NCV, carbon content) ● Consumption of various fuels for combustion ● Consumption of coking coal for production of coke ● Production and consumption of coke oven coke in the process ● Production and consumption of coke oven gas ● Production and consumption of blast furnace gas	AD	Accuracy Transparency Consistency Completeness Comparability	high
1.A.2.a 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Completeness Comparability Transparency	low
1.A.2.a	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	medium

⁹¹ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

⁹² United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

⁹³ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

1.2.4.2 Non-ferrous metals (CRT category 1.A.2.b)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2b_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.2 Non-ferrous metals (CRT category 1.A.2.b)

1.2.4.2.1 Category description

The CRT category 1.A.2.b Non-ferrous metals includes GHG emissions resulting from fuel combustion activities in

- Manufacture of basic precious and other non-ferrous metals (ISIC Class 2420)
- Casting of non-ferrous metals (ISIC Class 2432).

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.2.b	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A ‘✓’ indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description						Occurrent						Not occurrent (NO)					
							Estimated		Not estimated (NE)		Included elsewhere (IE)							
1.A.2.b	Non-Ferrous Metals										1990-2022 in 1.A.2.m							

The Energy balance currently does not provide information on the consumption of fuels in activities under Manufacture of basic precious and other non-ferrous metals and Casting of non-ferrous metals. However, as there are activities like zinc and zamak production in Algeria, fuel combustion in this sector can be assumed. Therefore, the notation key IE (included elsewhere) was used.

1.2.4.2.2 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2b_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-40 Planned improvements for CRT category 1.A.2.b Non-ferrous metals

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.b	Energy balance - Survey on use of fuel for combustion activities in Manufacture of basic precious and other non-ferrous metals (ISIC Class 2420) and Casting of non-ferrous metals (ISIC Class 2432).	AD	Accuracy Completeness Comparability Transparency	medium

1.2.4.3 Chemicals (CRT category 1.A.2.c)

Folder	\06_Inventory\2024_submission\01_Energy\1A2		
File	1A2c_IndustryManuf_Tool_DZA.xlsx		
NID CHAPTER	3.2.4.3 Chemicals (CRT category 1.A.2.c)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
	AD		emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

1.2.4.3.1 Category description

The CRT category 1.A.2.c Chemicals includes GHG emissions resulting from fuel combustion activities in Manufacture of chemicals and chemical products (ISIC division 20) and Manufacture of pharmaceuticals, medicinal chemical and botanical products (ISIC Class 21). However, the consumption of energy products by plants manufacturing charcoal (classified in ISIC 2011) is excluded, as these plants are considered part of the Energy industries.

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gas	other fossil fuel	peat	biomass	liquid	solid	gas	other fossil fuel	peat	biomass	liquid	solid	gas	other fossil fuel	peat	biomass
1.A.2.c	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description						Occurrent						Not occurrent (NO)					

		Estimated	Not estimated (NE)	Included elsewhere (IE)	
1.A.2.c	Chemicals	✓	-	-	-

The significant increase in GHG emissions over the period 2012-2022 is mainly due to the development and diversification of the chemical and petrochemical industries. Fluctuations in GHG emissions over the period 1990-2011 are probably induced by fluctuations in domestic chemical and petrochemical production.

1.2.4.3.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2c_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.4.3.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach⁹⁴ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.c. Chemical Industry is a key category.

1.2.4.3.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

⁹⁴ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

The following fuels are used for combustion in CRT category 1.A.2.c:

- Liquid fuels:**
- Gas/Diesel Oil* (only non-bio Gas/Diesel Oil)
 - Liquefied Petroleum Gases
 - Other Kerosene
 - Other Oil - Other Petroleum Products

- Gaseous fuels:**
- Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Liquid Fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1998- 2009 are taken from the Energy balance provided by MEM and UN statistics⁹⁵ ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM⁹⁶.

Activity data for liquid fuels from CRT category 1.A.2.c for the period 1990 – 1997 are included in 1.A.2.m as the energy balance was not disaggregated in this period.

Gaseous fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics⁹⁷ ;
- 2000 – 2022 are provided by Sonelgaz (MEM)

The significant increase in GHG emissions over the period 2012-2022 is mainly due to the development and diversification of the chemical and petrochemical industries. Fluctuations in GHG emissions over the period 1990-2011 are probably induced by fluctuations in domestic chemical and petrochemical production.

In energy statistics, production, transformation, and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table, the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.c Chemicals are provided.

Table 1-41 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.c Chemicals

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02	UN default
		TJ / Gg		48.0	2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21		43.0
	Residual Fuel Oil	TJ / Gg	42.18 * 0.95 = 40.07		40.4
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72		47.3
	Other Kerosene	TJ / Gg	43.92 * 0.95 = 41.72		43.8
	Other Petroleum Products	TJ / Gg	MEM/Sonatrach		40.2
Conversion from GCV to NCV			Default		

⁹⁵ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

⁹⁶ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

⁹⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
Natural gas			1 NCV = 0.9 x GCV		
Petroleum products			1 NCV = 0.95 x GCV		
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ⁹⁸			
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)			
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ⁹⁹ : Table 4 Difference between net and gross calorific values for selected fuels			
	Note:				
D	Default	CS	Country specific	PS	Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.					

1.2.4.3.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2c_IndustryManuf_Tool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas and liquid fuels were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-42 GHG Emission factor TIER 1 for CRT category 1.A.2.c Chemicals

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56.100	D	1	D	0.1	D
liquid	Gas / Diesel Oil*	74.100	D	3	D	0.6	D
	Residual Fuel Oil	77.400	D	3	D	0.6	D
	Liquefied Petroleum Gases (LPG)	63.100	D	1	D	0.1	D
	Other Kerosene	71.900	D	3	D	0.6	D
	Other Petroleum Products	77.400	D	3	D	0.6	D
Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor.						
	D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category						
Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.4.3.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
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⁹⁸ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

⁹⁹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

File	1A2c_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.2.c Chemicals are presented in the following table.

Table 1-43 Uncertainty for CRT category 1.A.2.c Chemicals.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

Liquid Fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1998- 2009 are taken from the Energy balance provided by MEM and UN statistics¹⁰⁰ ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM¹⁰¹.

Gaseous fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics¹⁰² ;
- 2000 – 2022 are provided by Sonelgaz (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹⁰³;

¹⁰⁰ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁰¹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹⁰² United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁰³ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹⁰⁴.

A revision of the years 1990-1999 for gaseous fuels and from 1990 to 2022 for liquid fuels is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be done for future submissions.

1.2.4.3.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2c_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹⁰⁵ and
 - international energy statistics of UN statistics¹⁰⁶ and International Energy Agency (IEA)¹⁰⁷
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.4.3.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2c_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-44 Planned improvements for CRT category 1.A.2.c Chemicals

¹⁰⁴ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

¹⁰⁵ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁰⁶ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁰⁷ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.c	Revision of the energy balance (1990-1999) for gaseous fuels and from 1990-2022 for liquid fuels: improvement of time series consistency by collection of plant specific data (consumption and production, NCV, carbon content) - Consumption of various fuels for combustion - Production and consumption of refinery gas	AD	Accuracy Transparency Consistency Completeness Comparability	high
1.A.2.c 1.B.2.a. iv	Venting and flaring activities (fugitive emission from Oil Refining)	AD	Accuracy Transparency Completeness	high
1.A.2.c	Input – output analysis	AD	Transparency Completeness	high
1.A.2.c 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Transparency	low
1.A.2.c	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	medium

1.2.4.4 CRT category 1.A.2.d Pulp, paper and print

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2d_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.4 CRT category 1.A.2.d Pulp, paper and print

1.2.4.4.1 Category description

The CRT category 1.A.2.d Pulp, paper and print include GHG emissions resulting from fuel combustion activities in:

- Manufacture of paper and paper products (ISIC Division 17) which consists out of
 - ISIC Group 1701 Manufacture of pulp, paper and paperboard.
 - ISIC Group 1702 Manufacture of corrugated paper and paperboard and of containers of paper and paperboard and ISIC Group
 - ISIC Group 1709 Manufacture of other articles of paper and paperboard.
- Printing and reproduction of recorded media (ISIC Division 18)
 - ISIC Group 181 Printing and service activities related to printing.
 - ISIC Group 182 Reproduction of recorded media

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.2.d	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A ‘✓’ indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description						Occurrent						Not occurrent (NO)					
							Estimated		Not estimated (NE)		Included elsewhere (IE)							
1.A.2.d	Pulp. Paper and Print										1990-2022 in 1.A.2.m							

The Energy balance currently does not provide information on the consumption of fuels in activities under Manufacture of paper and paper products and Printing and reproduction of recorded media. However, as there are activities like paper converting to bags, crates, boxes but in Algeria, fuel combustion in this sector can be assumed. Therefore, the notation key IE (included elsewhere) was used.

1.2.4.4.2 Category-specific planned improvements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-45 Planned improvements for CRT category 1.A.2.d Pulp, paper and print

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.d	Industries allocated to ISIC Division 17 and ISIC Division 18 'Manufacture of paper and paper products and Printing and reproduction of recorded media' - Identification of activities - Survey on use of fuel for combustion activities	AD	Accuracy Completeness Comparability Consistency Transparency	high/ medium

1.2.4.5 Food processing, beverages and tobacco (CRT category 1.A.2.e)

Folder	\06_Inventory\2024_submission\01_Energy\1A2			
File	1A2e_IndustryManuf_Tool_DZA.xlsx			
NID CHAPTER	3.2.4.5 Food processing, beverages and tobacco (CRT category 1.A.2.e)			
ToDo	Check for updated reasons for trend in sectoral chapter			
	Update GHG emissions and AD in tables & graphs			
	from sheet	1A1ai_NIR_tables_&_graphs		
		AD		emissions
	Table	B-H		Column E--R
	Graph	BT		J-BL
	Check for updated reasons for trend in chapter			
	- Trend -> 2.2.1 Energy - Executive Summary			

1.2.4.5.1 Category description

The CRT category 1.A.2.e *Food processing, beverages and tobacco* includes GHG emissions resulting from fuel combustion activities in:

- ISIC Divisions 10 Manufacture of food products
 - Processing and preserving of meat, fish, crustaceans and molluscs, fruit, and vegetables.
 - Manufacture of vegetable and animal oils and fats, dairy products, grain mill products, starches, and starch products and of other food products.
- ISIC Divisions 11 Manufacture of beverages
 - Distilling, rectifying, and blending.
 - Manufacture of wines, malt liquors and malt, soft drinks.
 - production of mineral waters and other bottled waters.
- ISIC Divisions 12 Manufacture of tobacco products.

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	P e a t	b i o m a s s
1.A.2.e	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

1.2.4.5.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2e_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.4.5.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach¹⁰⁸ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel} [kt] = Fuel\ Consumption_{fuel} [TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.e. *Food processing, beverages and tobacco* is a key category.

1.2.4.5.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx

¹⁰⁸ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx
BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

Liquid fuels: • Liquefied Petroleum Gases

Gaseous fuels: • Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Liquid fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 2010 – 2022 are taken from the National Energy balance provided by MEM¹⁰⁹.

Gaseous fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 2000 – 2022 are provide by Sonelgaz (MEM).

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tons or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.e *Food processing, beverages and tobacco* are provided.

Table 1-46 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.e *Food processing, beverages and tobacco*

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ / Gg		48.0 2006 IPCC default
liquid	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72	47.3

Conversion from GCV to NCV		Default
Natural gas		1 NCV = 0.9 x GCV
Petroleum products		1 NCV = 0.95 x GCV

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹¹⁰
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ¹¹¹ : Table 4 Difference between net and gross calorific values for selected fuels

Note:

¹⁰⁹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹¹⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

¹¹¹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
D	Default	CS	Country specific	P Plant specific S
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.				

1.2.4.5.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2e_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty

Default emission factors for CO₂, CH₄ and N₂O for Natural gas and liquid fuels were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-47 GHG Emission factor TIER 1 for CRT category 1.A.2.e Food processing, beverages and tobacco

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56.100	D	1	D	0.1	D
liquid	Liquefied Petroleum Gases (LPG)	63.100	D	1	D	0.1	D
Source		CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category					

Note:					
D	Default	CS	Country specific	PS	Plant specific
		IEF		Implied emission factor	

1.2.4.5.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2e_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.2.e *Food processing, beverages and tobacco* are presented in the following table.

Table 1-48 Uncertainty for CRT category 1.A.2.e Food processing, beverages and tobacco.

Uncertainty	Gaseous fuels	Liquid fuels	Reference
-------------	---------------	--------------	-----------

QA/QC Plan

	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

Liquid fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 2010 – 2022 are taken from the National Energy balance provided by MEM¹¹².

Gaseous fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 2000 – 2022 are provided by Sonelgaz (MEM).

Activity data for liquid fuels for the period 1990 – 2009 and gaseous fuels for the period 1990-1999 from CRT category 1.A.2.c are included in 1.A.2.m as the energy balance was not disaggregated in this period.

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹¹³;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹¹⁴.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be done for future submissions.

1.2.4.5.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2e_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,

¹¹² Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years

<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹¹³ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹¹⁴ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

- quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)¹¹⁵ and
 - international energy statistics of UN statistics¹¹⁶ and International Energy Agency (IEA)¹¹⁷
- cross checks with other relevant sectors are performed to avoid double counting or omissions.
- time series consistency - plausibility checks of dips and jumps.

1.2.4.5.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2e_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-49 Planned improvements for CRT category 1.A.2.e Food processing, beverages, and tobacco

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.e	Energy balance ● Revision of the energy balance for liquid fuels for the period 1990-2022 and from 1990-1999 for gaseous fuels: improvement of time series completeness and consistency by collection of plant specific data (consumption and production, NCV, carbon content) ● Survey on consumption of fuel for combustion activities in industry sector 'Manufacture of food products, beverages and tobacco products.	AD	Accuracy Transparency Consistency Completeness Comparability	high
1.A.2.e 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Completeness Transparency	low
1.A.2.e	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	medium

1.2.4.6 Non-metallic minerals (CRT category 1.A.2.f)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2f_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.6 Non-metallic minerals (CRT category 1.A.2.f)

¹¹⁵ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹¹⁶ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹¹⁷ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	1A1ai_NIR_tables_&_graphs
	AD	emissions
	Table	Column E--R
	Graph	J-BL
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.2.4.6.1 Category description

The CRT category 1.A.2.f *Non-metallic minerals* includes GHG emissions resulting from fuel combustion activities in:

- ISIC Divisions 23 Manufacture of other non-metallic mineral products
 - Manufacture of glass and glass products
 - Manufacture of non-metallic mineral products n.e.c.
 - Manufacture of refractory products. Manufacture of clay building materials
 - Manufacture of other porcelain and ceramic products
 - Manufacture of cement, lime and plaster
 - Manufacture of articles of concrete, cement and plaster
 - Cutting, shaping and finishing of stone
 - Manufacture of other non-metallic mineral products n.e.c.

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.2.f	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	-	-	LA 2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description						Occurrent						Not occurrent (NO)					
							Estimated		Not estimated (NE)		Included elsewhere (IE)							
1.A.2.f	Non-metallic minerals						✓											

1.2.4.6.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2f_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.4.6.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach¹¹⁸ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG}[kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel}[kt] + \sum_{fuel} emissions_{CH4, fuel}[kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel}[kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.f. *Non-metallic minerals* is a key category.

1.2.4.6.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

- Liquid fuels:**
- Gas/Diesel Oil* (only non-bio Gas/Diesel Oil)
 - Liquefied Petroleum Gases
 - Other Oil - Other Petroleum Products
- Gaseous fuels:**
- Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Liquid fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics¹¹⁹;
- 2010 – 2022 are taken from the National Energy balance provided by MEM¹²⁰.

¹¹⁸ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

¹¹⁹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹²⁰ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years

Gaseous fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics¹²¹;
- 2000 – 2022 are provided by Sonelgaz (MEM).

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.f *Non-metallic minerals* are provided.

Table 1-50 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.f *Non-metallic minerals*.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ / Gg		48.0 2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72	47.3
	Other Petroleum Products	TJ / Gg	-	40.2

Conversion from GCV to NCV	Default
Natural gas	1 NCV = 0.9 x GCV
Petroleum products	1 NCV = 0.95 x GCV

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹²²
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ¹²³ : Table 4 Difference between net and gross calorific values for selected fuels
	Note:	
D	Default	CS Country specific
		PS Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.		

1.2.4.6.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2f_IndustryManuf_Tool_DZA.xlsx
Sheet	EF IPCC_1A

<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹²¹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹²² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

¹²³ <https://unstats.un.org/unsd/energystats/methodology/i-res/>

Default emission factors for CO₂, CH₄ and N₂O for Natural gas and liquid fuels were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-51 GHG Emission factor TIER 1 for CRT category 1.A.2.f Non-metallic minerals

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	1	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	3	D	0.6	D
	Liquefied Petroleum Gases (LPG)	63,100	D	1	D	0.1	D
	Other Petroleum Products	77,400	D	3	D	0.6	D
Source		CS – country specific EF Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category					

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.4.6.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2f_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.2.f *Non-metallic minerals* are presented in the following table.

Table 1-52 Uncertainty for CRT category 1.A.2.f Non-metallic minerals.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

Liquid fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics¹²⁴ ;
- 2010 - 2022 are taken from the National Energy balance provided by MEM¹²⁵.

Gaseous fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics¹²⁶;
- 2000 – 2022 are provided by Sonelgaz (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹²⁷;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹²⁸.

A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.4.6.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2f_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹²⁹ and
 - international energy statistics of UN statistics¹³⁰ and International Energy Agency (IEA)¹³¹

¹²⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹²⁵ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹²⁶ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹²⁷ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹²⁸ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

¹²⁹ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹³⁰ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹³¹ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region

- cross checks with sector 2.A.1 are performed to avoid double counting or omissions.
- time series consistency - plausibility checks of dips and jumps.

1.2.4.6.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2f_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-53 Planned improvements for CRT category 1.A.2.f Non-metallic minerals

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.f	Energy balance • Revision of the energy balance (1990-1999): improvement of time series completeness and consistency by collection of plant specific data (consumption and production, NCV, carbon content) • Survey on consumption of fuel for combustion activities in Manufacture of glass and glass products, clay building materials, porcelain and ceramic products, cement, lime and plaster, etc.	AD	Accuracy Transparency Consistency Completeness Comparability	high
1.A.2.f 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Completeness Comparability Transparency	low
1.A.2.f	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	medium

1.2.4.7 CRT category 1.A.2.g Other (CRT category 1.A.2.g)

According to the CRT, category¹³² 1.A.2.g Other is further divided into the following IPCC categories and as described in Table 2.1 of the 2006 IPCC Guidelines¹³³.

CRT category	Name of source categories	CRT category
1.A.2.g	Manufacturing of transport equipment	1.A.2.g.i
1.A.2.h	Manufacturing of machinery	1.A.2.g.ii
1.A.2.i	Mining (excluding fuels) and Quarrying	1.A.2.g.iii

<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

¹³² CRT Common Reporting Tables (CRT) on NIR. CRT reporting tables are used under the Paris agreement available on 01.08.2022 at <https://unfccc.int/documents/311076>

¹³³ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 22.2 Description of sources

1.A.2.j	Wood and wood products	1.A.2.g.iv
1.A.2.k	Construction	1.A.2.g.v
1.A.2.l	Textile and Leather	1.A.2.g.vi
1.A.2.m	Other	1.A.2.g.viii

1.2.4.8 Manufacturing of transport equipment (CRT category 1.A.2.g)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2g_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.8 Manufacturing of transport equipment (CRT category 1.A.2.g)

1.2.4.8.1 Category description

The CRT category 1.A.2.g Manufacturing of transport equipment includes GHG emissions resulting from fuel combustion activities in

- ISIC Division 29 Manufacture of motor vehicles, trailers and semi-trailers.
- ISIC Division 30 Manufacture of other transport equipment.

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass
1.A.2.g	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

The CRT category 1.A.2.g Manufacturing of transport equipment does not exist in Algeria.

The Energy balance currently does not provide information on the consumption of fuels in activities under Manufacturing of transport equipment. However, an automotive industry is existing in Algeria whereby it is an "assembler" for cars from VW, Renault, Peugeot, Kia and other. It is assumed that no combustion activities occur. Therefore, the notation key NO (not occurring) was used.

1.2.4.8.2 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2g_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-54 Planned improvements for IPCC 1.A.2.g Manufacturing of transport equipment

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.g	Energy balance - Survey on use of fuel for combustion activities in - ISIC Division 29 Manufacture of motor vehicles, trailers and semi-trailers (ISIC Class 2420) and - ISIC Division 30 Manufacture of other transport equipment Casting of non-ferrous metals (ISIC Class 2432).	AD	Completeness	medium

1.2.4.9 Manufacturing of machinery (CRT category 1.A.2.h)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2h_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.9 Manufacturing of machinery (CRT category 1.A.2.h)

1.2.4.9.1.1 Category description

The CRT category 1.A.2.h Manufacturing of machinery includes GHG emissions resulting from fuel combustion activities in

- ISIC Division 25 Manufacture of fabricated metal products, except machinery and equipment
 - Manufacture of structural metal products, tanks, reservoirs and steam generators
 - Manufacture of weapons and ammunition
 - Manufacture of other fabricated metal products; metalworking service activities
- ISIC Division 26 Manufacture of computer, electronic and optical products
 - Manufacture of electronic components and boards
 - Manufacture of computers and peripheral equipment
 - Manufacture of communication equipment
 - Manufacture of consumer electronics
 - Manufacture of measuring, testing, navigating and control equipment; watches and clocks
 - Manufacture of irradiation, electromedical and electrotherapeutic equipment
 - Manufacture of optical instruments and photographic equipment
 - Manufacture of magnetic and optical media
- ISIC Division 27 Manufacture of electrical equipment
 - Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
 - Manufacture of batteries and accumulators
 - Manufacture of wiring and wiring devices
 - Manufacture of electric lighting equipment
 - Manufacture of domestic appliances
 - Manufacture of other electrical equipment

- ISIC Division 28 Manufacture of machinery and equipment n.e.c.
 - Manufacture of general-purpose machinery
 - Manufacture of special-purpose machinery

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	P e a t	b i o m a s s
1.A.2.h	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

The CRT category 1.A.2.h Manufacturing of machinery does not exist in Algeria.

The Energy balance currently does not provide information on the consumption of fuels in activities under Manufacturing of transport equipment. However, a machinery industry is existing in Algeria whereby it is an "assembler" for different fabricated products. It is assumed that no combustion activities occur. Therefore, the notation key NO (not occurring) was used.

1.2.4.9.1.2 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2h_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-55 Planned improvements for CRT category 1.A.2.h Manufacturing of machinery

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.h	Energy balance - Survey on consumption of fuel for combustion activities in ● ISIC Division 25 Manufacture of fabricated metal products, except machinery and equipment ● ISIC Division 26 Manufacture of computer, electronic and optical products ● ISIC Division 27 Manufacture of electrical equipment ● ISIC Division 28 Manufacture of machinery and equipment n.e.c.	AD	Completeness	medium

1.2.4.10 Mining (excluding fuels) and quarrying (CRT category 1.A.2.i)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2i_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.10 Mining (excluding fuels) and quarrying (CRT category 1.A.2.i)

1.2.4.10.1.1 Category description

The CRT category 1.A.2.i Mining (excluding fuels) and quarrying includes GHG emissions resulting from fuel combustion activities in

- ISIC Division 07 Mining of metal ores (iron ores and non-ferrous metal ores).
- ISIC Division 08 Other mining and quarrying
 - Quarrying of stone, sand and clay
 - Mining and quarrying n.e.c.:
 - Mining of chemical and fertilizer minerals (Extraction of peat, salt)
 - Other mining and quarrying n.e.c.
- ISIC Division 09 Mining support service activities
 - Support activities for petroleum and natural gas extraction
 - Support activities for other mining and quarrying

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.2.i	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A ‘✓’ indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description						Occurrent						Not occurrent (NO)					
							Estimated		Not estimated (NE)		Included elsewhere (IE)							
1.A.2.i	Mining (excluding fuels) and quarrying						✓				1990-1999 in 1.A.2.m							

1.2.4.10.1.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

Gaseous fuels: • Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Gaseous fuels consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics¹³⁴;
- 2000 – 2022 are provided by Sonelgaz (MEM).

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.i Mining (excluding fuels) and quarrying are provided.

Table 1-56 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.f Non-metallic minerals.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ /Gg		48.0 2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Gasoil / Diesel			
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72	47.3
	Other Petroleum Products	TJ / Gg	-	40.2
Conversion from GCV to NCV			Default	
Natural gas			1 NCV = 0.9 x GCV	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹³⁵		
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)		
		International Recommendations for Energy Statistics (IRES) (2018) ¹³⁶ :		
	Conversion from GCV to NCV	Table 4 Difference between net and gross calorific values for selected fuels		
Note:				
D	Default	CS	Country specific	PS Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.				

¹³⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹³⁵ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

¹³⁶ <https://unstats.un.org/unsd/energystats/methodology/i-res/>

1.2.4.10.2 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2i_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹³⁷ and
 - international energy statistics of UN statistics¹³⁸ and International Energy Agency (IEA)¹³⁹
- cross checks with sector 2.A.1 are performed to avoid double counting or omissions.
- time series consistency - plausibility checks of dips and jumps.

1.2.4.10.2.1 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2i_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-57 Planned improvements for CRT category 1.A.2.i Mining (excluding fuels) and quarrying

GHG source & sink category	Planned improvement	Type of improvement		Priority
		AD	Completeness	
1.A.2.h	Energy balance - Survey on consumption of fuel for combustion activities in ● ISIC Division 07 Mining of metal ores (iron ores and non-ferrous metal ores). ● ISIC Division 08 Other mining and quarrying. ● ISIC Division 09 Mining support service activities.			medium

¹³⁷ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹³⁸ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹³⁹ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

1.2.4.11 Wood and wood products (IPCC 1.A.2.j)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2j_IndustryManuf_Tool_DZA.xlsx
NID CHAPTER	3.2.4.11 Wood and wood products (IPCC 1.A.2.j)

1.2.4.11.1 Category description

The CRT category 1.A.2.j Wood and wood products includes GHG emissions resulting from fuel combustion activities in

- ISIC Division 16 Manufacture of wood and of products of wood and cork (except furniture), and manufacture of articles of straw and plaiting materials.
 - Sawmilling and planning of wood.
 - Manufacture of products of wood, cork, straw and plaiting materials.
 - Manufacture of veneer sheets and wood-based panels.
 - Manufacture of builders' carpentry and joinery.
 - Manufacture of wooden containers.
 - Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials Quarrying.

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	P e a t	b i o m a s s
1.A.2.j	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

The CRT category 1.A.2.j Wood and wood products does not exist in Algeria.

The Energy balance currently does not provide information on the consumption of fuels in activities under Wood and wood products. However, a mining industry is existing in Algeria.

1.2.4.11.2 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2j_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-58 Planned improvements for CRT category 1.A.2.j Wood and wood products

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.j	Energy balance - Survey on consumption of fuel for combustion activities in • Manufacture of wood and of products of wood and cork (except furniture), and manufacture of articles of straw and plaiting materials	AD	Completeness	medium

1.2.4.12 Construction (CRT category 1.A.2.k)

Folder	\06_Inventory\2024_submission\01_Energy\1A2		
File	1A2k_IndustryManuf_Tool_DZA.xlsx		
NID CHAPTER	3.2.4.12 Construction (CRT category 1.A.2.k)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
	AD		emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter - Trend -> 2.2.1 Energy - Executive Summary		

1.2.4.12.1 Category description

The CRT category 1.A.2.k Construction includes GHG emissions resulting from fuel combustion activities in

- ISIC Division 41 Construction of buildings
- Division 42 Civil engineering
 - Construction of roads and railways
 - Construction of utility projects
 - Construction of other civil engineering projects
- Division 43 Specialized construction activities
 - Demolition and site preparation
 - Electrical, plumbing and heat and air-conditioning installation and other construction installation activities.
 - Building completion and finishing.

- Other specialized construction activities Manufacture.

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.2.k	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO	✓	NO	✓	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A ‘✓’ indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description						Occurrent						Not occurrent (NO)					
							Estimated		Not estimated (NE)		Included elsewhere (IE)							
1.A.2.i	Construction						✓				1990-2005 in 1.A.2.m							

1.2.4.12.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2k_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.4.12.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach¹⁴⁰ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel} [kt] = Fuel\ Consumption_{fuel} [TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.k. Construction is a key category.

¹⁴⁰ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

1.2.4.12.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

- Liquid fuels:**
- Gas/Diesel Oil* (only non-bio Gas/Diesel Oil)
 - Other Kerosene
 - Other Oil - Other Petroleum Products
- Gaseous fuels:**
- Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 2005 are taken from the Energy balance provided by MEM and UN statistics¹⁴¹ ;
- 2006 – 2022 are provided by Sonelgaz (MEM).

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.k Construction are provided.

Table 1-59 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.k Construction.

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02	UN default
		TJ / Gg		48.0	2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21		43.0
	Other Kerosene	TJ / Gg	43.92 * 0.95 = 41.72		43.8
	Other Petroleum Products	TJ / Gg	-		40.2
Conversion from GCV to NCV			Default		
Natural gas			1 NCV = 0.9 x GCV		
Petroleum products			1 NCV = 0.95 x GCV		
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹⁴²			
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2			

¹⁴¹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁴² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison	
		International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)			
Conversion from GCV to NCV		International Recommendations for Energy Statistics (IRES) (2018) ¹⁴³ : Table 4 Difference between net and gross calorific values for selected fuels			
Note:					
D	Default	CS	Country specific	P S	Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.					

1.2.4.12.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2k_IndustryManuf_Tool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas and liquid fuels were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-60 GHG Emission factor TIER 1 for CRT category 1.A.2.k Construction

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	1	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	3	D	0.6	D
	Other Kerosene	71,900	D	3	D	0.6	D
	Other Petroleum Products	77,400	D	3	D	0.6	D
Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor.						
	D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category						
Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.4.12.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2k_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter

¹⁴³ <https://unstats.un.org/unsd/energystats/methodology/ires/>

1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.2.k Construction are presented in the following table.

Table 1-61 Uncertainty for CRT category 1.A.2.k Construction.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data are considered almost consistent even though two different data sets were used:

- 1990 - 2005 are taken from the Energy balance provided by MEM and UN statistics¹⁴⁴.
- 2006 - 2022 are provided by Sonelgaz (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹⁴⁵;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹⁴⁶.

A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.4.12.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2k_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),

¹⁴⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

¹⁴⁵ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹⁴⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

- documented sources,
- use of units and conversion factors,
- strictly defined interfaces between spreadsheets/calculation modules,
- record keeping, use of write protection,
- unique use of formulas, special cases are documented/highlighted,
- quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)¹⁴⁷ and
 - international energy statistics of UN statistics¹⁴⁸ and International Energy Agency (IEA)¹⁴⁹
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.4.12.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2k_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-62 Planned improvements for CRT category 1.A.2.k Construction

GHG source & sink category	Planned improvement	Type of improvement	Priority
1.A.2.k	Energy balance Revision of the energy balance (1990-2005): improvement of time series completeness and consistency by collection of plant specific data (consumption and production, NCV, carbon content) Survey on consumption of fuel for combustion activities in Manufacture of glass and glass products, clay building materials, porcelain and ceramic products, cement, lime and plaster, etc.	AD	Accuracy Transparency Consistency Completeness Comparability high
1.A.2.k 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Completeness Comparability Transparency low
1.A.2.k	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency medium

¹⁴⁷ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁴⁸ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁴⁹ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

1.2.4.13 Textile and leather (CRT category 1.A.2.I)

Folder	\06_Inventory\2024_submission\01_Energy\1A2	
File	1A2I_IndustryManuf_Tool_DZA.xlsx	
NID CHAPTER	3.2.4.13 Textile and leather (CRT category 1.A.2.I)	
ToDo	Check for updated reasons for trend in sectoral chapter Update GHG emissions and AD in tables & graphs from sheet 1A1ai_NIR_tables_&_graphs	
	AD	emissions
Table	B-H	Column E--R
Graph	BT	J-BL
	Check for updated reasons for trend in chapter • Trend -> 2.2.1 Energy • Executive Summary	

1.2.4.13.1 Category description

The CRT category 1.A.2.I Textile and leather includes GHG emissions resulting from fuel combustion activities in

- ISIC Division 13 Manufacture of textiles
 - Spinning, weaving and finishing of textiles
 - Manufacture of other textiles
 - Manufacture of knitted and crocheted fabrics, made-up textile articles (except apparel)
 - Manufacture of carpets and rugs, cordage, rope, twine and netting
 - Manufacture of other textiles n.e.c.
- ISIC Division 14 Manufacture of wearing apparel
 - Manufacture of wearing apparel, except fur apparel
 - Manufacture of articles of fur
 - Manufacture of knitted and crocheted apparel
- ISIC Division 15 Manufacture of leather and related products
 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur
 - Manufacture of footwear

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.2.I	IE	NO	✓	NO	NO	NO	IE	NO	✓	NO	NO	NO	IE	NO	✓	NO	NO	NO

Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A ‘✓’ indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		
IPCC code	Description	Occurrent						Not occurred (NO)										
		Estimated	Not estimated (NE)	Included elsewhere (IE)														
1.A.2.I	Textile and leather	✓		1990-1999 in 1.A.2.m														

1.2.4.13.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2I_IndustryManuf_Tool_DZA.xlsx
Sheet	ChoiceMethology

1.2.4.13.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach¹⁵⁰ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.I. Textile and leather is a key category.

1.2.4.13.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

¹⁵⁰ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

Gaseous fuels:

- Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Fuel consumption used for estimating the GHG and non-GHG emissions for the years.

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics¹⁵¹ ;
- 2000 – 2022 are provided by Sonelgaz (MEM).

2010 - 2022	113.17%	NA	NA	113.17%	NA	NA	NA
2021 - 2022	7.33%	NA	NA	7.33%	NA	NA	NA

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.I Textile and leather are provided.

Table 1-63 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.I Textile and leather.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ /Gg		48.0 2006 IPCC default
Conversion from GCV to NCV			Default	
Natural gas			1 NCV = 0.9 x GCV	
Source	CS Gross Caloric Value (GCV)		Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹⁵²	
	Default Net Calorific values (NCVs)		2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)	
	Conversion from GCV to NCV		International Recommendations for Energy Statistics (IRES) (2018) ¹⁵³ : Table 4 Difference between net and gross calorific values for selected fuels	
Note:				
D	Default	CS	Country specific	PS Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.				

1.2.4.13.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2I_IndustryManuf_Tool_DZA.xlsx

¹⁵¹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁵² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

¹⁵³ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Sheet	EF IPCC_1A
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Default emission factors for CO₂, CH₄ and N₂O for Natural gas were taken from IPCC 2006 Guidelines.

For liquid fuels and biomass, the default emission factors for greenhouse gases were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-64 GHG Emission factor TIER 1 for CRT category 1.A.2.I Textile and leather

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	1	D	0.1	D
Source		CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category					

Note:					
D	Default	CS	Country specific	PS	Plant specific
				IEF	Implied emission factor

1.2.4.13.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2I_IndustryManuf_Tool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for 1.A.2.I Textile and leather are presented in the following table.

Table 1-65 Uncertainty for CRT category 1.A.2.I Textile and leather.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data are considered almost consistent even though two different data sets were used:

- 1990 - 1999 are taken from the Energy balance provided by MEM and UN statistics¹⁵⁴;
- 2000 - 2022 are provided by Sonelgaz (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹⁵⁵;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹⁵⁶.

A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.4.13.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2I_IndustryManuf_Tool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)¹⁵⁷ and
 - international energy statistics of UN statistics¹⁵⁸ and International Energy Agency (IEA)¹⁵⁹
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.4.13.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
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¹⁵⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁵⁵ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹⁵⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

¹⁵⁷ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁵⁸ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁵⁹ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

File	1A2I_IndustryManuf_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-66 Planned improvements for CRT category 1.A.2.I Textile and leather

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.I	Energy balance Revision of the energy balance (1990-2000): improvement of time series completeness and consistency by collection of plant specific data (consumption and production, NCV, carbon content) Survey on consumption of fuel for combustion activities in Manufacture of glass and glass products, clay building materials, porcelain and ceramic products, cement, lime and plaster, etc.	AD	Accuracy Transparency Consistency Completeness Comparability	high
1.A.2.I 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Completeness Comparability Transparency	low
1.A.2.I	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	medium

1.2.4.14 Off-road vehicles and other machinery (CRT category 1.A.2.g.vii)

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	
NID CHAPTER	3.2.4.14 Off-road vehicles and other machinery (CRT category 1.A.2.g.vii)

1.2.4.14.1 Category description

The CRT category 1.A.g.vii Off-road vehicles and other machinery includes GHG emissions resulting from fuel combustion in off-road vehicles which comprises vehicles and mobile equipment used primarily on commercial or industrial sites.

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass
1.A.2.g.vii	IE	NO	NO	NO	NO	NO	IE	NO	NO	NO	NO	NO	IE	NO	NO	NO	NO	NO

Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																	
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																	

The emissions from combustion of liquid fuels (mainly gas/diesel oil, motor gasoline and liquefied petroleum gases (LPG)) of the CRT category 1.A.g.vii Off-road vehicles and other machinery are included either categories of 1.A.2 *Manufacturing Industries and Construction* or 1.A.3.b. Road transportation.

The Energy balance currently does not provide information on the consumption of liquid fuels in activities under Off-road vehicles and other machinery.

1.2.4.14.2 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-67 Planned improvements for CRT category 1.A.g.vii Off-road vehicles and other machinery

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.g.vii 1.A.2	Energy balance - Survey on use/consumption of liquid fuels in stationary and off-road vehicles and other machinery	AD	Accuracy Completeness Comparability Transparency	low

1.2.4.15 Other (Not-specified industry & Autoproducer) (CRT category 1.A.2.m)

Folder	\06_Inventory\2024_submission\01_Energy\1A2	
File	1A2m_IndustryManuf_Tool_DZA.xlsx	
Based on	1A2m_i_IndustryManuf_Tool_DZA	
	1A2m_ii_IndustryManuf_Tool_DZA	
	1A2m_iii_IndustryManuf_Tool_DZA	
NID CHAPTER	3.2.4.15 Other (Not-specified industry & Autoproducer) (CRT category 1.A.2.m)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	1A1ai_NIR_tables_&_graphs
	AD	emissions
	Table	Column E--R
	Graph	J-BL
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.2.4.15.1 Category description

The CRT category 11.A.2.m *Other (Not-specified industry & Autoproducer)* GHG emissions resulting from fuel combustion activities

- in any manufacturing industry/construction not included in 1.A.2.a - 1.A.2.l;
- in transformation sector of autoproducer electricity plants, autoproducer CHP plants, autoproducer heat plants;
- in 1.A.2 (all categories) for the period 1990 – 2000 as the energy balance was not disaggregated in this period.

GHG emissions / removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gas	other fossil fuel	peat	biomass	liquid	solid	gas	other fossil fuel	peat	biomass	liquid	solid	gas	other fossil fuel	peat	biomass
1.A.2.m	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓
Key Category	LA 1990 & TA	-	LA 1990 & 2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

1.2.4.15.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2m_IndustryManuf_Tool_DZA.xlsx
Based on	1A2m_i_IndustryManuf_Tool_DZA 1A2m_ii_IndustryManuf_Tool_DZA 1A2m_iii_IndustryManuf_Tool_DZA
Sheet	ChoiceMethology

1.2.4.15.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach¹⁶⁰ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel}[kt] = Fuel\ Consumption_{fuel}[TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO_2\ equivalent}] = \sum_{fuel} emissions_{CO_2, fuel} [kt] + \sum_{fuel} emissions_{CH_4, fuel} [kt] \times GWP_{CH_4} + \sum_{fuel} emissions_{N_2O, fuel} [kt] \times GWP_{N_2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.2.m. Other is a key category.

1.2.4.15.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

- Liquid fuels:**
- Gas/Diesel Oil* (only non-bio Gas/Diesel Oil)
 - Motor Gasoline* (only non-bio-gasoline)
 - Liquefied Petroleum Gases
 - Other Kerosene
 - Other Oil - Other Petroleum Products
- Gaseous fuels:**
- Natural gas
- Biomass**
- Fuelwood

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

¹⁶⁰ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table, the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.2.m *Other (Not-specified industry & Autoproducer)* are provided.

Table 1-68 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.2.m *Other (Not-specified industry & Autoproducer)*.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ / Gg		48.0 2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Motor Gasoline*	TJ / Gg	44.75 * 0.95 = 42.51	44.3
	Residual Fuel Oil	TJ / Gg	42.18 * 0.95 = 40.07	40.4
	Liquefied Petroleum Gas (LPG)	TJ / Gg	46.02 * 0.95 = 43.72	47.3
	Other Kerosene	TJ / Gg	43.92 * 0.95 = 41.72	43.8
	Other Petroleum Products	TJ / Gg	MEM/Sonatrach	40.2
biomass	Fuel Wood	TJ / Gg	MEM/Sonatrach	15.6

Conversion from GCV to NCV	Default
Natural gas	1 NCV = 0.9 x GCV
Petroleum products	1 NCV = 0.95 x GCV

Conversion from weight in tons per m3 for fuelwood (general fuelwood)	
Fuelwood (general fuelwood)	Volume (m3) * 0.707 = weight (tonnes)

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹⁶¹
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ¹⁶² : Table 4 Difference between net and gross calorific values for selected fuels
	Conversion from weight in tons per m3 for fuelwood (general fuelwood)	Table 4.3 Conversion table for fuelwood (wood with 25 per cent moisture content)

Note:			
D	Default	CS	Country specific
PS	Plant specific		
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.			

1.2.4.15.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2m_IndustryManuf_Tool_DZA.xlsx

¹⁶¹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

¹⁶² <https://unstats.un.org/unsd/energystats/methodology/ires/>

Based on	1A2m_i_IndustryManuf_Tool_DZA 1A2m_ii_IndustryManuf_Tool_DZA 1A2m_iii_IndustryManuf_Tool_DZA
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas, liquid fuels and biomass were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-69 GHG Emission factor TIER 1 for CRT category 1.A.2.m Other (Not-specified industry & Autoproducer).

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	1	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	3	D	0.6	D
	Motor Gasoline*	69,300	D	3	D	0.6	D
	Residual Fuel Oil	77,400	D	3	D	0.6	D
	Liquefied Petroleum Gases (LPG)	63,100	D	1	D	0.1	D
	Other Kerosene	71,900	D	3	D	0.6	D
	Other Petroleum Products	73,300	D	3	D	0.6	D
biomass	Fuelwood	112,000	D	30	D	4	D
Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category						

Note:					
D	Default	CS	Country specific	PS	Plant specific
		IEF		Implied emission factor	

1.2.4.15.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2m_IndustryManuf_Tool_DZA.xlsx
Based on	1A2m_i_IndustryManuf_Tool_DZA 1A2m_ii_IndustryManuf_Tool_DZA 1A2m_iii_IndustryManuf_Tool_DZA
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.2.m *Other (Not-specified industry & Autoproducer)* are presented in the following table.

Table 1-70 Uncertainty for CRT category 1.A.2.m *Other (Not-specified industry & Autoproducer)*.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data are considered almost consistent even though two different data sets were used:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics¹⁶³;
- 2010 - 2022 are taken from the National Energy balance provided by MEM¹⁶⁴.

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹⁶⁵;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹⁶⁶.

A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.4.15.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2m_IndustryManuf_Tool_DZA.xlsx
Based on	1A2m_i_IndustryManuf_Tool_DZA
	1A2m_ii_IndustryManuf_Tool_DZA
	1A2m_iii_IndustryManuf_Tool_DZA
Sheet	QC CHECKLIST

¹⁶³ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

¹⁶⁴ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹⁶⁵ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹⁶⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹⁶⁷ and
 - international energy statistics of UN statistics¹⁶⁸ and International Energy Agency (IEA)¹⁶⁹
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.4.15.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A2
File	1A2m_IndustryManuf_Tool_DZA.xlsx
Based on	1A2m_i_IndustryManuf_Tool_DZA 1A2m_ii_IndustryManuf_Tool_DZA 1A2m_iii_IndustryManuf_Tool_DZA
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-71 Planned improvements for CRT category 1.A.2.m *Other (Not-specified industry & Autoproducer)*.

GHG source & sink category	Planned improvement	Type of improvement	Priority
1.A.2.m	Energy balance ● Revision of the energy balance (1990-2007): improvement of time series completeness and consistency by collection of plant specific data (consumption and production, NCV, carbon content)	AD Accuracy Transparency Consistency Completeness Comparability	high
1.A.2.m	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD Accuracy Completeness Comparability Transparency	low

¹⁶⁷ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁶⁸ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁶⁹ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.2.m	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GHG	Accuracy Transparency	medium

1.2.5 Transport (CRT category 1.A.3)

This section describes GHG emissions resulting from fuel combustion in transport sector, which originate from the following subcategories.

IPCC code	Description	Occurrent			Not occurrent (NO)
		Estimated	Not estimated (NE)	Included elsewhere (IE)	
1.A.3.a.i	Domestic Aviation (Civil)	✓			
1.A.3.b	Road Transportation				
1.A.3.b.i	Cars	✓			
1.A.3.b.ii	Light-duty trucks			✓ (in 1.A.3.b.i)	
1.A.3.b.iii	Heavy-duty trucks and buses			✓ (in 1.A.3.b.i)	
1.A.3.b.iv	Motorcycles			✓ (in 1.A.3.b.i)	
1.A.3.b.v	Evaporative emissions from vehicles		✓		
1.A.3.b.vi	Urea-based catalysts		✓		
1.A.3.c	Railways	✓			
1.A.3.d	Domestic Water-borne Navigation	✓			
1.A.3.e	Other Transportation				
1.A.3.e.i	Pipeline transport	✓			
1.A.3.e.ii	Other				✓

1.2.5.1 Domestic aviation (CRT category 1.A.3.a.ii)

Folder	\06_Inventory\2024_submission\01_Energy\1A3		
File	1A3aii_TransportTool_DZA.xlsx		
NID CHAPTER	3.2.5.1 Domestic aviation (CRT category 1.A.3.a.ii)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
		AD	emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter		
	● Trend -> 2.2.1 Energy ● Executive Summary		

1.2.5.1.1 Category description

As described in the 2006 IPCC Guidelines, the CRT category 1.A.3.a.ii Domestic Aviation includes emissions from flights that depart in one country and arrive in the same country. Also, Domestic Aviation include CRT category 1.A.3.a.ii take-offs and landings for these flight stages. It is good practice, that emissions from Domestic Aviation are reported separately from Domestic aviation and it is good practice to apply the definition presented in the following table.

Table 1-72 Criteria for defining international and domestic Aviation.

Criteria for defining international or <i>Domestic navigation</i> (applies to individual legs of journeys with more than one take-off and landing)		
Journey type between two airports	Domestic	International
• Departs and arrives in same country	Yes	No
• Departs from one country and arrives in another	No	Yes
Source: 2006 IPCC Guidelines. Volume 2. Chapter 3: Mobile Combustion. 3.6.1.3 Choice of activity data. TABLE 3.6.		

This section describes GHG emissions resulting from fuel combustion in Domestic Aviation (CRT category 1.A.3.a.ii).

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	I I q u i d	S O l i d	G A S E O U S	Other fossil fuel	P e a t	B i o m a S S	I I q u i d	S O l i d	G A S E O U S	Other fossil fuel	P e a t	B i o m a S S	I I q u i d	S O l i d	G A S E O U S	Other fossil fuel	P e a t	B i o m a S S
Estimated																		
1.A.3.a.ii	✓	NA	NA	NA	NA	NO	✓	NA	NA	NA	NA	NO	✓	NA	NA	NA	NA	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A ‘✓’ indicates: emissions from this sub-category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

1.2.5.1.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aai_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.5.1.2.1 Choice of methods – TIER 1

For estimating the CO₂, CH₄ and N₂O emissions, the 2006 IPCC Guidelines Tier 1 approach¹⁷⁰ has been applied:

Equation 3.6.1: Aviation equation (2006 IPCC GL. Vol. 3. Chap. 3.6.1.1)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kg GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., jet kerosene, aviation gasoline

1.2.5.1.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used in Domestic aviation:

Liquid fuels: • Jet Kerosene

Fuel consumption used for estimating the GHG and non-GHG emissions for the years.

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics¹⁷¹ ;
- 2008 – 2022 are provided by Naftal (MEM).

Total fuel consumption increased by 57.6% over the period 1990-2022 due to the increase in passenger and freight transport activities and the increase in the number of aircraft with the improvement of the country's economic situation. The emergence of new compagnies such as Tassili Airlines has led to an increase in the number of take-offs and landings within the country, which has increased the fuel consumption. In addition, the addition of new domestic flights, particularly to and from the southern wilayas during the summer

¹⁷⁰ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 3: Mobile Combustion - 3.6.1.1 Methodological issues - Choice of method

¹⁷¹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

season, contributes to the increase of fuel consumption. Fluctuations in total fuel consumption from year to year are mainly due to:

- The use of two different data set for GHG emissions estimations,
- The fluctuation of number of flights from year to year,
- The launch of new lines, particularly to and from the southern wilayas.

In energy statistics production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units. e.g., in tonnes or cubic meters. To convert these data to energy units in this case terajoules requires calorific values. The emission calculations are based on net calorific values. In the following table, the applied net calorific values (NCVs) for conversion to energy units in CRT category Domestic aviation are provided.

Table 1-73 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category CRT category 1.A.3.a.ii Domestic aviation

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV *
liquid	Jet Kerosene	TJ / Gg	43.92 * 0.95 = 41.72	44.1
Conversion from GCV to NCV			Default	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹⁷²		
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2		
Note:				
D	Default	CS	Country specific	PS Plant specific
*	For comparison			

1.2.5.1.2.3 Choice of emission factors

Folder	\\06_Inventory\2024_submission\01_Energy\1A3
File	1A3a.ii_TransportTool_DZA.xlsx
Sheet	EF IPCC_1A3

Default emission factors for CO₂, CH₄ and N₂O for Jet Kerosene were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-74 GHG Emission factors TIER 1 for CRT category 1.A.3.a.ii Domestic aviation

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
liquid	Jet Kerosene	71 500	D	0.5	D	2	D
Source	2006 IPCC Guidelines Vol. 2. Chap. 3 (3.6.1.2) Table 3.6.4 CO ₂ emission factors and Table 3.6.5 NON-CO ₂						
Note:							

¹⁷² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

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Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.5.1.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aii_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category CRT category 1.A.3.a.ii Domestic aviation are presented in the following table.

Table 1-75 Uncertainty for CRT category 1.A.3.a.ii Domestic aviation.

Uncertainty	Jet Kerosene			Reference
	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	10%	10%	10%	2006 IPCC GL. Vol. 2. Chap. 3.6.1.7
Emission factor (EF)	5%	82%	133%	
Combined Uncertainty (U)	11%	83%	133%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics.
- 2008 - 2022 are provided by Naftal (MEM).

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be done for future submissions.

1.2.5.1.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aii_TransportTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹⁷³ and
 - international energy statistics of UN statistics¹⁷⁴ and International Energy Agency (IEA)¹⁷⁵
- time series consistency - plausibility checks of dips and jumps.

1.2.5.1.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aii_TransportTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-76 Planned improvements for CRT category 1.A.3.a.ii Domestic aviation

GHG source & sink category	Planned improvement	Type of improvement	Priority
1.A.3.a.i 1.A.3.a.ii	Energy balance - Revision of the energy balance (1990-2007) for all aviation related fuels ● improvement of time series completeness and consistency (consumption and production, NCV, carbon content) ● for all aviation related fuels ○ Jet kerosene ○ aviation gasoline ● Investigation regarding fuel consumption of aviation gasoline used by small planes and helicopters.	AD	Accuracy Completeness Comparability Transparency Consistency
1.A.3.a.i 1.A.3.a.ii	● Application of good practice approach to separate the activity data (fuel consumption) consistent with the definition of Table 3.6 of the 2006 IPCC GL. Vol. 2. Chap. 3: Mobile Combustion. 3.6.1.3 Choice of activity data. ● Improvement of Energy balance: allocation of Jet kerosene used in International or Domestic aviation	AD	Accuracy Completeness Comparability Transparency Consistency

¹⁷³ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁷⁴ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁷⁵ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
	and Jet kerosene exported			
1.A.3.a.i	Collection of data on aircraft movement	AD	Accuracy	medium
1.A.3.a.ii	- international aviation - domestic aviation		Completeness Transparency	
1.A.3.a.i	Application of Tier 2 methodology	M	Accuracy	high
1.A.3.a.ii	- Estimate fuel consumption for LTO and cruise for - International aviation - domestic aviation - Estimate emissions from LTO and cruise phases for - International aviation - domestic aviation	EF	Completeness Comparability Transparency Consistency	

1.2.5.2 Road transportation (CRT category 1.A.3.b)

Folder	\06_Inventory\2024_submission\01_Energy\1A3		
File	1A3b_TransportTool_DZA.xlsx		
NID CHAPTER	2.2.5.2 Road transportation (CRT category 1.A.3.b)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	1A1ai_NIR_tables_&_graphs	
		AD	emissions
	Table	B-H	Column E--R
	Graph	BT	J-BL
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

1.2.5.2.1 Category description

This section describes GHG emissions resulting from fuel combustion in Road Transport (CRT category 1.A.3.b). The mobile Road Transportation includes all types of vehicles such as light-duty vehicles such as automobiles and light trucks, and heavy-duty vehicles such as tractor trailers and buses, and on-road motorcycles (including mopeds, scooters and three-wheelers).

CRT category	description
1.A.3.b	Road Transportation
1.A.3.b.i	Cars
1.A.3.b.i.1	Passenger cars with 3-way catalysts
1.A.3.b.i.2	Passenger cars without 3-way catalysts
1.A.3.b.ii	Light-duty trucks
1.A.3.b.ii.1	Light-duty trucks with 3-way catalysts
1.A.3.b.ii.2	Light-duty trucks without 3-way catalysts
1.A.3.b.iii	Heavy-duty trucks and buses

1.A.3.b.iv	Motorcycles
1.A.3.b.v	Evaporative emissions from vehicles
1.A.3.b.vi	Urea-based catalysts

Estimated	CO ₂							CH ₄							N ₂ O						
	Gasoline	Diesel oil	LPG	Other liquid fuels	Gas oils	Bio mass	Other fossil fuels	Gasoline	Diesel oil	LPG	Other liquid fuels	Gas oils	Bio mass	Other fossil fuels	Gasoline	Diesel oil	LPG	Other liquid fuels	Gas oils	Bio mass	Other fossil fuels
1.A.3.b (i-iv)	✓	✓	✓	NO	NO	NO	NO	✓	✓	✓	NO	NO	NO	NO	✓	✓	✓	NO	NO	NO	NO
1.A.3.b.v	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
1.A.3.b.vi	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Key category																					
1.A.3.b (i-iv)	LA 1990 & 2022 TA	LA 1990 & 2022 TA	LA 2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.A.3.b.v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.A.3.b.vi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this sub-category have been estimated.																					
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																					
Key Category: LA – Level Assessment (in year); TA – Trend Assessment																					

The CRT category 1.A.3.b Road transport is for CO₂ and Diesel oil, Gasoline and LPG key source.

1.2.5.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3b_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.5.2.2.1 Choice of methods

For estimating the CO₂, CH₄ and N₂O emissions the 2006 IPCC Guidelines Tier 1 approach¹⁷⁶ has been applied:

Equation 3.2.1: CO₂ from road transport (2006 IPCC GL. Vol. 2. Chap. 3.2.1.1)

Equation 3.2.3: Emissions of CH₄ and N₂O (2006 IPCC GL. Vol. 2. Chap. 3.2.1.1)

$$Emissions_{GHG, fuel} = Fuel Consumption_{fuel} \times Emission Factor_{GHG, fuel}$$

¹⁷⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 3: Mobile Combustion - 3.6.1.1 Methodological issues - Choice of method

Equation 3.2.1: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (Gg GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ) (as represented by fuel sold)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., Gas/Diesel Oil, Motor Gasoline, LPG

1.2.5.2.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used in Road transportation:

- Liquid fuels:**
- Gas/Diesel Oil* (only non- Gas/Diesel Oil)
 - Motor Gasoline* (only non-bio-gasoline)
 - Liquefied Petroleum Gases (LPG)

Fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics¹⁷⁷;
- 2010 – 2022 are taken from the National Energy balance provided by MEM¹⁷⁸.

The significant increase of fuel consumption from the transport sector is the result of the growth in the national vehicle fleet, which has risen from 2,742,306 vehicles in 1996 to 7,731,664 in 2020 according to ONS data, either an increase of 281%. In addition, growing mobility between towns and the increase in freight transport due to the growth in national production, particularly since the opening of the East-West freeway, has contributed to rising fuel consumption. It should also be noted that the fuels most commonly used in road transport are mainly diesel and gasoline, which is a major source of GHG emissions given that light vehicles, buses and trucks are the most widely used means of transporting passengers and freight.

¹⁷⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁷⁸ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category Domestic aviation are provided.

Table 1-77 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.3.b Road transportation.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV (D)
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Gasoil / Diesel			
	Motor Gasoline*	TJ / Gg	44.75 * 0.95 = 42.51	44.3
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.21 * 0.95 = 43.90	47.3

Conversion from GCV to NCV		Default
Natural gas		1 NCV = 0.9 x GCV
Petroleum products		1 NCV = 0.95 x GCV

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹⁷⁹
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
	Conversion from GCV to NCV	International Recommendations for 150 Energy Statistics (IRES) (2018) ¹⁸⁰ : Table 4 Difference between net and gross calorific values for selected fuels

Note:			
D	Default	CS	Country specific
PS	Plant specific		
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.			

1.2.5.2.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3b_TransportTool_DZA.xlsx
Sheet	EF IPCC_1A3

Default emission factors for CO₂, CH₄ and N₂O for Gasoil / Diesel, Motor Gasoline and Liquefied Petroleum Gases (LPG) were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-78 GHG Emission factor TIER 1 for IPCC CRT category 1.A.3.b Road transportation

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
liquid	Gas / Diesel Oil*	74.100	D	3	D	0.6	D
	Gasoil / Diesel						

¹⁷⁹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

¹⁸⁰ <https://unstats.un.org/unsd/energystats/methodology/ires/>

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Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
	Motor Gasoline*	69.300	D	3	D	0.6	D
	Liquefied Petroleum Gases (LPG)	63.100	D	1	D	0.1	D

Source 2006 IPCC Guidelines Vol. 2. Chap. 3 (3.2.1.2) Table 3.2.1 CO₂ emission factors and Table 3.2.2 NON-CO₂

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.5.2.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3b_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category CRT category 1.A.3.b Road transportation are presented in the following table.

Table 1-79 Uncertainty for CRT category 1.A.3.b Road transportation.

Uncertainty	Road transportation, Diesel oil			Road transportation, Motor gasoline			Road transportation, LPG			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	7%	7%	7%	7%	7%	7%	7%	7%	7%	based on 2006 IPCC GL. Vol. 2. Chap. 3.6.1.7
Emission factor (EF)	3%			3%			3%			
		131%			229%			150%		
			197%			203%			200%	
Combined Uncertainty (U)	8%	150%	200%	8%	150%	200%	8%	150%	200%	

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics.
- 2010 - 2022 are taken from the National Energy balance provided by MEM.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.5.2.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3b_TransportTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹⁸¹ and
 - international energy statistics of UN statistics¹⁸² and International Energy Agency (IEA)¹⁸³
- time series consistency - plausibility checks of dips and jumps.

1.2.5.2.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3b_TransportTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-80 Planned improvements for CRT category 1.A.3.b Road transportation

GHG source & sink category	Planned improvement	Type of improvement	Priority
1.A.3.b	Application of Tier 2 (or higher) using the COPERT model ¹⁸⁴	AD Accuracy Transparency Consistency Completeness Comparability	high

¹⁸¹ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁸² United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁸³ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

¹⁸⁴ COPERT is the EU standard vehicle emissions calculator. It uses vehicle population, mileage, speed and other data such as ambient temperature and calculates emissions and energy consumption for a specific country or region.
<https://www.emisia.com/utilities/copert/>

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.b	Collection of road transport related data for 1990 - 2022 Vehicle fleet: ● Collect data on vehicle fleet in operation per category ○ Passenger transport ○ Freight transport ● Collect or estimate data on vehicle fleet split per ○ fuel (energy) type ○ segment subcategories ○ technology/Euro standard ● Collect or estimate data on vehicle fleet split per age distributions ● Mileage: Collect or assume typical values for average annual distance driven for each vehicle (sub)category ● Speeds: Estimate average travelling speeds in urban areas, rural areas and highways;	AD	Accuracy Transparency Consistency Completeness Comparability	high
1.A.3.b	Fuel (energy) consumption - Energy balance Revision of the energy balance (1990-2022): improvement of time series completeness and consistency by collection of plant specific data (consumption and production, NCV, carbon content)	EF	Accuracy Transparency Consistency Completeness Comparability	high
1.A.3.b	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Transparency	Medium
1.A.3.b	Information about imported secondhand vehicles	AD	Accuracy Transparency	Medium

1.2.5.3 Railways (CRT category 1.A.c)

Folder	\06_Inventory\2024_submission\01_Energy\1A3	
File	1A3c_TransportTool_DZA.xlsx	
NID CHAPTER	2.2.5.3 Railways (CRT category 1.A.c)	
ToDo	Check for updated reasons for trend in sectoral chapter Update GHG emissions and AD in tables & graphs from sheet 1A1ai_NIR_tables_&_graphs	
	AD	emissions
Table	B-H	Column E--R
Graph	BT	J-BL
	Check for updated reasons for trend in chapter ● Trend -> 2.2.1 Energy ● Executive Summary	

1.2.5.3.1 Category description

As described in the 2006 IPCC Guidelines, the CRT category 1.A.c Railways includes emissions from railway transport for both freight and passenger traffic routes.

This section describes GHG emissions resulting from fuel combustion in CRT category 1.A.c Railways.

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	I q u i d	S o l i d	G a s e o u s	Other fossil fuel	P e a t	B i o m a s s	I q u i d	S o l i d	G a s e o u s	Other fossil fuel	P e a t	B i o m a s s	I q u i d	S o l i d	G a s e o u s	Other fossil fuel	P e a t	B i o m a s s
Estimated																		
1.A.3.c	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

A '✓' indicates: emissions from this sub-category have been estimated.

Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential

LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF

It is assumed, that GHG emissions for the years 1990-2008, 2012-2015, 2017 and 2021 in CRT category 1.A.c Railways are included in CRT category 1.A.3 Road transport.

The Algerian railway network comprises a total of 3,995 km (2018). Over the period 1998-2018, tonne-kilometres decreased by 53% but passenger-kilometres increased by 38%. These results can be explained by the increase in the use of road freight transport (following the completion of the East-West motorway and other national roads) leading to a decrease in tonne-kilometres in rail transport. In the case of the increase in passenger-kilometres, it can be explained by the increase in the number of trains since the improvement of the economic situation of the country. The number of locomotives, mainly diesel-powered, has increased by 38% over the period 1998-2018.

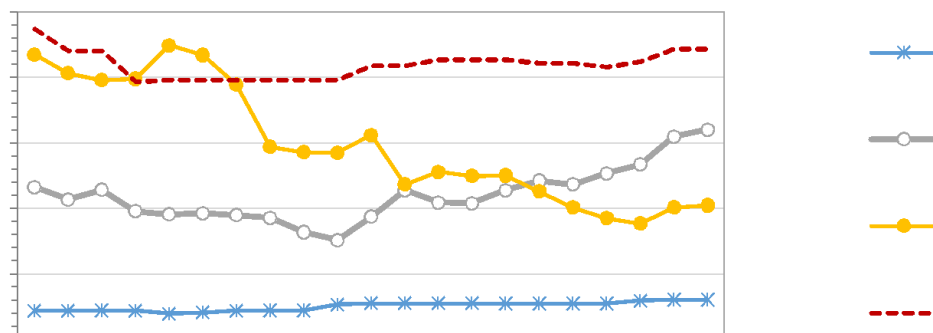


Figure 1-7 Railway: number of locomotives. lines operated. passenger-km and tone-kilometer

Source : Office National des Statistiques (ONS) : L'Algérie en quelques chiffres : résultats. Several years.¹⁸⁵

1.2.5.3.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3c_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.5.3.2.1 Choice of methods – TIER 1

For estimating the CO₂, CH₄ and N₂O emissions, the 2006 IPCC Guidelines Tier 1 approach¹⁸⁶ has been applied:

Equation 3.4.1: General method for emissions from LOCOMOTIVES
(2006 IPCC GL. Vol.2. Chap. 3.4.1.2)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 3.4.2: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap.3)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kg GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., gas/diesel oil, motor gasoline

1.2.5.3.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx

¹⁸⁵ available (20.09.2022) on <https://www.ons.dz/spip.php?rubrique127>

¹⁸⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 3: Mobile Combustion - 3.4.1.1 Methodological issues - Choice of method

UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx
BEN 2021 & 2022.xlsx

The following fuels are used in CRT category 1.A.c Railways:

Liquid fuels: • gas/diesel oil.

Fuel consumption used for estimating the GHG and non-GHG emissions for the years.

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics¹⁸⁷ ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM¹⁸⁸.

2010 - 2022. The decrease in fuel consumption from rail transport, despite the increase in the number of trains, is mainly explained by the acquisition of electrified trains, which do not generate GHG emissions compared with diesel-powered trains.

It is assumed that the activity data from 1.A.c Railways for the period 1990 – 2008, 2012-2015, 2017 and 2021 are included in 1.A.3.b. as the energy balance does not provide information for this period.

The activities data are provided in **Error! Reference source not found..**

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units. in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category Domestic aviation are provided.

Table 1-81 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.c Railways.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV *
liquid	Gas / Diesel Oil* Gasoil / Diesel	TJ / Gg	43.38 * 0.95 = 41.21	43.0
Conversion from GCV to NCV			Default	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ¹⁸⁹		
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2		
Note:				
D	Default	CS	Country specific	PS Plant specific

1.2.5.3.2.3 Choice of emission factors

Folder \06_Inventory\2024_submission\01_Energy\1A3

¹⁸⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

¹⁸⁸ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹⁸⁹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière de reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

File	1A3aii_TransportTool_DZA.xlsx
Sheet	EF IPCC_1A3

Default emission factors for CO₂, CH₄ and N₂O for diesel oil were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-82 GHG Emission factor TIER 1 for CRT category CRT category 1.A.c Railways

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
liquid	Gas / Diesel Oil* Gasoil / Diesel	74,100	D	4.15	D	28.6	D

Source 2006 IPCC Guidelines Vol. 2. Chap. 3 (3.4.1.2) Table 3.4.1 CO₂ EF and NON-CO₂ EF

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.5.3.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3c_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category CRT category 1.A.c Railways are presented in the following table.

Table 1-83 Uncertainty for CRT category 1.A.c Railways.

Uncertainty	Jet Kerosene			Reference
	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	7%	7%	7%	2006 IPCC GL. Vol. 2. Chap. 3.4.1.6
Emission factor (EF)	2%	162%	206%	
Combined Uncertainty (U)	7%	162%	206%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics¹⁹⁰;

¹⁹⁰ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

- 2010 - 2022 are taken from the National Energy balance provided by MEM¹⁹¹.

For the CRT category 1.A.c Railways only data for some years from energy balance were available. Further improvement of the energy balance will be made for future submissions.

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)¹⁹²;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities¹⁹³. A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.5.3.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aii_TransportTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)¹⁹⁴ and
 - international energy statistics of UN statistics¹⁹⁵ and International Energy Agency (IEA)¹⁹⁶
- time series consistency - plausibility checks of dips and jumps.

1.2.5.3.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aii_TransportTool_DZA.xlsx

¹⁹¹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

¹⁹² (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

¹⁹³ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

¹⁹⁴ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

¹⁹⁵ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

¹⁹⁶ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-84 Planned improvements for CRT category 1.A.c Railways

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.c	Revision of the energy balance (1990-2022) ● improvement of time series completeness and consistency, ● for all railway related fuels ○ motor gasoline, ○ gas/diesel oil, ○ fuel oil.	AD	Accuracy Comparability Transparency Consistency	high
1.A.3.c	Application of Tier 2 methodology (or higher) and development of country-specific emission factors for locomotives = collection of information regarding engine types	M EF	Accuracy Completeness Comparability Transparency Consistency	medium
1.A.3.c	Collection of activity data related to locomotives ● number of locomotives by type, ● annual hours of use of locomotive, ● average rated power of locomotive.	M EF	Accuracy Completeness Comparability Transparency Consistency	medium
1.A.3.c	Collection of activity data related to emission standards.	AD	Transparency	medium

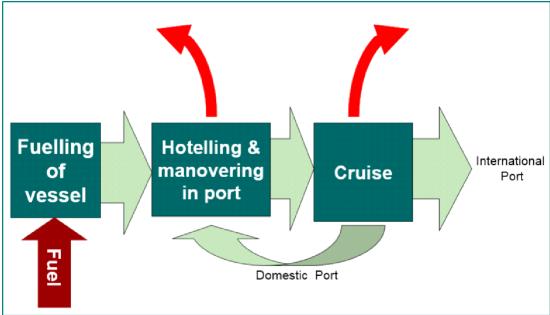
1.2.5.4 Domestic navigation (CRT category 1.A.3.d.ii)

Folder	\06_Inventory\2024_submission\01_Energy\1A3	
File	1A3d.ii_TransportTool_DZA.xlsx	
NID CHAPTER	2.2.5.4 Domestic navigation (CRT category 1.A.3.d.ii)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	1A1ai_NIR_tables_&_graphs
	AD	emissions
Table	B-H	Column E--R
Graph	BT	J-BL
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.2.5.4.1 Category description

As described in the 2006 IPCC Guidelines, the CRT category A.3.d.ii Domestic Water-borne Navigation (International bunkers) includes emissions from fuels used by vessels of all flags that are engaged in international water-borne navigation. The *Domestic navigation* may take place at sea on inland lakes and waterways and in coastal waters. This category includes emissions from journeys that depart in one country and arrive in the same country. The category exclude consumption by fishing vessels (see here Other Sector - Fishing). It is good practice that emissions from *Domestic navigation* are reported separately from international navigation, and it is good practice to apply the definition presented in the following table.

Table 1-85 Criteria for defining international or domestic water-borne navigation

Criteria for defining international or domestic water-borne navigation (applies to each segment of a voyage calling at more than two ports)			
Journey type between two ports	Domestic	International	
Departs and arrives in same country	Yes	No	
Departs from one country and arrives in another	No	Yes	
Source: 2006 IPCC Guidelines. Volume 2. Chapter 3: Mobile Combustion. 3.5.1.3 Choice of activity data. TABLE 3.5.4. ¹⁹⁷			Source: EMEP/EEA air pollutant emission inventory guidebook 2019. Chapter 1.A.3.d Navigation (shipping) 2019. Figure 2 – 1 Flow diagram for the contribution from navigation to mobile sources combustion emissions ¹⁹⁸

GHG emissions/removals	CO ₂	CH ₄	N ₂ O
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¹⁹⁷ https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf

¹⁹⁸ Source: EMEP/EEA air pollutant emission inventory guidebook 2016, Part B: sectoral guidance chapters, 1. Energy, 1.A Combustion, Chapter 1.A.3.d Navigation (shipping) 2016
<https://www.eea.europa.eu/publications/emep-eea-guidebook-2016/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-d-navigation/view>

	l i q u i d	s o l i d	g a s e o u s	Other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	Other fossil fuel	P e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	Other fossil fuel	P e a t	b i o m a s s
Estimated																		
1.A.3.d.ii	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this sub-category have been estimated. Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

it is assumed, that GHG emissions for the period 1990-2007 from 1.A.3.d.ii *Domestic navigation* is included in CRT category 1.A.3 Road transport.

An overview of the GHG emission from fuel combustion in CRT category 1.A.3.d.ii *Domestic navigation* is provided in the following figures and tables:

- Annual GHG emissions;
- Trend of the periods 1990-2022, 2010 – 2022 and 2021 – 2022

1.2.5.4.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3dii_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.5.4.2.1 Choice of methods

For estimating the CO₂, CH₄ and N₂O emissions, the 2006 IPCC Guidelines Tier 1 approach¹⁹⁹ has been applied:

Equation 3.5.1: Water-borne navigation equation (2006 IPCC GL. Vol. 3. Chap. 3.5.1.1)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kg GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., Gas/diesel oil, motor gasoline

1.2.5.4.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx

¹⁹⁹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 3: Mobile Combustion - 3.5.1.1 Methodological issues - Choice of method

based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx
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The following fuels are used in CRT category 1.A.3.a.ii Domestic navigation:

- Liquid fuels:**
- Gas/Diesel Oil
 - Residual fuel oil

Fuel consumption used for estimating the GHG and non-GHG emissions for the years.

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics²⁰⁰ ;
- 2008 – 2022 are provided by Naftal (MEM).

It is assumed that the activity data from 1.A.3.d.ii *Domestic navigation* for the period 1990 – 2007 are included in 1.A.3.b. as the energy balance does not provide information for in this period.

The activities data are provided in **Error! Reference source not found..**

In energy statistics production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units in this case terajoules requires calorific values. The emission calculations are based on net calorific values. In the following table, the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.3.a.ii *Domestic navigation* are provided.

Table 1-86 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units CRT category 1.A.3.d.ii Domestic navigation.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV*
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Gasoil / Diesel			
	Residual fuel Oil *	TJ / Gg	42.18 * 0.95 = 40.07	40.4
Conversion from GCV to NCV			Default	
Petroleum products			1 NCV = 0.95 x GCV	
Source	CS Gross Caloric Value (GCV)		Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²⁰¹	
	Default Net Calorific values (NCVs)		2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2	
Note:				
D	Default	CS	Country specific	PS Plant specific
*	For comparison			

1.2.5.4.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3iii_TransportTool_DZA.xlsx

²⁰⁰ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²⁰¹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

Sheet	EF IPCC_1A3
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Default emission factors for CO₂, CH₄ and N₂O for liquid fuels were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-87 GHG Emission factor TIER 1 for CRT category 1.A.3.d.ii Domestic navigation

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
liquid	Gas / Diesel Oil*	74,100	D	4.15	D	28.6	D
	Gasoil / Diesel						
	Residual fuel Oil*	77,400	D	10	D	0.6	D
Source		2006 IPCC Guidelines Vol. 2. Chap. 3 (3.5.1.2) Table 3.5.2 CO ₂ EF and Table 3.5.3 NON-CO ₂ EF					

Note:					
D	Default	CS	Country specific	PS	Plant specific
				IEF	Implied emission factor

1.2.5.4.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3dii_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.3.d.ii *Domestic navigation* are presented in the following table.

Table 1-88 Uncertainty for CRT category 1.A.3.d.ii Domestic navigation.

Uncertainty	Gas/Diesel Oil			Residual Fuel Oil			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	7%	7%	7%	7%	7%	7%	2006 IPCC GL. Vol. 2. Chap. 3.5.1.7
Emission factor (EF)	1.5%	+/-50%	-40% to 140%	3.0%	+/-50%	-40% to 140%	
Combined Uncertainty (U)	7%	71%	134%	8%	71%	134%	

$$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2007 are taken from the Energy balance provided by MEM and UN statistics²⁰² ;
- 2008 – 2022 are provided by Naftal (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)²⁰³;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities²⁰⁴.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.5.4.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3dii_TransportTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series),
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources (e.g., 1.A.3.d.i International navigation):
 - national statistic published by MEM and Office National des Statistics (ONS)²⁰⁵ and
 - international energy statistics of UN statistics²⁰⁶ and International Energy Agency (IEA)²⁰⁷
- time series consistency - plausibility checks of dips and jumps.

1.2.5.4.5 Category-specific recalculations including explanatory information and justifications.

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3iii_TransportTool_DZA.xlsx
Sheet	Recalculation

²⁰² United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²⁰³ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

²⁰⁴ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

²⁰⁵ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

²⁰⁶ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

²⁰⁷ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

The following table presents the main revisions and recalculations done since the last submission to the UNFCCC and relevant to CRT category 1.A.3.a.ii Domestic navigation.

Table 1-89 Recalculations since the last submission in CRT category 1.A.3.d.ii Domestic navigation.

GHG source & sink category	Revisions of data	Type of revision	Type of improvement
1.A.3.d.ii	Fuel consumption data (activity data) was revised due to the use of data provided by Naftal (MEM) for the period 2008-2022.	AD	Accuracy Transparency

1.2.5.4.6 Category-specific planned improvements

Folder	\\06_Inventory\2024_submission\01_Energy\1A3
File	1A3iii_TransportTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-90 Planned improvements for CRT category 1.A.3.d.ii Domestic navigation

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.d.i 1.A.3.d.ii	Revision of the energy balance (1990-2007) - improvement of time series completeness and consistency) - for all navigation related fuels - gas/diesel oil - fuel oil	AD	Accuracy Comparability Transparency Consistency	high
1.A.3.d.i 1.A.3.d.ii	Application of good practice approach to separate the activity data (fuel consumption) consistent with the definition of Table 3.6 of the 2006 IPCC Guidelines. Volume 2. Chapter 3: Mobile Combustion. 3.5.1.3 Choice of activity data.	AD	Accuracy Comparability Transparency Consistency	high
1.A.3.d.i 1.A.3.d.ii	Data on fuel consumption by fuel type and engine type - Surveys of shipping companies (including ferry and freight) - Surveys of individual port and marine authorities	AD	Accuracy Completeness Comparability Transparency Consistency	medium
1.A.3.d.i 1.A.3.d.ii	- Ship movement data and standard passenger and freight ferry schedules - Fischery boat movements	AD	Transparency	medium
1.A.3.d.i 1.A.3.d.ii	Application of Tier 2 methodology - Estimate fuel consumption for hotelling & movements and cruise for navigation. - Estimate emissions from hotelling & movements and cruise for navigation.	M EF	Accuracy Completeness Comparability Transparency Consistency	medium

1.2.5.5 Other transportation (CRT category 1.A.3.e)

Folder	\06_Inventory\2024_submission\01_Energy\1A3	
File	1A3e_TransportTool_DZA.xlsx	
NID CHAPTER	2.2.5.5 Other transportation (CRT category 1.A.3.e)	
ToDo	Check for updated reasons for trend in sectoral chapter Update GHG emissions and AD in tables & graphs from sheet 1A1ai_NIR_tables_&_graphs	
	AD	emissions
Table	B-H	Column E--R
Graph	BT	J-BL
	Check for updated reasons for trend in chapter ● Trend -> 2.2.1 Energy ● Executive Summary	

1.2.5.5.1 Category description

As described in the 2006 IPCC Guidelines, the CRT category 1.A.3.e *Other* transportation includes GHG emissions from

IPCC code	Description
1.A.3.e.i Pipeline transport	which include fuel combustion related emissions from the operation of pump stations and maintenance of pipelines. Transport via pipelines includes transport of gases, liquids, slurry and other commodities via pipelines. ⇒ Distribution of natural or manufactured gas, water or steam from the distributor to final users is excluded and should be reported in 1.A.1.c.ii or 1.A.4.a.
1.A.3.e.ii Other	which include fuel combustion emissions from Other Transportation excluding Pipeline Transport.

GHG emissions/ removals estimated	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	other fossil fuel	p e a t	b i o m a s s
1.A.3.e.i	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO	NO	NO	✓	NO	NO	NO
1.A.3.e.ii	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Key Category																		
1.A.3.e.i	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.A.3.e.i	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this sub-category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

1.2.5.5.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3e_TransportTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.5.5.2.1 Choice of methods – TIER 1 CO₂, CH₄ and N₂O

For estimating the CO₂, CH₄ and N₂O emissions the 2006 IPCC Guidelines Tier 1 approach²⁰⁸ has been applied:

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG, fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG, fuel}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL. Vol. 2. Chap. 2)

$$Emissions_{GHG} = \sum_{fuel} emissions_{GHG, fuel}$$

Where:

Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kg GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
GHG	= CO ₂ , CH ₄ , N ₂ O
Fuel	= liquid fuels, e.g., motor gasoline, gas/diesel oil, LPG

1.2.5.5.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion of fuel used for operation of pump stations and maintenance of pipelines.

Gaseous fuels: • Natural gas

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Fuel consumption used for estimating the GHG and non-GHG emissions for the years.

- 2010 – 2022 are taken from Sonatrach (MEM)²⁰⁹.

²⁰⁸ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

²⁰⁹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

Table 1-91 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.3.e.i Other transport - Pipeline transport.

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific (CS) NCV (GVC * Conversion factor)	2006 IPCC default NCV (D)
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02*

Conversion from GCV to NCV		Default
Natural gas		1 NCV = 0.9 x GCV
Petroleum products		1 NCV = 0.95 x GCV

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²¹⁰
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
	Conversion from GCV to NCV	International Recommendations for 150 Energy Statistics (IRES) (2018) ²¹¹ : Table 4 Difference between net and gross calorific values for selected fuels

Note:			
D	Default	CS	Country specific
PS	Plant specific		
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.			

1.2.5.5.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3aii_TransportTool_DZA.xlsx
Sheet	EF IPCC_1A3

Default emission factors for CO₂, CH₄ and N₂O for Natural gas were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-92 GHG Emission factor TIER 1 for CRT category 1.A.3.e.i Other transport - Pipeline transport.

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56 100	D	1	D	0.1	D

Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor.
	D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category

Note:				
D	Default	CS	Country specific	PS
				Plant specific
				IEF
				Implied emission factor

1.2.5.5.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A3
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²¹⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

²¹¹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

File	1A3e_TransportTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.3.e.i *Other transport - Pipeline transport* are presented in the following table.

Table 1-93 Uncertainty for CRT category 1.A.3.e.i *Other transport - Pipeline transport*.

Uncertainty	Gaseous fuels			Reference
	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2 (2.4.2)
Activity data (AD)	2%	2%	2%	Table 2.15 and Table 3.1
Emission factor (EF)	1%	100%	192%	Table 2.13
				Table 2.12
				Table 2.14
Combined Uncertainty (U)	2%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though only one data set were used:

- 2010 - 2022 are taken from the Sonatrach by MEM.

1.2.5.5.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3e_TransportTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.

- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)²¹² and
 - international energy statistics of UN statistics²¹³. International Energy Agency (IEA)²¹⁴
 - Sonelgaz: Chiffres Clés (different years)²¹⁵
 - Sonatrach: Rapport Annuel (different years)²¹⁶
- cross checks with other relevant sectors are performed to avoid double counting or omissions.
- time series consistency - plausibility checks of dips and jumps.

1.2.5.5.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A3
File	1A3e_TransportTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-94 Planned improvements for CRT category 1.A.3.e.i *Other transport - Pipeline transport*.

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.3.e.i	Revision of the energy balance (1990-2009) • improvement of time series completeness and consistency • for all used fuels ○ natural gas	AD	Accuracy Comparability Transparency Consistency	high
1.A.3.e.i 1.A.2.g.vii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Accuracy Completeness Comparability Transparency	low

²¹²

²¹³ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

²¹⁴ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

²¹⁵ <https://www.sonelgaz.dz/fr>

²¹⁶ <https://sonatrach.com/rapports>

1.2.6 Other sectors (CRT category 1.A.4)

The CRT category 1.A.4 *Other sectors* comprise emissions from fuel combustion in agriculture, forestry, fishing and fishing industries such as fish farms. Activities included in ISIC²¹⁷ Divisions 01, 02 and 05.

CRT category	description	
1.A.4	Other Sectors	Emissions from combustion activities as described below, including combustion for the generation of electricity and/or heat for own use in these sectors.
1.A.4.a	Commercial/Institutional	▪ activities of public administration (governmental) ○ executive and legislative administration of central, regional and local level ○ activities of providing health care, education, cultural services and other social services ○ Public order and safety activities, foreign affairs ▪ Financial sector ▪ NGOs ▪ Commercial activities: wholesale and retail trade, repair of motor vehicles and motorbikes, transport and storage, accommodation and food service activities, information and communication, private scientific and technical activities, other business activities.
1.A.4.a.i	Stationary combustion	
1.A.4.a.ii	Off-road vehicles and other machinery	
1.A.4.b	Residential	▪ private households
1.A.4.b.i	Stationary combustion	
1.A.4.b.ii	Off-road vehicles and other machinery	
1.A.4.c	Agriculture/Forestry/Fishing	▪ includes the exploitation of vegetal and animal natural resources. ▪ activities of growing of crops, raising and breeding of animals. harvesting of timber and other plants, animals or animal products from a farm or their natural habitats.
1.A.4.c.i	Stationary	
1.A.4.c.ii	Off-road vehicles and other machinery	
1.A.4.c.iii	Fishing	
Source: 2006 IPCC Guidelines. Volume 2: Energy. Chapter 2: Stationary Combustion - 2.2 Description of sources		

²¹⁷ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

1.2.6.1 Commercial/Institutional (CRT category 1.A.4.a)

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
NID CHAPTER	3.2.6.1 Commercial/Institutional (CRT category 1.A.4.a)

1.2.6.1.1 Category description

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass
1.A.4.a																		
1.A.4.a.i	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓
1.A.4.a.ii	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO
Key Category	LA 2022	-	LA 2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

1.2.6.1.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.6.1.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach²¹⁸ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel} [kt] = Fuel\ Consumption_{fuel} [TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO2\ equivalent}] = \sum_{fuel} emissions_{CO2, fuel} [kt] + \sum_{fuel} emissions_{CH4, fuel} [kt] \times GWP_{CH4} + \sum_{fuel} emissions_{N2O, fuel} [kt] \times GWP_{N2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

²¹⁸ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

The method is not in line with the decision tree, as the category 1.A.4.a. *Commercial/Institutional* is a key category.

1.2.6.1.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use (and which are not delivered by public electricity power plants):

- | | |
|----------------------|---|
| Liquid fuels | <ul style="list-style-type: none"> ● Gas/Diesel Oil* (only non-bio Gas/Diesel Oil) ● Motor Gasoline* (only non-bio-gasoline) ● Liquefied Petroleum Gases ● Other Petroleum Products |
| Gaseous fuels | <ul style="list-style-type: none"> ● Natural gas |
| Biomass | <ul style="list-style-type: none"> ● Fuelwood |

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Emissions from the combustion of wood charcoal, used for e.g. for barbeque, were not estimated due to lack of data.

Gaseous fuel consumption used for estimating the GHG and non-GHG emissions for the entire period

- 1990 - 2005 are taken from the Energy balance provided by MEM and UN statistics²¹⁹ ;
- 2006 – 2022 are provided by Sonelgaz (MEM).

Liquid fuel consumption used for estimating the GHG and non-GHG emissions for the entire period

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²²⁰ ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM²²¹

Activity data from 1.A.4.a. for the period 1990 – 2009 are included in 1.A.4.b as the energy balance was not disaggregated in this period.

In energy statistics production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tons or cubic meters. To convert these data to energy units in this case terajoules requires calorific values. The emission calculations are based on net calorific values. In the following table, the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.4.a *Commercial/Institutional* are provided.

²¹⁹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²²⁰ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²²¹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

Table 1-95 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.4.a Commercial/Institutional

Fuel type	Fuel	Unit	Net calorific value (NCV)	
			Country specific NCV (CS NCV) (GVC * Conversion factor)	default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02 UN default
		TJ / Gg		48.0 2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21	43.0
	Gasoil / Diesel			
	Motor Gasoline*	TJ / Gg	44.75 * 0.95 = 42.51	44.3
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72	47.3
	Other Petroleum Products	TJ / Gg	MEM/Sonatrach	40.2
biomass	Fuel Wood	TJ / Gg	MEM/Sonatrach	15.6
	Bois/résidus de bois			
Conversion from GCV to NCV			Default	
Natural gas			1 NCV = 0.9 x GCV	
Petroleum products			1 NCV = 0.95 x GCV	
Conversion from weight in tons per m3 for fuelwood (general fuelwood)				
Fuelwood (general fuelwood)			Volume (m3) *0.707 = weight (tonnes)	
Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²²²		
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)		
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ²²³ ; Table 4 Difference between net and gross calorific values for selected fuels		
	Conversion from weight in tons per m3 for fuelwood (general fuelwood)	Table 4.3 Conversion table for fuelwood (wood with 25 per cent moisture content)		
	Note:			
D Default		CS Country specific	PS Plant specific	
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.				

1.2.6.1.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
Sheet	ChoiceMethology

Default emission factors for CO₂, CH₄ and N₂O for natural gas, liquid fuels and biomass, were taken from IPCC 2006 Guidelines and are presented in the following table.

²²² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

²²³ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Table 1-96 GHG Emission factor TIER 1 for CRT category 1.A.4.a Commercial/Institutional

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	5	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	10	D	0.6	D
	Gasoil / Diesel						
	Motor Gasoline*	69,300	D	10	D	0.6	D
	Liquefied Petroleum Gases (LPG)	63,100	D	5	D	0.1	D
	Other Petroleum Products	73,300	D	10	D	0.6	D
biomass	Fuelwood Bois/résidus de bois	112,000	D	300	D	4	D
Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category						

Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.6.1.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
Sheet	ChoiceMethology
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.4.a Commercial/ Institutional are presented in the following table.

Table 1-97 Uncertainty for CRT category 1.A.4.a Commercial/Institutional.

Uncertainty	Gaseous fuels			Liquid fuels			Biomass			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	
Activity data (AD)	2%	2%	2%	2%	2%	2%	20%	20%	20%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			7%			based Table 2.13
		100 %			100 %			189 %		based Table 2.12

QA/QC Plan

			192 %			192 %			268 %	based Table 2.14
Combined Uncertainty (U)	2%	100 %	192 %	3%	100 %	192 %	21%	190 %	269 %	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

Data for gaseous fuels for the period:

- 1990 - 2005 are taken from the Energy balance provided by MEM and UN statistics²⁴⁴ ;
- 2006 – 2022 are provided by Sonelgaz (MEM).

Liquid fuel for the period:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²⁴⁵ ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM²⁴⁶ ;

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)²²⁴;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities²²⁵.

A revision of the years 1990-2005 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.6.1.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
Sheet	ChoiceMethology

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- Cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)²²⁶ and

²²⁴ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

²²⁵ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

²²⁶ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

- international energy statistics of UN statistics²²⁷ and International Energy Agency (IEA)²²⁸
- Cross checks with other relevant sectors (e.g., 1.4.b and 1.4.c) are performed to avoid double counting or omissions.
- time series consistency - plausibility checks of dips and jumps.

1.2.6.1.5 Category-specific recalculations including explanatory information and justifications

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
Sheet	Recalculation

The following table presents the main revisions and recalculations done since the last submission to the UNFCCC and relevant to CRT category 1.A.4.a *Commercial/Institutional*.

Table 1-98 Recalculations done since last NIR in CRT category 1.A.4.a *Commercial/Institutional*

GHG source & sink category	Revisions of data	Type of revision	Type of improvement
1.A.4.a	Application of 2006 IPCC Guidelines methodology	EF	Comparability
1.A.4.a	Fuel consumption data (activity data) was revised due to revised gaseous fuel consumption data provided by MEM for the period 2006-2022 / revision of energy Balance and use of data from MEM and UN statistics – energy statistics	AD	Accuracy Transparency
1.A.4.a	Assumption of 100% oxidation	EF	Accuracy Comparability

1.2.6.1.6 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4a_OtherSectorTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-99 Planned improvements for CRT category 1.A.4.a *Commercial/Institutional*

GHG source & sink category	Planned improvement	Type of improvement	Priority
1.A.4	Revision of the energy balance (1990-2005): Distribution of fuel consumption from all categories (1.A.4.a. 1.A.4.b. 1.A.4.c) within category 1.A.4 <i>Other Sectors</i>	AD	Accuracy Transparency Medium
1.A.4.a.i	Energy balance - Survey on use of fuels in stationary and	AD	Completeness
1.A.4.a.ii	Off-road vehicles and other machinery		Comparability low
1.A.4.a	Energy balance - Use of other biomass than fuel wood	AD	Completeness medium

²²⁷ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

²²⁸ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

GHG source & sink category	Planned improvement	Type of improvement		Priority
	- bio-gasoline or bio-gas/diesel oil including MTBE, AddBlue, etc. - Wood charcoal			
1.A.4.a	Determination	EF	Accuracy Transparency	Medium
	- CS NCV for biomass considering moisture content - Carbon content (%) of biomass			
1.A.4.a	Survey on	AD	Transparency	Medium
	- thermal insulation of the buildings - type of use of the building - comfort requirements (air conditioning, etc.) - energy-saving devices and technologies	EF		/ low

1.2.6.2 Residential (CRT category 1.A.4.b)

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx
NID CHAPTER	3.2.6.2 Residential (CRT category 1.A.4.b)

1.2.6.2.1 Category description

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass	liquid	solid	gaseous	other fossil fuel	peat	biomass
1.A.4.b																		
1.A.4.b.i	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓
1.A.4.b.ii	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO	IE	NO	IE	NO	NO	NO
Key Category	LA 1990 & 2022 TA	-	LA 1990 & 2022 TA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

Emissions included elsewhere (IE):

- It is assumed that the fuel combusted in CRT category 1.A.4.b.ii *Off-road vehicles and other machinery* is included either in CRT category 1.A.4.b.i *Residential* or CRT category 1.A.3 *Road transport*.
- Furthermore, for the period 1990 – 2010 the greenhouse gas emissions from CRT category 1.A.4.b *Residential* include emissions from CRT category 1.A.4.a *Commercial/Institutional* as the energy balance was not disaggregated in this period.

1.2.6.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx
NID CHAPTER	3.2.6.2 Residential (CRT category 1.A.4.b)

1.2.6.2.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach²²⁹ has been applied.

Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG, fuel} [kt] = Fuel\ Consumption_{fuel} [TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} \left[kt_{CO_2\ equivalent} \right] = \sum_{fuel} emissions_{CO_2, fuel} [kt] + \sum_{fuel} emissions_{CH_4, fuel} [kt] \times GWP_{CH_4} + \sum_{fuel} emissions_{N_2O, fuel} [kt] \times GWP_{N_2O}$$

²²⁹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ) For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is not in line with the decision tree, as the category 1.A.4.b. *Residential* is a key category.

1.2.6.2.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

- Liquid fuels:**
- Gas/Diesel Oil* (only non-bio Gas/Diesel Oil)
 - Liquefied Petroleum Gases
- Gaseous fuels:**
- Natural gas
- Biomass**
- Fuelwood

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Emissions from the combustion of wood charcoal, used for e.g., barbecue were not estimated due to lack of data.

Data for gaseous fuel consumption used for estimating the GHG and non-GHG emissions for the time series

- 1990 - 2005 are taken from the Energy balance provided by MEM and UN statistics.
- 2006 – 2022 are provided by Sonelgaz (MEM).

Data for liquid fuel consumption used for estimating the GHG and non-GHG emissions for the time series

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²³⁰ ;
- 2010 – 2020 are taken from the National Energy balance provided by MEM²³¹.

In energy statistics, production, transformation, and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units. e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.4.b *Residential* are provided.

²³⁰ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²³¹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

Table 1-100 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.4.b Residential

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)		default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³	39.57 * 0.9 = 35.61	39.02	UN default
		TJ /Gg		48.0	2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21		43.0
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72		47.3
biomass	Fuelwood	TJ / Gg	MEM/Sonatrach		15.6

Conversion from GCV to NCV		Default
Natural gas		1 NCV = 0.9 x GCV
Petroleum products		1 NCV = 0.95 x GCV

Conversion from weight in tons per m3 for fuelwood (general fuelwood)	
Fuelwood (general fuelwood)	Volume (m3) *0.707 = weight (tonnes)

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²³²
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ²³³ : Table 4 Difference between net and gross calorific values for selected fuels
	Conversion from weight in tons per m3 for fuelwood (general fuelwood)	Table 4.3 Conversion table for fuelwood (wood with 25 per cent moisture content)

Note:			
D	Default	CS	Country specific
		PS	Plant specific
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.			

1.2.6.2.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas , liquid fuels and biomass were taken from IPCC 2006 Guidelines and are presented in the following table.

Table 1-101 GHG Emission factor TIER 1 for CRT category 1.A.4.b Residential

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	5	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	10	D	0.6	D

²³² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

²³³ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
biomass	Liquefied Petroleum Gases (LPG)	63,100	D	5	D	0.1	D
	Fuelwood	112,000	D	300	D	4	D
Source	CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category						
Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.2.6.2.2.4 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.4.a Commercial/ Institutional are presented in the following table.

Table 1-102 Uncertainty for CRT category 1.A.4.b Residential.

Uncertainty	Gaseous fuels			Liquid fuels			Biomass			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	20%	20%	20%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			7%			based Table 2.13
		100 %			100 %			189 %		based Table 2.12
			192 %			192 %			268 %	based Table 2.14
Combined Uncertainty (U)	2%	100 %	192 %	3%	100 %	192 %	21%	190 %	269 %	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²³⁴ ;
- 2010 - 2022 are taken from the National Energy balance provided by MEM²³⁵.

²³⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²³⁵ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)²³⁶;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities²³⁷.

A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.6.2.3 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)²³⁸ and
 - international energy statistics of UN statistics²³⁹ and International Energy Agency (IEA)²⁴⁰
- cross checks with other relevant sectors (e.g., 1.4.a and 1.4.c) are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.6.2.4 Category-specific recalculations including explanatory information and justifications

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx

<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

²³⁶ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

²³⁷ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

²³⁸ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

²³⁹ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

²⁴⁰ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

Sheet	Recalculation
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The following table presents the main revisions and recalculations done since the last submission to the UNFCCC and relevant to CRT category 1.A.4.b *Residential*.

Table 1-103 Recalculations done since last submission in CRT category 1.A.4.b *Residential*

GHG source & sink category	Revisions of data	Type of revision	Type of improvement
1.A.4.b	Gaseous Fuel consumption data (activity data) was revised due to revised fuel consumption data provided by Sonelgaz (MEM) for the period 2006-2022	AD	Accuracy Transparency

1.2.6.2.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4b_OtherSectorTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-104 Planned improvements for CRT category 1.A.4.b *Residential*

GHG source & sink category	Planned improvement	Type of improvement	Priority
1.A.4	Revision of the energy balance (1990-2005): Distribution of fuel consumption from all categories (1.A.4.a. 1.A.4.b. 1.A.4.c) within category 1.A.4 Other Sectors	AD	Accuracy Transparency Medium
1.A.4.b.i 1.A.4.b.ii	Energy balance - Survey on use of fuels in stationary and Off-road vehicles and other machinery	AD	Completeness Comparability low
1.A.4.b	Energy balance - Use of other biomass than fuel wood - bio-gasoline or bio-gas/diesel oil including MTBE, AddBlue, etc. - Wood charcoal	AD	Completeness medium
1.A.4.b	Determination - CS NCV for biomass considering moisture content - Carbon content (%) of biomass	EF	Accuracy Transparency Medium
1.A.4.b	Survey on - thermal insulation of the buildings - type of use of the building - comfort requirements (air conditioning etc.) - energy-saving devices and technologies	AD EF	Transparency Medium / low

1.2.6.3 Agriculture/forestry/fishing (CRT category 1.A.4.c)

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4c_OtherSectorTool_DZA.xlsx
NID CHAPTER	3.2.6.3 Agriculture/forestry/fishing (CRT category 1.A.4.c)

1.2.6.3.1 Category description

GHG emissions/ removals	CO ₂						CH ₄						N ₂ O					
	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	p e a t	b i o m a s s	l i q u i d	s o l i d	g a s e o u s	o t h e r f o s s i l f u e l	p e a t	b i o m a s s
1.A.4.c.																		
1.A.4.c.i.	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓	✓	NO	✓	NO	NO	✓
1.A.4.c.ii.	IE	NO	NO	NO	NO	NO	IE	NO	NO	NO	NO	NO	IE	NO	NO	NO	NO	NO
1.A.4.c.iii.	IE	NO	NO	NO	NO	NO	IE	NO	NO	NO	NO	NO	IE	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE – included elsewhere. NO – not occurring. NE – not estimated. NA – not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

Emissions included elsewhere (IE):

- It is assumed, that the fuel combusted in CRT category 1.A.4.c.ii *Off-road vehicles and other machinery* and
- CRT category 1.A.4.c.iii *Fishing* is included either in CRT category 1.A.4.c.i *Stationary combustion*. CRT category 1.A.4.b *Residential* or CRT category 1.A.3 *Road transport*.
- Furthermore, the greenhouse gas emissions from CRT category 1.A.4.c *Agriculture/forestry/fishing* from gaseous fuels for the period 1990 – 2005 are included in emissions from CRT category 1.A.4.b *Residential* as the energy balance was not disaggregated in this period.

1.2.6.3.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4c_OtherSectorTool_DZA.xlsx
Sheet	ChoiceMethology

1.2.6.3.2.1 Choice of methods – TIER 1 for CO₂, CH₄ and N₂O

For estimating the GHG emissions (CO₂, CH₄, N₂O) the 2006 IPCC Guidelines Tier 1 approach²⁴¹ has been applied.

$$\text{Equation 2.1: GHG emissions from stationary combustion (2006 IPCC GL, Vol. 2, Chap. 2)}$$

$$Emissions_{GHG, fuel} [kt] = Fuel\ Consumption_{fuel} [TJ] \times Emission\ Factor_{GHG, fuel} \left[\frac{kg}{TJ} \right] * 10^{-6}$$

²⁴¹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.3.1 Methodological issues - Choice of method

Equation 2.2: Total emissions by greenhouse gas (2006 IPCC GL, Vol. 2, Chap. 2)

$$Emissions_{GHG} [kt_{CO_2 \text{ equivalent}}] = \sum_{fuel} emissions_{CO_2, fuel} [kt] + \sum_{fuel} emissions_{CH_4, fuel} [kt] \times GWP_{CH_4} + \sum_{fuel} emissions_{N_2O, fuel} [kt] \times GWP_{N_2O}$$

Where:

Emissions _{GHG}	= emissions of GHG (kt _{CO2 equivalent})
Emissions _{GHG, fuel}	= emissions of a given GHG by type of fuel (kt GHG)
Fuel consumption _{fuel}	= amount of fuel combusted (TJ)
Emission factor _{GHG, fuel}	= default emission factor of a given GHG by type of fuel (kg gas/TJ)
	For CO ₂ , it includes the carbon oxidation factor, assumed to be 1.
10 ⁻⁶	= conversion from kg to kt (≡ divided by 1.000.000)
GHG	= CO ₂ , CH ₄ , N ₂ O
GWP	= Global warming potential for CO ₂ , CH ₄ , N ₂ O according to the IPCC 5AR
Fuel	= liquid fuels, solid fuels, gaseous fuels, other fossil fuel, biomass, peat

The method is in line with the decision tree, as the category 1.A.4.c *Agriculture/forestry/fishing* is not a key category.

1.2.6.3.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The following fuels are used for combustion for the generation of electricity and/or heat for own use:

- Liquid fuels:**
- Gas/Diesel Oil (Non-bio gas/diesel oil)
 - Liquefied Petroleum Gases
 - Other Oil - Other Petroleum Products

* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.

Liquid fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 1990 – 2009 are taken from the Energy balance provided by MEM and UN statistics²⁴² ;
- 2010 – 2022 are taken from the National Energy balance provided by MEM²⁴³.

Gaseous fuel consumption used for estimating the GHG and non-GHG emissions for the years

- 2006-2022 are provided by Sonelgaz (MEM).

Activity data for gaseous fuels from 1.A.4.c for the period 1990 – 2005 are included in 1.A.4.b as the energy balance was not disaggregated in this period.

In energy statistics, production, transformation and consumption of solid, liquid, gaseous and renewable fuels are specified in physical units, e.g., in tonnes or cubic meters. To convert these data to energy units, in this case terajoules, requires calorific values. The emission calculations are based on net calorific values. In the following table the applied net calorific values (NCVs) for conversion to energy units in CRT category 1.A.4.c *Agriculture/forestry/fishing* are provided.

²⁴² United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²⁴³ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

Table 1-105 Net calorific values (NCVs) and Conversion factors applied for conversion to energy units in CRT category 1.A.4.c Agriculture/forestry/fishing

Fuel type	Fuel	Unit	Net calorific value (NCV)		
			Country specific NCV (CS NCV) (GVC * Conversion factor)		default NCV for comparison
gaseous	Natural Gas	TJ / 10 ⁶ m ³ TJ / Gg	39.57 * 0.9 = 35.61	39.02 48.0	UN default 2006 IPCC default
liquid	Gas / Diesel Oil*	TJ / Gg	43.38 * 0.95 = 41.21		43.0
	Gasoil / Diesel				
	Liquefied Petroleum Gases (LPG)	TJ / Gg	46.02 * 0.95 = 43.72		47.3
	Other Petroleum Products	TJ / Gg	-		40.2
biomass	Solid Biofuels - Wood / Wood Waste/ Fuelwood. Wood residues and by-products	TJ / Gg	-		29.5

Conversion from GCV to NCV	Default
Natural gas	1 NCV = 0.9 x GCV
Petroleum products	1 NCV = 0.95 x GCV

Conversion from weight in tons per m3 for fuelwood (general fuelwood)	
Solid Biofuels - Wood / Wood Waste/ Fuelwood, Wood residues and by-products	Volume (m3) *0.707 = weight (tonnes)

Source	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²⁴⁴
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2 International Recommendations for Energy Statistics (IRES) (2018): Table 4.1 Default net calorific values for energy products (only English version)
	Conversion from GCV to NCV	International Recommendations for Energy Statistics (IRES) (2018) ²⁴⁵ : Table 4 Difference between net and gross calorific values for selected fuels
	Conversion from weight in tons per m ³ for fuelwood (general fuelwood)	Table 4.3 Conversion table for fuelwood (wood with 25 per cent moisture content)

Note:		
D	Default	CS Country specific
		P Plant specific S
* no bio-gas/diesel oil or bio-gasoline is not consumed in Algeria.		

1.2.6.3.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4c_OtherSectorTool_DZA.xlsx
Sheet	EF IPCC_1A

Default emission factors for CO₂, CH₄ and N₂O for Natural gas, liquid fuels and biomass, were taken from IPCC 2006 Guidelines and are presented in the following table.

²⁴⁴ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

²⁴⁵ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Table 1-106 GHG Emission factor TIER 1 for CRT category 1.A.4.c Agriculture/forestry/fishing

Fuel type	Fuel	CO ₂ (kg/TJ)		CH ₄ (kg/TJ)		N ₂ O (kg/TJ)	
		EF	type	EF	type	EF	type
gaseous	Natural Gas	56,100	D	5	D	0.1	D
liquid	Gas / Diesel Oil*	74,100	D	10	D	0.6	D
	Gasoil / Diesel						
	Liquefied Petroleum Gases (LPG)	63,100	D	5	D	0.1	D
	Other Petroleum Products	73,300	D	10	D	0.6	D
biomass	Fuelwood Bois/résidus de bois	112,000	D	300	D	4	D
Source		CS – country specific EF - Ministry of Energy and Mines (2021): Development of Country specific emission factor. D – Default EF - 2006 IPCC Guidelines Vol. 2. Chap. 2 (2.3.2.1) Table 2.4 Default emission factors for stationary combustion in the commercial/ institutional category					

Note:					
D	Default	CS	Country specific	PS	Plant specific
				IEF	Implied emission factor

1.2.6.3.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4c_OtherSectorTool_DZA.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.A.4.a Commercial/ Institutional are presented in the following table.

Table 1-107 Uncertainty for CRT category 1.A.4.c Agriculture/forestry/fishing.

Uncertainty	Gaseous fuels			Liquid fuels			Reference
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O	2006 IPCC GL. Vol. 2. Chap. 2
Activity data (AD)	2%	2%	2%	2%	2%	2%	based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	1%			2%			based Table 2.13
		100%			100%		based Table 2.12
			192%			192%	based Table 2.14
Combined Uncertainty (U)	2%	100%	192%	3%	100%	192%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent even though two different data sets were used:

Activity data for liquid fuels for the years:

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²⁴⁶ ;
- 2010 - 2022 are taken from the National Energy balance prepared by MEM²⁴⁷.

Activity data for gaseous fuels for the years:

- 1990 - 2005 are included in 1.A.4.b.
- 2010 - 2022 are provide by Sonelgaz (MEM).

In 2009, the energy balance was improved by applying International Recommendations for Energy Statistics (IRES) based on Standard International Energy Product Classification (SIEC) which is harmonized with the

- International Standard Industrial Classification of all Economic Activities (ISIC)²⁴⁸;
- 2006 IPCC Guidelines - Sectoral Approach, where emissions from stationary combustion are specified for a number of societal and economic activities and as defined within the CRT sector 1.A Fuel Combustion Activities²⁴⁹.

A revision of the years 1990-2009 is still pending.

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.2.6.3.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4c_OtherSectorTool_DZA.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistics (ONS)²⁵⁰ and
 - international energy statistics of UN statistics²⁵¹ and International Energy Agency (IEA)²⁵²

²⁴⁶ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²⁴⁷ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

²⁴⁸ (ISIC) - International Standard Industrial Classification of All Economic Activities is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities. <https://unstats.un.org/unsd/classifications/Econ/isic>

²⁴⁹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 2: Stationary Combustion - 2.2 Description of sources

²⁵⁰ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

²⁵¹ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

²⁵² Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region

- cross checks with other relevant sectors (e.g., 1.4.b and 1.4.c) are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.2.6.3.5 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1A4
File	1A4c_OtherSectorTool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-108 Planned improvements for CRT category 1.A.4.c Agriculture/forestry/fishing

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.A.4	Revision of the energy balance (1990-2005) for gaseous fuels: Distribution of fuel consumption from all categories (1.A.4.a. 1.A.4.b. 1.A.4.c) within category 1.A.4 Other Sectors	AD	Accuracy Transparency	Medium
1.A.4.c.i	Energy balance - Survey on use of fuels in	AD	Completeness	Medium
1.A.4.c.ii	• Stationary		Comparability	
1.A.4.c.iii	• Off-road vehicles and other machinery			
	• Fishing			
1.A.4.b	Energy balance - Use of other biomass than fuel wood	AD	Completeness	medium
	▪ Wood charcoal			
1.A.4.b	Determination	EF	Accuracy Transparency	Medium
	▪ CS NCV for biomass considering moisture content			
	Carbon content (%) of biomass			
1.A.4.b	Survey on	AD	Transparency	Medium
	▪ thermal insulation of the buildings	EF		/ low
	▪ type of use of the building			
	▪ comfort requirements (air conditioning, etc.)			
	▪ energy-saving devices and technologies			

1.2.7 Other - Non-Specified (CRT category 1.A.5)

Folder	\\06_Inventory\2024_submission\01_Energy\1A5
File	1A5a_NonSpecified_Tool_DZA.xlsx 1A5b_NonSpecified_Tool_DZA.xlsx 1A5c_NonSpecified_Tool_DZA.xlsx
NID CHAPTER	3.2.7 Other - Non-Specified (CRT category 1.A.5)

The fuel consumption of the military is included in the energy balance. Activity data of fuels used by military are confidential. Emissions of military mobile sources are aggregated and included under category 1.A.3b

GHG emissions/removals	CO ₂						CH ₄						N ₂ O					
	liquid	solid	gaseous	other fossil fuel	Peat	biomass	liquid	solid	gaseous	other fossil fuel	Peat	biomass	liquid	solid	gaseous	other fossil fuel	Peat	biomass
1.A.5.a	NE	NO	NE	NO	NO	NE	NE	NO	NE	NO	NO	NE	NE	NO	NE	NO	NO	NE
1.A.5.b.i	NE	NO	NO	NO	NO	NO	NE	NO	NO	NO	NO	NO	NE	NO	NO	NO	NO	NO
1.A.5.b.ii	NE	NO	NO	NO	NO	NO	NE	NO	NO	NO	NO	NO	NE	NO	NO	NO	NO	NO
1.A.5.b.iii	IE,C	NO	NO	NO	NO	NO	IE,C	NO	NO	NO	NO	NO	IE,C	NO	NO	NO	NO	NO
Key Category	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A '✓' indicates: emissions from this category have been estimated.																		
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential																		
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF																		

1.2.7.1 Category-specific planned improvements

Folder	\\06_Inventory\2024_submission\01_Energy\1A5
File	1A5a_NonSpecified_Tool_DZA.xlsx 1A5b_NonSpecified_Tool_DZA.xlsx 1A5c_NonSpecified_Tool_DZA.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-109 Planned improvements for CRT category 1.A.5

GHG source & sink category	Planned improvement	Type of improvement		Priority
		AD	Transparency	
1.A.5	Survey on fuels combustion not included in IPCC categories 1.A.1-1.A.4;	AD	Transparency	Medium

1.3 Fugitive emissions from fuels (CRT category 1.B)

Folder	\07_NIR\2024_NID\17_References
File	NID_Algeria_2024_references.docx 1B2_Fugitive_emissions_DZA.xlsx Information_OPEC.xlsx
NID CHAPTER	3.3.2 Oil and Natural Gas (CRT category 1.B.2)
ToDo	Check for updated reasons for trend in chapter 3.3 Fugitive emissions from fuels (CRT category 1.B)

1.3.1 Solid fuels (CRT category 1.B.1)

In the following table is provided the status of reporting of sources of CRT category 1.B.1 Solid fuels.

Table 1-110 Status of reporting and key category of CRT category 1.B.1 Solid fuels

IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.a	Coal mining and handling						
1.B.1.a.i	Underground mines	NO	-	NO	-	NA	-
1.B.1.a.i.1	Mining activities	NO	-	NO	-	NA	-
1.B.1.a.i.2	Post-mining activities	NO	-	NO	-	NA	-
1.B.1.a.i.3	Abandoned underground mines	NO	-	NO	-	NA	-
1.B.1.a.i.4	Flaring of drained methane or conversion of methane to CO ₂	NO	-	NO	-	NA	-
1.B.1.a.i.5	Other	NO	-	NO	-	NA	-
1.B.1.a.ii	Surface mines	NO	-	NO	-	NA	-
1.B.1.a.ii.1	Mining activities	NO	-	NO	-	NA	-
1.B.1.a.ii.2	Post-mining activities	NO	-	NO	-	NA	-
1.B.1.a.ii.3	Other	NO	-	NO	-	NA	-
1.B.1.b	Fuel transformation						
1.B.1.b.i	Charcoal and biochar production	✓	-	✓	-	NA	-
1.B.1.b.ii	Coke production	✓	-	✓	-	NA	-
1.B.1.b.iii	Coal to liquids	NO	-	NO	-	NA	-
1.B.1.b.iv	Gas to liquids	✓	-	✓	-	NA	-
1.B.1.b.v	Other	NO	-	NO	-	NA	-
1.B.1.c	Other						
1.B.1.c	Other	NO	-	NO	-	NA	-
A '✓' indicates: emissions from this category have been estimated.							
Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential							
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF							

1.3.1.1 Fugitive emissions from Coal mining and handling (CRT category 1.B.1.a)

The IPCC subcategory 1.B.1.a Coal mining and handling does not exist in Algeria.

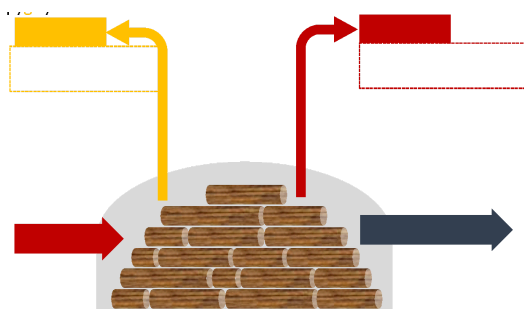
1.3.1.2 Fugitive emissions from Fuel transformation (CRT category 1.B.1.b)

This section describes the estimation of fugitive emissions arising during the manufacture of secondary and tertiary products from fuels.

1.3.1.2.1 Charcoal and biochar production (CRT category 1.B.1.b.i)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	
NID CHAPTER	3.3.1.2.1 Charcoal and biochar production (CRT category 1.B.1.b.i)

Charcoal is produced by the carbonization of wood. Carbonization of fuel is the thermal decomposition in the absence of oxygen at a temperature above 300°C. According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁵³, the carbonization of wood produces charcoal, volatile compounds and a range of gases. The gases produced include direct greenhouse gases (CO₂, CH₄ and N₂O), indirect greenhouse gases (CO) and other gases, including H₂.



This category has not been estimated due to lack of activity data and resources.

1.3.1.2.1.1 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-111 Planned improvements for CRT category 1.B.1.b.i Charcoal and biochar production

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.1.b.i	Estimation of fugitive emissions from wood charcoal and biochar production				M	Completeness	medium
1.B.1.b.i	Collection of activity data: - Fuel wood used for charcoal production - wood used for charcoal production				AD	Completeness	medium
Note	AD	Activity data	EF	Emission factor	M	Method	

²⁵³ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.3.2.3, page 4.99

1.3.1.2.2 Coke production (CRT category 1.B.1.b.ii)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
NID CHAPTER	3.3.1.2.1 Charcoal and biochar production (CRT category 1.B.1.b.i)

This section describes the fugitive emissions arising during the production of coke. As described in the 2019 IPCC Refinements to the 2006 IPCC GL²⁵⁴

- the coke is produced by the pyrolysis of coal. This is a managed thermal treatment of the coal which limits combustion or oxidation of the coal or coke product. Coal pyrolysis at high temperature is called carbonisation. The process produces coke, volatile compounds and a range of other gases. In the coke production process, the coal is heated indirectly up to 1 000 – 1 100°C for 14 – 28 hours.
- Coke is the most important reducing agent used in primary metal production. Other uses of coke include as a heating fuel and feedstock.
- Fugitive emissions can occur during coking operations from leakages at the battery, for example because of leakage from vessels, oven doors, flanges, or at the by-product plant.
- Fugitive emissions occur also from the ascension pipe and charging hole sealings. The magnitude of these emissions will depend on the coke oven technology and the level of maintenance. The variability in the magnitude of fugitive emissions will be large.

1.3.1.2.2.1 Category description

IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.b	Fuel transformation						
1.B.1.b.ii	Coke production						
1.B.1.b.ii.1	Coal handling and preparation	IE	-	IE	-	NA	-
1.B.1.b.ii.2	Battery operation (coal charging, heating/firing, coking, coke pushing, coke quenching)	✓	-	✓	-	NA	-
1.B.1.b.ii.3	Flaring of coke oven gas (COG) emissions						
	coke oven gas (COG) treatment with recovery and treatment of by-products in the case of a conventional coking plant	NE	-	NE	-	NA	-
	coke oven gas (COG) treatment with recovery of the heat of the coking and treatment of the flue gas in the case of a heat recovery coking plant.	NE	-	NE	-	NA	-
IE: it is assumed that the CH ₄ emissions of coal handling and preparation are included in battery operation							
A '✓' indicates: emissions from this category have been estimated.							
Notation keys: IE - included elsewhere. NO – not occurred. NE - not estimated. NA - not applicable. C – confidential							
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF							

²⁵⁴ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.3.2 Methodological issues, page 4.104

1.3.1.2.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	ChoiceMethology

1.3.1.2.2.2.1 Choice of methods

For estimating the CO₂ and CH₄ emissions the 2019 Refinements to the 2006 IPCC Guidelines Tier 1 approach²⁵⁵ has been applied:

Equation 4.3.2 (new) Fugitive GHG emission from coke production
(2019 to the 2006 IPCC GL. Vol. 2. Chap. 4.3.2)

$$Emissions_{GHG} = Activity\ data_{coke\ production} \times Emission\ Factor_{GHG}$$

Where:

Emissions _{GHG}	= emissions of a given GHG (kg GHG)
GHG	= CH ₄
Activity data _{coke production}	= amount of coke produced (tonnes)
Emission factor _{GHG, fuel}	= default emission factor for each GHG (kg GHG/tonne of coke produced)

1.3.1.2.2.2.2 Choice of activity data

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The coke production data was taken for the years 1990 - 2009 are provided by SIDER EL HADJAR (plant specific). The coke production was stopped in 2010.

1.3.1.2.2.2.3 Choice of emission factors

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The default emission factor for CH₄ was taken from 2019 Refinements to the IPCC 2006 Guidelines and are presented in the following table.

Table 1-112 GHG Emission factor TIER 1 for CRT category 1.B.1.b.ii Coke production

	Unit	CH ₄ EF	Type	Source
Hard coal / coking coal (Using horizontal coke batteries. Non-heat recovery ovens)	kg / ton	0.049	D	TABLE 4.3.5 (NEW); 2019 Refinement to the 2006 IPCC Guidelines. Volume 2. Chapter 4.3.2 Methodological issues. page 4.111

²⁵⁵ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.3.2 Methodological issues, page 4.111

		Unit	CH ₄ EF	Type	Source		
Note:							
D	Default	CS	Country specific	PS	Plant specific	IEF	Implied emission factor

1.3.1.2.2.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	Uncertainty
ToDo	Check for updated information in file 1.B.1.a.Fugitive emissions from solid fuels.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The uncertainties for activity data and emission factors used for CRT category 1.B.1.b.ii Coke production are presented in the following table.

Table 1-113 Uncertainty for CRT category 1.B.1.b.ii Coke production.

Uncertainty		Reference
	CH ₄	
Activity data (AD)	10%	2006 IPCC GL. Vol. 2. Chap. 2 based Table 2.15 and Chap. 2.4.2
Emission factor (EF)	-90% to +900%	2019 Refinement of the 2006 IPCC GL. Vol. 2. Chap. 4 based TABLE 4.3.6 (NEW)
Combined Uncertainty (U)	895%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The time-series are considered to be consistent as the same methodology is applied to the whole period. The activity data is considered almost consistent considering that just one data source was used.

- 1990 - 2009 1990 - 2009 are provided by SIDER EL HADJAR (plant specific).

Several checks and reallocation have been performed in order to ensure time series consistency. Further improvement of the energy balance will be made for future submissions.

1.3.1.2.2.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	QC CHECKLIST

The following source-specific QA/QC activities were performed out:

- Checked of calculations by spreadsheets
 - consistent use of energy balance data (preparation of a time series) ,
 - documented sources,
 - use of units and conversion factors,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control checks for data consistency through all steps of calculation.
- cross-checked from different sources:
 - national statistic published by MEM and Office National des Statistiques (ONS)²⁵⁶ and
 - International energy statistics of UN statistics²⁵⁷. International Energy Agency (IEA)²⁵⁸
- cross checks with other relevant sectors are performed to avoid double counting or omissions;
- time series consistency - plausibility checks of dips and jumps.

1.3.1.2.2.5 Category-specific recalculations including explanatory information and justifications

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	Recalculation

The following table presents the main revisions and recalculations done since the last submission to the UNFCCC and relevant to CRT category 1.B.1.b.ii Coke production.

Table 1-114 Recalculations since the last submission in CRT category 1.B.1.b.ii Coke production

GHG source & sink category	Revisions of data	Type of revision	Type of improvement
1.B.1.b.ii	Fuel consumption data (activity data) was revised due to revised fuel consumption data / revision provided by plant specific.	AD	Accuracy Completeness

1.3.1.2.2.6 Category-specific planned improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	Recalculation

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

²⁵⁶ <https://www.ons.dz/spip.php?rubrique6> and <https://www.ons.dz/IMG/pdf/CH8-ENERGIE.pdf>; <https://www.ons.dz/spip.php?rubrique127>

²⁵⁷ United Nations - Department of Economic and Social Affairs - Statistics Division Statistics - Energy Statistics
<https://unstats.un.org/unsd/energystats/>

²⁵⁸ Data and statistics - Data tools - Data tables Energy data by category, indicator, country or region
<https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource>

Table 1-115 Planned improvements for CRT category 1.B.1.b.ii Coke production

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.B.1.b.ii	Application of methodology of the 2006 IPCC guidelines – higher TIER methodology	M	Comparability Completeness	medium
1.B.1.b.ii	Application of guidance on methodology and emission factors provided by the 2019 Refinements to the 2006 IPCC guidelines	EF	Accuracy Completeness Transparency	medium
1.B.1.b.ii	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of plant specific data: - Consumption of hard coal and/or coking coal - Production of coke oven coke - Production, consumption and flaring coke oven coke gas (COG)	AD	Accuracy Completeness Transparency Consistency	high
1.B.1.b.ii	Information about fitted/non-fitted equipment for flue gas cleaning, improvement in combustion	EF non-GH G	Accuracy Transparency	Medium
1.B.1.b.ii	Investigation of the coke oven technology applied and the level of maintenance	AD	Transparency	High

1.3.1.2.3 Coal to liquids (CRT category 1.B.1.b.iii)

IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.b	Fuel transformation						
1.B.1.b.iii	Coal to liquids	NO	-	NO	-	NA	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF							

The IPCC subcategory 1.B.1.b.iii Other does not exist in Algeria.

1.3.1.2.4 Gas to liquids (CRT category 1.B.1.b.iv)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	
NID CHAPTER	3.3.1.2.4 Gas to liquids (CRT category 1.B.1.b.iv)

This section describes the estimation of fugitive emissions arising from the transformation of natural gas into syngas, composed by H₂, CO, CO₂ and CH₄, and then, into a liquid hydrocarbons fuel.²⁵⁹

IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.b	Fuel transformation						

²⁵⁹ Is this approach applied in Algeria for LNG, LPG (GPL) and ...

IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.b.iv	Gas to liquids	NE	-	NE	-	NA	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential							

This category has not been estimated due to lack of activity data and resources.

1.3.1.2.4.1 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	
Sheet	PlannedImprovements

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-116 Planned improvements for CRT category 1.B.1.b.iv Gas to liquids

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.1.b.iv	Estimation of fugitive emissions from Gas to liquids				M	Completeness	high
1.B.1.b.iv	Collection of activity data: - Natural gas used - Liquefied Fuel produced				AD	Completeness	high
1.B.1.b.iv	Investigation on - number of plants - technology applied - abatement technology applied				AD	Transparency	medium
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.1.2.5 Other (CRT category 1.B.1.b.v)

IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.b	Fuel transformation						
1.B.1.b.v	Other	NO	-	NO	-	NA	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential							

The IPCC subcategory 1.B.1.b.v Other does not exist in Algeria.

1.3.1.3 Other (CRT category 1.B.1.c)

Energy (CRT sector 1)

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IPCC code	Description	CH ₄		CO ₂		N ₂ O	
		Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.1.c	Other						
1.B.1.c	Other	NO	-	NO	-	NA	-
A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential							

The IPCC subcategory 1.B.1.c Other does not exist in Algeria.

1.3.2 Oil and Natural Gas (CRT category 1.B.2)

Folder	\\06_Inventory\2024_submission\01_Energy\1B
NID CHAPTER	3.3.2 Oil and Natural Gas (CRT category 1.B.2)

This section describes the fugitive GHG emissions from oil and gas systems except contributions from fuel combustion. Oil and natural gas systems consists of infrastructure required to produce, collect, process, or refine and deliver natural gas and petroleum products to market. As described in the 2019 Refinement to the 2006 IPCC GL, the sources of fugitive emissions on oil and gas systems include, but are not limited to, equipment leaks, evaporation and flashing losses, venting, flaring and accidental releases (e.g., pipeline dig-ins, well blow-outs and spills). Venting and flaring emission sources are engineered or intentional (e.g., vents from tanks, seal and process vents and flare systems), while leak emissions (e.g., working losses from tanks, and leaks from other equipment) are unintentional (or uncontrolled). The scope of the inventory includes all relevant processes from the well head, or oil and gas source, to the final sales point to the consumer.

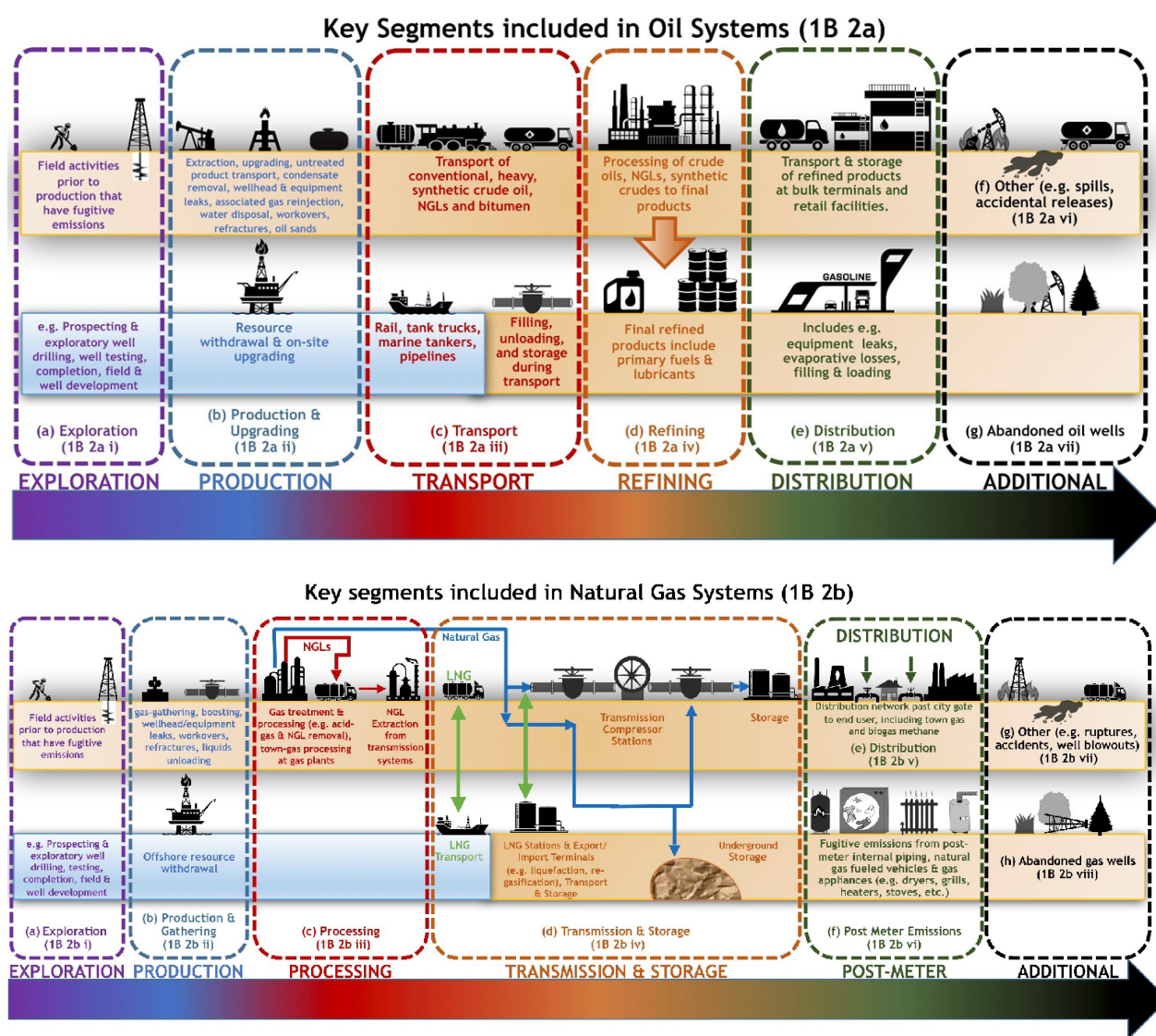


Figure 1-8 Key segments included in oil and natural gas systems.

Source: 2019 Refinement to the 2006 IPCC GL. Chapter 4: Fugitive Emissions. Figure 4.2.0. page 4.36²⁶⁰

In the following table is the status of reporting of sources of CRT category 1.B.2 Oil and natural gas provided.

Table 1-117 Status of reporting and key category of CRT category 1.B.2

IPCC code	Description		CH ₄		CO ₂		NMVOC		N ₂ O	
			Estimated	Key Category	Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.2.a	Oil									
1.B.2.a.i	Exploration	Leaks	NA		NA		NA		NA	
		Venting	IE in 1.B.2.c.i.1							
		Flaring	IE in 1.B.2.c.ii.1							
1.B.2.a.ii	Production and upgrading	Leaks	✓		NA		✓		NA	
		Venting	IE in 1.B.2.c.i.1							
		Flaring	IE in 1.B.2.c.ii.1							
1.B.2.a.iii	Transport	All	✓		✓		✓		NA	
1.B.2.a.iv	Refining/storage	Leaks	✓		✓		✓		✓	
		Venting	IE in 1.B.2.c.i.1							
		Flaring	IE in 1.B.2.c.ii.1							
1.B.2.a.v	Distribution of oil products	All	NA		NA		✓		NA	
1.B.2.a.vi	Other									
1.B.2.a.vi.1	Abandoned wells	All	NE		NE		NE		NE	
1.B.2.a.vi.2	Other	All	NE		NE		NE		NE	
1.B.2.b	Natural gas									
1.B.2.b.i	Exploration	Leaks	NA		NA		NA		NA	
		Venting	1.B.2.c.i.2							
		Flaring	1.B.2.c.ii.2							
1.B.2.b.ii	Production and gathering	All	✓		✓		✓		✓	
1.B.2.b.iii	Processing	All	✓		✓		✓		✓	
1.B.2.b.iv	Transmission and storage	All	✓		✓		✓		NA	
1.B.2.b.v	Distribution	All	✓		✓		✓		NA	
1.B.2.b.vi	Other									
1.B.2.b.vi.1	Gas post-meter	All	NE		NE		NE		NE	
1.B.2.b.vi.2	Abandoned wells	All	NE		NE		NE		NE	
1.B.2.b.vi.3	Other	All	NE		NE		NE		NE	
1.B.2.c.	Venting and flaring									
1.B.2.c.i.	Venting									
1.B.2.c.i.1.	Oil		✓		✓		✓		✓	
1.B.2.c.i.2.	Gas		✓		✓		✓		✓	
1.B.2.c.i.3.	Combined		NO		NO		NO		NO	
1.B.2.c.ii.	Flaring									
1.B.2.c.ii.1.	Oil		✓		✓		✓		✓	
1.B.2.c.ii.2.	Gas		✓		✓		✓		✓	
1.B.2.c.ii.3.	Combined		NO		NO		NO		NO	

²⁶⁰ https://www.ipcc-nggip.iges.or.jp/public/2006gl/french/pdf/2_Volume2/V2_4_CH#4#_Fugitive_Emissions.pdf

This section describes the emissions resulting from CRT category 1.B.2. Oil and Natural Gas.

1.3.2.1 Characteristics of the Algerian oil and gas sector in Algeria

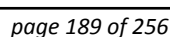
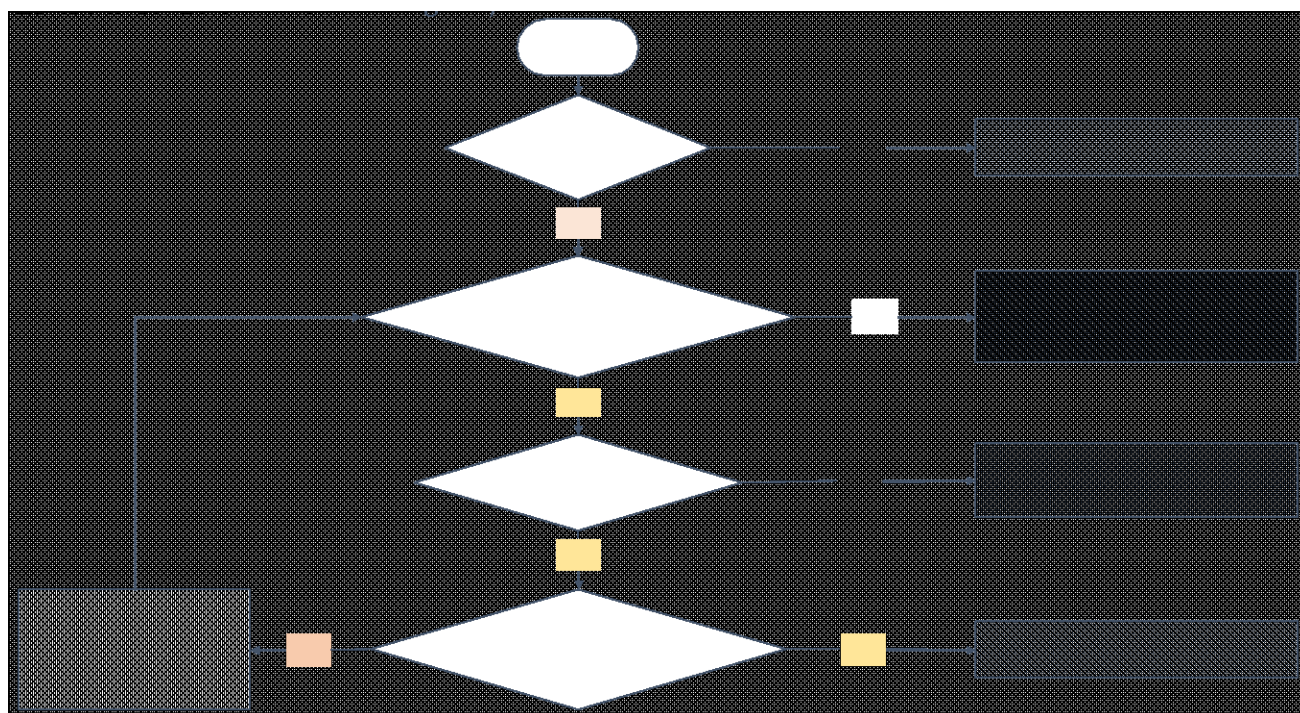


Figure 1-9 Oil and gas map of Algeria²⁶¹

The previous figure shows the characteristics of the oil and gas sector in Algeria, with the various oil production sites, mainly in Hassi-Messaoud, Ain-Amenas and Adrar, and the natural gas production sites, mainly in Hassi-R'mel and Adrar. The figure illustrates the enormous length of the gas and oil pipelines that transport hydrocarbons to refineries, distribution and processing stations and to the export ports at Arzew, Skikda, Béjaïa and Annaba.

1.3.2.2 Methodological issues

In the following figure is provided, the decision tree and the decision (highlighted) for Tier 1 or Tier 2 method for estimating fugitive emissions of CO₂, CH₄, N₂O, and NMVOC from CRT category 1.B.1.a oil systems.

**Figure 1-10 Decision tree for oil and natural gas systems**

Source: 2019 Refinement to the 2006 IPCC Guidelines. Vol. 2: Energy. Chapter 4: Fugitive Emissions. sub-chap. 4.2.2.1
Choice of method, decision trees. TIERS. Figure 4.2. p. 4.42. (modified)

1.3.2.2.1 Choice of methods for estimating fugitive emissions from oil and natural gas systems

For estimating fugitive emissions of CH₄, CO₂, N₂O and NMVOC from oil and natural gas systems, the Tier 1 method according to 2019 Refinements to 2006 IPCC GL has been applied. Fugitive emissions include emissions from leaks.

For estimating fugitive emissions of CH₄, CO₂, N₂O and NMVOC from oil and natural gas systems, the Tier 1 method according to 2019 Refinements to 2006 IPCC GL has been applied. Fugitive emissions include emissions from venting and flaring.

²⁶¹ Source: SONATRACH (2018): Map of Algeria. (modified);
available (12 August 2022) on https://sonatrach.com/wp-content/uploads/2018/12/Oil_Gas_map_of_Algeria_2018.jpg

Equation 4.2.1 TIER 1 Estimating fugitive emissions from an industry segment
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$\frac{\text{Emissions}_{\text{gas, industry segment}}}{AD_{\text{industry segment}} * EF_{\text{gas, industry segment}}} =$$

Equation 4.2.1 TIER 1 Estimating fugitive emissions from an industry segment
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$\frac{\text{Emissions}_{\text{NMVOC, industry segment}}}{AD_{\text{industry segment}} * EF_{\text{NMVOC, industry segment}}} =$$

Equation 4.2.2 Total fugitive emissions from industry segments
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$\text{Emissions}_{\text{gas}} = \sum_{\text{industry segments}} \text{emissions}_{\text{gas, industry segments}}$$

Where:

Gas = CH₄, CO₂, N₂O, NMVOC

Emissions_{gas, industry segment} = emissions of CH₄, CO₂, NMVOC, and N₂O from different industry segments

AD_{industry segment} = activity data of different industry segments

EF_{gas, industry segment} = default emission factor of CH₄, CO₂, N₂O and NMVOC for different industry segments

1.3.2.3 Fugitive emissions from Oil systems (CRT category 1.B.2.a)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
File	Information_OPEC.xlsx
NID CHAPTER	3.3.2 Oil and Natural Gas (CRT category 1.B.2)
ToDo	Check for updated reasons for trend in chapter 3.3 Fugitive emissions from fuels (CRT category 1.B)

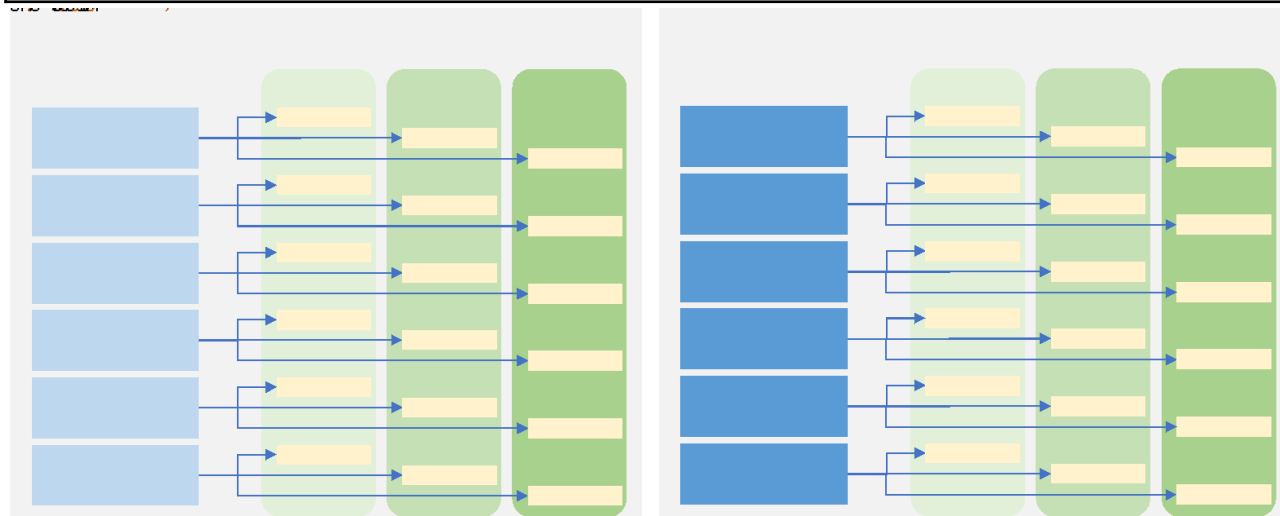
In the following table is the status of reporting of sources of CRT category 1.B.2 Oil and natural gas provided.

Table 1-118 Status of reporting and key category of CRT category 1.B.2

IPCC code	Description		CH ₄		CO ₂		NMVOC		N ₂ O	
			Estimated	Key Category	Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.2.a	Oil	LA 1990								
1.B.2.a.i	Exploration	Leaks	NA		NA		NA		NA	
		Venting	IE in 1.B.2.c.i.1							
		Flaring	IE in 1.B.2.c.ii.1							
1.B.2.a.ii	Production and upgrading	Leaks	✓		NA		✓		NA	
		Venting	IE in 1.B.2.c.i.1							
		Flaring	IE in 1.B.2.c.ii.1							
1.B.2.a.iii	Transport	All	✓		✓		✓		NA	
1.B.2.a.iv	Refining/storage	Leaks	✓		✓		✓		✓	
		Venting	IE in 1.B.2.c.i.1							
		Flaring	IE in 1.B.2.c.ii.1							
1.B.2.a.v	Distribution of oil products	All	NA		NA		✓		NA	
1.B.2.a.vi	Other									
1.B.2.a.vi.1	Abandoned wells	All	NE		NE		NE		NE	
1.B.2.a.vi.2	Other	All	NE		NE		NE		NE	
1.B.2. c.	Venting and flaring	LA 1990 & 2022								
1.B.2.c.i.	Venting									
1.B.2.c.i.1.	Oil		✓		✓		✓		✓	
1.B.2.c.i.2.	Gas		✓		✓		✓		✓	
1.B.2.c.i.3.	Combined		NO		NO		NO		NO	
1.B.2.c.ii.	Flaring									
1.B.2.c.ii.1.	Oil		✓		✓		✓		✓	
1.B.2.c.ii.2.	Gas		✓		✓		✓		✓	
1.B.2.c.ii.3.	Combined		NO		NO		NO		NO	
All: sum of leak, venting and flaring		A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurrent. NE - not estimated. NA - not applicable. C – confidential								

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IPCC code	Description		CH ₄		CO ₂		NMVOC		N ₂ O	
			Estimated	Key Category	Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF										



This section describes the emissions from CRT category 1.B.2.a Oil and category 1.B.2.C Flaring and venting.

1.3.2.3.1 Fugitive emissions from oil exploration (CRT category 1.B.2.a.i)

Folder	\06_Inventory\2024_submission\01_Energy\1B		
File	1B2_Fugitive_emissions_DZA.xlsx		
Sheet	1.B.2.a.i Oil Exploration_2019R		
File	Information_OPEC.xlsx		
NID CHAPTER	3.3.2.3.1 Fugitive emissions from oil exploration (CRT category 1.B.2.a.i)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	OilExploration_T	
	AD		emissions
	Table	Column E	Column R-AN
	Graph	Row 175	Row 175 / 177
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁶² the segment Oil Exploration includes fugitive emissions, including equipment leaks, venting and flaring, from oil field activities prior to production.

- geological and geophysical surveys and tests.
- prospecting and exploratory well drilling.
- well/drill stem testing.
- field development and well development
 - construction/drilling.
 - testing, well completion.
 - any fracture stimulation

In the following figure an overview of the active rigs and completed well in Algeria is provided.

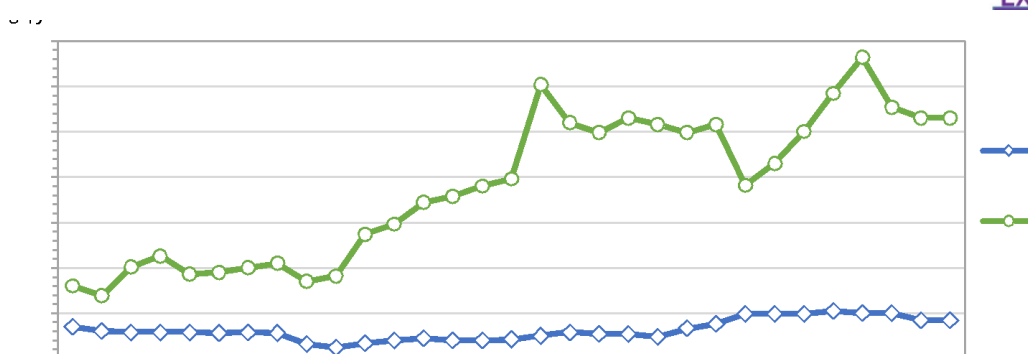
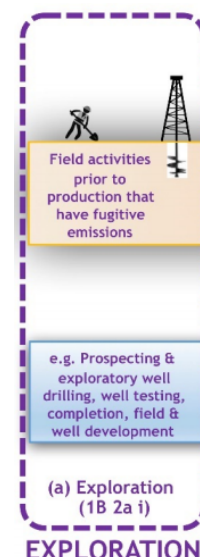


Figure 1-11 Active rigs and completed wells

Source: Organization of the Petroleum Exporting Countries (OPEC)(2022): Data download. Section 3 — Oil data: upstream. Table 3.2 and Table 3.3.²⁶³

The following table provides an overview of occurring activities in Algeria.

Table 1-119 Activities of segment Oil Exploration occurring in Algeria.

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
Onshore				
• Exploration of unconventional oil <u>without</u> flaring or recover				x
• Exploration of unconventional oil <u>with</u> flaring or recover				x
• Exploration of conventional oil		x		
Offshore				x

Note: Unconventional oil exploration refers to exploration that includes well completions with hydraulic fracturing.

Conventional oil exploration emission factors refers to exploration where hydraulic fracturing well completion practices are not used.

It must be noted that GHG emissions from oil exploration (category 1.B.2.a.i) were included in Oil production and upgrading (category 1.B.2.a.ii) for the whole time period (1990 – 2022).

²⁶² 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.48

²⁶³ Available on 05. June 2022: https://asb.opec.org/data/ASB_Data.php

1.3.2.3.2 Fugitive emissions from Oil production and upgrading (CRT category 1.B.2.a.ii)

Folder	\06_Inventory\2024_submission\01_Energy\1B	
File	1B2_Fugitive_emissions_DZA.xlsx	
Sheet	1.B.2.a.ii Oil Production_2019R	
File	Information_OPEC.xlsx	
NID CHAPTER	3.3.2.3.2 Fugitive emissions from Oil production and upgrading (CRT category 1.B.2.a.ii)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	OilProduction_T
	AD	emissions
	Table	Column E
	Graph	Row 175
	Row 175 / 177	
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.3.2.3.2.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁶⁴ the segment Oil production and upgrading includes fugitive emissions from onshore production, including equipment leaks, venting and flaring, from activities during production

- extraction
- on-site crude oil processing (i.e, removing water and gases contained in crude oil)
- wells, e.g., wellhead leaks, from well workovers and refractures
- well-site equipment, e.g., pneumatic controllers, dehydrators and separators.
- untreated transport.
- condensate removal.
- upgrading facilities.
- water disposal.
- upgrading.

The following table provides an overview of occurring activities in Algeria.

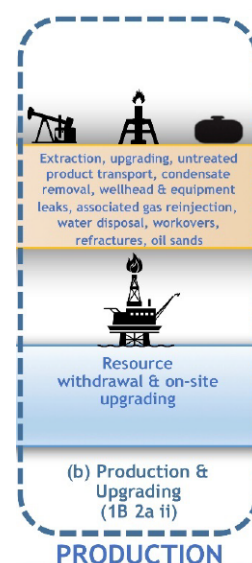


Table 1-120 Activities of segment Oil production and upgrading occurring in Algeria.

	Occurring			Not occurring (NO)
	Estimated	Included elsewhere (IE)	Not estimated (NE)	
Onshore oil production				
• Oil production	x			
• Oil Sands Mining and Ore Processing				x
• Oil Sands Upgrading				x
Offshore oil production				x

²⁶⁴ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.52

1.3.2.3.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.ii

1.3.2.3.2.2.1 Choice of method

For estimating emissions of CH₄, CO₂, N₂O and NMVOC of leaks from oil production and upgrading activities, Tier 1 method according to 2019 Refinements²⁶⁵ has been applied.

For estimating emissions of CH₄, CO₂ and N₂O from venting and flaring for oil and gas production and upgrading activities, Tier 1 method according to 2006 IPCC GL²⁶⁶ has been applied.

It is necessary to precise that emissions from oil and gas production are aggregated and reported under this category. Moreover, venting and flaring from oil and gas production are aggregated under category 1.B.2.c.ii.1 Flaring - Oil production and upgrading).

²⁶⁵ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2 Methodological issues - Choice of method

²⁶⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2 Methodological issues - Choice of method

Equation 4.2.10 (new) General equation for estimating fugitive emissions from oil production and upgrading
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$Emissions_{oil\ production} = AD_{oil\ production} * EF_{leaks} + AD_{oil\ production} * EF_{venting} + AD_{oil\ production} * EF_{flaring}$$

Where:

Emissions_{oil production} = emissions of CH₄, CO₂, NMVOC and N₂O from oil production and upgrading activities

Activity data_{oil production} = activity data on exploration of conventional oil

EF_{leaks/venting/flaring} = default emission factor of CH₄, CO₂, NMVOC and N₂O for fugitive emissions from leaks, venting and flaring from oil production and upgrading

Note: In Algeria, there are no activities of oil sands processing, sands upgrading, or offshore oil production. Therefore, this part of the formula is omitted.

1.3.2.3.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The emission factors (EF) is related to throughput and presented in the unit of thousand cubic meters onshore oil production. Production data of crude oil, natural gas liquids (NGL)/condensate and GPL aux champ were used for estimating the fugitive emissions of CH₄, CO₂, N₂O and NMVOC for the years.

- 1990 - 2022 are taken from the Energy balance provided by MEM and UN statistics²⁶⁷.
- 2010 – 2022 are taken from the National Energy balance prepared by MEM²⁶⁸.

It is necessary to clarify that Activity data used to estimate emissions of venting and flaring from oil production and upgrading were provided by the MEM for the period between 2010-2022.

The production data in energy statistics are provided in the physical units 1000 tonnes. To convert these data to volume, country specific density was used which are presented in the following table.

Table 1-121 Country specific Density and NCV for selected fuels and default data for comparison

Fuel	Country specific (CS) Density	Country specific (CS) NCV	For comparison	
	kt / 10 ⁶ m ³	TJ/kt	Average Density kt / 10 ⁶ m ³	IPCC default NCV TJ/kt
Crude oil	0.799	46.2 * 0.95 = 43.89	0.853	42.3
Natural Gas Liquids (NGL) / Condensate	0.525 = Average (0.52 - 0.53)	47.4 * 0.95 = 45.03		44.2
GPL aux champ		46.02 * 0.95 = 43.72	0.539	47.3

²⁶⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energyvstats/> ; <https://unstats.un.org/unsd/energyvstats/data/>

²⁶⁸ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

Fuel	Country specific (CS)	Country specific (CS)	For comparison	
	Density	NCV	Average Density	IPCC default NCV
	kt / 10 ⁶ m ³	TJ/kt	kt / 10 ⁶ m ³	TJ/kt

Conversion from GCV to NCV	Default
Petroleum products	1 NCV = 0.95 x GCV

Source	CS Density	MEM
	Average Density	IEA (2019): Oil information: database documentation; page 65 ²⁶⁹
	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités de mesure et taux de conversion utilisés. Annex 3. ²⁷⁰
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
	Conversion from GCV to NCV	International Recommendations for 150 Energy Statistics (IRES) (2018) ²⁷¹ : Table 4 Difference between net and gross calorific values for selected fuels

Note:			
D	Default	CS	Country specific
		PS	Plant specific

1.3.2.3.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4

The following Tier 1 emission factors of the 2006 IPCC GL and 2019 Refinement to the 2006 IPCC GL ²⁷² were applied. According to personal communication with national stakeholders, it was assumed that each 50% of the production of crude oil, condensate and GPL aux Champ in oil production segment was carried out with

- lower-emitting technologies and practices, and
- higher-emitting technologies and practices.

Table 1-122 TIER 1 emission factors for oil production and disaggregation of TIER 1 EF

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
Onshore: Most activities occurring with <u>higher- emitting</u> technologies and practices	TIER 1 Emission factors for oil production						
	All	3.43	12.40	1.48	0.00019	Tons/thousand cubic meters onshore oil production	Table 4.2.4A (new)
	Disaggregation of TIER 1 emission factors for oil production						
	Leaks	7%	0%	7%	0%		Table 4A.2.2 (new)
	Vents	83%	3%	83%	0%		
	Flares	10%	97%	10%	100%		
	Disaggregated TIER 1 emission factors for oil production						

²⁶⁹ IEA (2019): Oil information: database documentation (2019 first release) Table Oil products - Average densities, volume and heat equivalents; available on 08.07.2022 at https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/Oil_documentation%20aie.pdf

²⁷⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines.

²⁷¹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

²⁷² Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Stationary Combustion - 4.2.2.3 Choice of emission factor.

QA/QC Plan

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
	Leaks	0.24	NA	0.10	NA	Tons/thousand cubic meters onshore oil production	Calculated
	Vents	2.85	0.37	1.228	NA		
	Flares	0.34	12.03	0.148	0.000019		
Onshore: Most activities occurring with <u>lower-emitting</u> technologies and practices	TIER 1 Emission factors for oil production						
	All	2.91	44.99	1.25	0.00067	Tons/thousand cubic meters onshore oil production	Table 4.2.4A (new)
	Disaggregation of TIER 1 emission factors for oil production						
	Leaks	9%	0%	9%	0%		Table 4A.2.2 (new)
	Vents	78%	1%	78%	0%		
	Flares	13%	99%	13%	100%		
	Disaggregated TIER 1 emission factors for oil production						
	Leaks	0.26	NA	0.11	NA	Tons/thousand cubic meters onshore oil production	Calculated
	Vents	2.27	0.45	0.975	NA		
	Flares	0.38	44.54	0.163	0.00067		
venting and flaring	Calculated						
	venting and flaring	0.012	2.0	-	0.000023	Tons/thousand cubic meters onshore oil production	Calculated
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor and Annex 4A.2 Disaggregation of Tier 1 factors presented in Section 4.2.2.3							
2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor TABLE 4.2.4(CONTINUED) tier 1 emission factors for fugitive emissions (including venting and flaring) from oil and gas operations in developed countries a,b							

1.3.2.3.2.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.a.ii Fugitive emissions from Oil production and upgrading are presented in the following table.

Table 1-123 Uncertainty for CRT category 1.B.2.a.ii Fugitive emissions from Oil production and upgrading.

Uncertainty	Oil exploration				Reference
	CO ₂	CH ₄	NM VOC	N ₂ O	
Activity data (AD)	10%	10%	10%	10%	2006 IPCC GL. Chapter 4.2
Emission factor (EF)	42%	42%	806%	1000%	Table 4.2.4A (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	43%	43%	806%	1000%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

1.3.2.3.2.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,
 - use of units,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI, OPEC
- cross-checked with 2006 IPCC default values
- time series consistency - plausibility checks of dips and jumps.

1.3.2.3.2.5 Category-specific recalculations including explanatory information and justifications

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Recalculation_all

The following table presents the main revisions and recalculations done since the last submission to the UNFCCC and relevant to CRT category 1.B.2.a.ii Oil production and upgrading.

Table 1-124 Recalculations since the last submission in CRT category 1.B.2.a.ii Fugitive emissions from Oil production and upgrading

Source category	Revisions of data				Type of revision	Type of improvement
1.B.2.a.ii	Revision of activity data due to updated energy statistics and use of data of UN statistics				AD	Accuracy Comparability Completeness
Note	AD	Activity data	EF	Emission factor	M	Method

1.3.2.3.2.6 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-125 Planned improvements for CRT category 1.B.2.a.ii Fugitive emissions from Oil production and upgrading

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.a.ii	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of site specific data: production of crude oil, natural gas liquids (NGL)/ condensate and GPL aux champs				AD	Completeness Consistency Transparency	high
1.B.2.a.ii	Application of Tier 2 method for CO ₂ for flaring Application of Tier 2 method for CH ₄ for venting				M	Accuracy Comparability	medium
1.B.2.a.ii	Development of country-specific EF for CO ₂ and CH ₄				EF	Accuracy	medium
1.B.2.a.ii	Investigation on share of activities occurring with lower-emitting or higher-emitting technologies and practices				AD	Accuracy Transparency	high
1.B.2.a.ii	Use of activity data from installation: amount of gas vented and flared				AD	Accuracy	medium
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.3.3 Fugitive emissions from oil transport (CRT category 1.B.2.a.iii)

Folder	\06_Inventory\2024_submission\01_Energy\1B		
File	1B2_Fugitive_emissions_DZA.xlsx		
Sheet	1.B.2.a.iii_Oil_Transport_2019R.xlsx		
File	Information_OPEC.xlsx		
NID CHAPTER	3.3.2.3.3 Fugitive emissions from oil transport (CRT category 1.B.2.a.iii)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	OilTransport_T	
		AD	emissions
	Table		Column L-AD
	Graph		Row 175 / 177
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

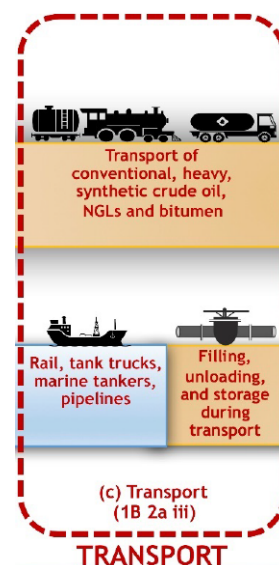
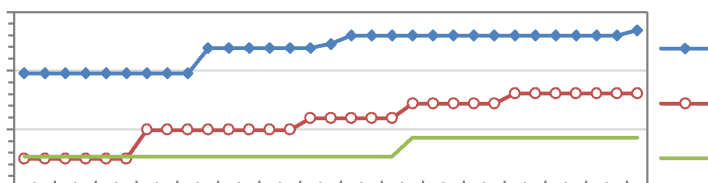
1.3.2.3.3.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁷³ the segment Oil Transport includes fugitive emissions, including equipment leaks, venting and flaring, related to the transport of marketable crude oil (including conventional, heavy and synthetic crude oil and bitumen) , etc, to upgraders and refineries.

In Algeria, the transportation systems comprise mainly by through pipelines. At the tanker terminal Arzew. Algiers and Skikda the petroleum products are transferred to marine tankers. Occasionally, tank trucks and rail cars are used for short transports. Also, oil was only fed in tanks for short term.

Evaporation losses from storage, filling and unloading activities and fugitive equipment leaks are the primary sources of these emissions.

In the following figure an overview of the Algerian pipeline network for oil, LPG and condensate is provided.



²⁷³ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.56/57

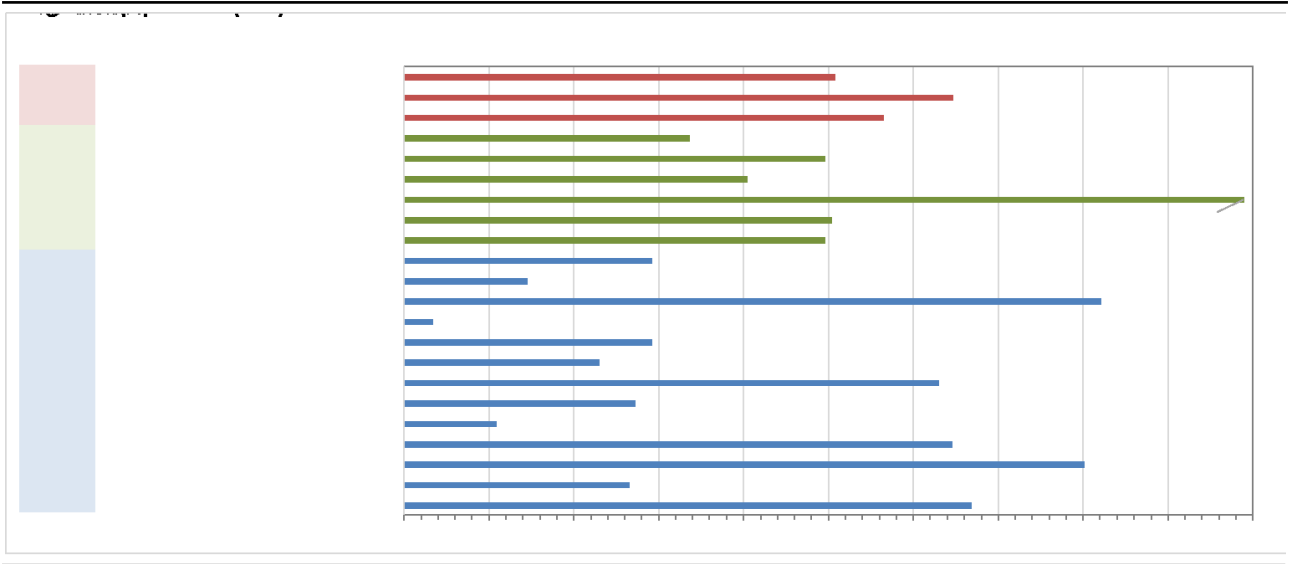


Figure 1-12 Pipeline network for oil, LPG and condensate transport

The following table provides an overview of activities occurring in Algeria.

Table 1-126 Activities of segment Oil transport occurring in Algeria

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
• Pipelines		Estimated		
• Tanker Trucks and Rail Cars		Not estimated (NE)		
• Tanks		Not estimated (NE)		
• Loading of offshore production on tanker ships without VRU		Not occurring (NO)		
• Loading of offshore production on tanker ships with VRU		Not occurring (NO)		

1.3.2.3.3.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.iii

1.3.2.3.3.2.1 Choice of method

Equation 4.2.11 (new) General equation for estimating fugitive emissions from oil transportation
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$Emissions_{oil\ transport} = AD_{pipelines} * EF_{pipelines} + AD_{tanker\ trucks\ and\ rail\ cars} * EF_{tanker\ trucks\ and\ rail\ cars} + AD_{tanks} * EF_{tanks}$$

Where:

- Emissions_{oil transportation} = emissions of CH₄, CO₂, NMVOC and N₂O due to all relevant from oil transportation activities
- Activity_{pipelines} = Volume of oil transported by pipelines

EF _{pipelines}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for oil transported by pipelines
Activity _{tanker trucks and rail cars}	= Volume of oil transported by tanker trucks and rail cars
EF _{tanker trucks and rail cars}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for oil transported by tanker trucks and rail cars
Activity _{tanks}	= Volume of crude oil feed
EF _{tanks}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for tanks

Emissions from oil and gas transport are aggregated and reported under the category Oil transport 1.B.2.a.iii. Venting and flaring from oil and gas production are aggregated and reported also under this category.

Note: In Algeria, there is no loading of offshore production on tanker ships. Therefore, this part of the formula is omitted.

Table 1-127 Sample calculation – Tier1 Fugitive emissions from oil and gas

ii. Production - Onshore: Most activities occurring with higher- emitting technologies and practices - ALL				
Emission factors (CH ₄)	EF_CH4	Natural gas (including LNG)	Mg/10 ⁶ m ³	4.09
Emission factors (CO ₂)	EF_CO2	Natural gas (including LNG)	Mg/10 ⁶ m ³	1.45
Emission factors (NMVOC)	EF_NMVOC	Natural gas (including LNG)	Mg/10 ⁶ m ³	0.98
Emission factors (N ₂ O)	EF_N2O	Natural gas (including LNG)	Mg/10 ⁶ m ³	0.000025
Leaks - Disaggregation share - CH ₄	Leak_CH4		%	11%
Vents - Disaggregation share - CH ₄	Vents_CH4		%	89%
Flares - Disaggregation share - CH ₄	Flares_CH4		%	0%
Leaks - Disaggregation share - CO ₂	Leak_CO2		%	4%
Vents - Disaggregation share - CO ₂	Vents_CO2		%	31%
Flares - Disaggregation share - CO ₂	Flares_CO2		%	65%
Leaks - Disaggregation share - NMVOC	Leak_NMVOC		%	11%
Vents - Disaggregation share - NMVOC	Vents_NMVOC		%	89%
Flares - Disaggregation share - NMVOC	Flares_NMVOC		%	0%
Leaks - Disaggregation share - N ₂ O	Leak_N2O		%	0%
Vents - Disaggregation share - N ₂ O	Vents_N2O		%	0%
Flares - Disaggregation share - N ₂ O	Flares_N2O		%	100%
Leaks				
Emission factors (CH ₄)	EF_CH4_Leaks	Natural Gas	Mg/10 ⁶ m ³	0.45
Emission factors (CO ₂)	EF_CO2_Leaks	Natural Gas	Mg/10 ⁶ m ³	0.06
Emission factors (NMVOC)	EF_NMVOC_Leaks	Natural Gas	Mg/10 ⁶ m ³	0.11
Emission factors (N ₂ O)	EF_N2O_Leaks	Natural Gas	Mg/10 ⁶ m ³	NA

Vents					
Emission factors (CH ₄)	EF_CH ₄ _Vents	Natural Gas	Mg/10 ⁶ m ₃		3.64
Emission factors (CO ₂)	EF_CO ₂ _Vents	Natural Gas	Mg/10 ⁶ m ₃		0.4
Emission factors (NMVOC)	EF_NMVOC_Vents	Natural Gas	Mg/10 ⁶ m ₃		0.872
Emission factors (N ₂ O)	EF_N ₂ O_Vents	Natural Gas	Mg/10 ⁶ m ₃		NA
Flares					
Emission factors (CH ₄)	EF_CH ₄ _Flares	Natural Gas	Mg/10 ⁶ m ₃		0.0000
Emission factors (CO ₂)	EF_CO ₂ _Flares	Natural Gas	Mg/10 ⁶ m ₃		0.94
Emission factors (NMVOC)	EF_NMVOC_Flares	Natural Gas	Mg/10 ⁶ m ₃		0.000000
Emission factors (N ₂ O)	EF_N ₂ O_Flares	Natural Gas	Mg/10 ⁶ m ₃		0.0000250
EMISSIONS (CH₄)	EMI_CH ₄	Natural gas (including LNG)	Gg (=kt)	=AD_m3 * EF_CH ₄ * 10 ⁻³	96.12
EMISSIONS (CO₂)	EMI_CO ₂	Natural gas (including LNG)	Gg (=kt)	=AD_m3 * EF_CO ₂ * 10 ⁻³	34.08
EMISSIONS (NMVOC)	EMI_NMVOC	Natural gas (including LNG)	Gg (=kt)	=AD_m3 * EF_NMVOC * 10 ⁻³	23.03
EMISSIONS (N₂O)	EMI_N ₂ O	Natural gas (including LNG)	Gg (=kt)	=AD_m3 * EF_N ₂ O * 10 ⁻³	0.0006
Type of method					T1
Type of emission factor					D

1.3.2.3.3.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The emission factors (EF) are related to throughput and presented in the unit of thousand cubic meters oil transported by pipeline. Production data of crude oil, natural gas liquids (NGL)/condensate and GPL aux champ were used for estimating the fugitive emissions of CH₄, CO₂, N₂O and NMVOC for the years

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²⁷⁴

²⁷⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

- 2010 – 2022 are taken from the National Energy balance prepared by MEM²⁷⁵.

It is necessary to clarify that Activity data used to estimate emissions of venting and flaring from Oil transport (CRT category 1.B.2.a.iii) were provided by the MEM for the period between 2019-2022.

For the period 1990 – 2018, missing data of venting and flaring volumes have been completed by using a ratio of flaring and venting volumes to oil production of the time series 2019-2020 applied to the period 1990 -2018 to generate flaring and venting volumes based on annual oil production.

For the period 1990 – 2009 the Activity Data used to estimate emissions of venting and flaring from Oil transport (CRT category 1.B.2.a.iii) were estimated using the Interpolation method.

1.3.2.3.3.2.3 Choice of Emission Factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The following Tier 1 emission factors of the 2006 IPCC GL and 2019Refinement to the 2006 IPCC GL²⁷⁶ were applied.

Table 1-128 TIER 1 emission factors for oil transport

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
Pipelines	All s	0.0054	0.00049	0.054	NA	Tonne per thousand cubic meters oil transported by pipeline	TABLE 4.2.4B (NEW)
Tanker Trucks and Rail Cars	All	0.025	0.0023	0.25	NA	Tonne per thousand cubic meters oil transported by tanker truck or rail car	
Tanks	All	0.002	NA	NA	NA	Tonne per thousand cubic meters crude oil feed	
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor and Annex 4A.2 Disaggregation of Tier 1 factors presented in Section 4.2.2.3 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor TABLE 4.2.4(CONTINUED) tier 1 emission factors for fugitive emissions (including venting and flaring) from oil and gas operations in developed countries a,b							

1.3.2.3.3.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx

²⁷⁵ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

²⁷⁶ Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor.

	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file
	19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter
	1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
	11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.a.i Fugitive emissions from oil transport are presented in the following table.

Table 1-129 Uncertainty for CRT category 1.B.2.a.iii Fugitive emissions from oil transport

Uncertainty	Oil transport				Reference
	CO ₂	CH ₄	NMVOC	N ₂ O	
Activity data (AD)	10%	10%	10%	NA	2006 IPCC GL. Chapter 4.2
Emission factor (EF)	100%	100%	194%	NA	Table 4.2.4B (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	100.5%	100.5%	194%	NA	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

The uncertainty of the NMVOC emission factor for pipeline transport has been calculated using the average of the values provided by IPCC guidelines mentioned in Table 4.2.4B (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3.

1.3.2.3.3.4 Category-specific QA/QC and verification

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,
 - use of units,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI, OPEC
- time series consistency - plausibility checks of dips and jumps.

1.3.2.3.3.5 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-130 Planned improvements for CRT category 1.B.2.a.iii Fugitive emissions from oil transport

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.a.iii	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of site-specific data: production of crude oil, natural gas liquids (NGL)/ condensate and GPL aux champs				AD	Completeness Consistency Transparency	high
1.B.2.a.iii	Application of Tier 2 method for CH ₄				M	Accuracy Comparability	medium
1.B.2.a.iii	Estimation of fugitive emissions from transport activities with tanker trucks and Rail Cars and from tank feeds				AD	Completeness	high
1.B.2.a.iii	Estimation of fugitive emissions from loading activities at the tanker terminal related to import and export of crude oil, condensate and GPL aux champs				AD	Completeness	High
	Investigation related to pipeline transport: material of pipelines, maintenance, breakdown/accidents				AD	Completeness	High
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.3.4 Fugitive emissions from oil refining and storage (CRT category 1.B.2.a.iv)

Folder	\06_Inventory\2024_submission\01_Energy\1B		
File	1B2_Fugitive_emissions_DZA.xlsx		
Sheet	1.B.2.a.iv_Oil_Refining_2019R		
File	Information_OPEC.xlsx		
NID CHAPTER	3.3.2.3.4 Fugitive emissions from oil refining and storage (CRT category 1.B.2.a.iv)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	OilRefining_T	
		AD	emissions
	Table		Column E--R
	Graph		Row 175 / 177
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

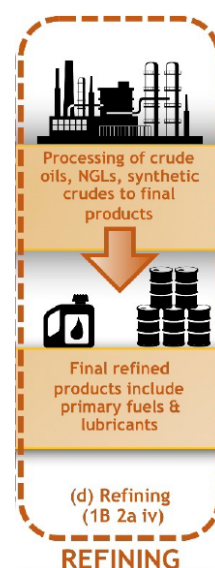
1.3.2.3.4.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁷⁷ the segment Oil Refining includes fugitive emissions, including equipment leaks, venting and flaring at petroleum refineries. Refineries process crude oils, natural gas liquids and synthetic crude oils to produce final refined products (e.g., primarily fuels and lubricants).

CH₄ emission sources include storage tanks, blowdowns, asphalt blowing, equipment leaks, vents, loading operations, wastewater treating, cooling towers, catalytic cracking/reforming/fluid cracking, flares, delayed coking, and coke calcining.

CO₂ emissions included under 1.B.2.a.iv include asphalt blowing, calcination, anode production, process vents, and flaring.

In the following table and figure an overview of refinery capacity and finished products are provided.

**Algiers Refinery - RA1G**

- Treatment capacity: 2.57 million tons per year of 'BHM'²⁷⁸. increased at 3.7 million tons per year after rehabilitation (2019)
- Finished products: LPG, gasoline, kerosene, gas-oil

Arzew Refinery - RA1Z

- Treatment capacity: 2.5 million tons per year of 'BHM', increased at 3.750 million tons per year after rehabilitation (2012) and 270.000 t/y of 'BRI'
- Finished products: LPG, gasoline, kerosene, gas-oil, naphtha

Hassi Messaoud Refinery - RHM

- Treatment capacity: 1.07 million tons per year of 'BHM'
- Finished products: fuel (gasoline, kerosene, gas-oil)

Skikda Refinery RA1K

- Treatment capacity: 15 million tons per year of 'BHM'. increased at 16.5 million tons per year after rehabilitation (2013) and 277.000 t/y of 'BRI'
- Finished products: LPG, gasoline, kerosene, gas-oil.

²⁷⁷ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.58

²⁷⁸

and fuel, lubricants and bitumen	naphtha, fuel, aromatics and bitumen
Adrar – RA1D	Skikda Condensate Refinery RA2K
Treatment capacity: 0.6 million tons per year of finished products: LPG, unleaded gasoline, gas-oil, kerosene	- Treatment capacity: 5 million tons per year of condensate - Finished products: Butan, fuels (gas-oil, kerosene) , naphtha
Source: Sonatrach: Oil and gas map of Algeria.	

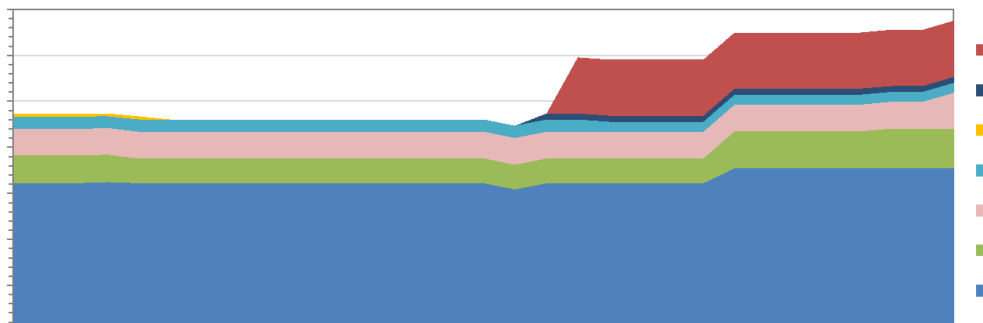


Figure 1-13 Refinery capacity

Source: Organization of the Petroleum Exporting Countries (OPEC)(2022): Data download. Section 3 — Oil data: downstream.

1.3.2.3.4.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.iv

1.3.2.3.4.2.1 Choice of method

For estimating fugitive emissions (leaks) of CH₄, CO₂, N₂O and NMVOC from oil refining, the Tier 1 method according to 2019 Refinements to 2006 IPCC GL has been applied.

For estimating emissions from venting and flaring of CH₄, CO₂ and N₂O from oil production and upgrading activities the Tier 1 method according to 2006 IPCC GL has been applied.

Equation 4.2.1 General equation for estimating fugitive emissions from Oil refining and storage
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$Emissions_{refining} = AD_{oil refining} * EF_{oil refining-leaks} + AD_{oil refining} * EF_{oil refining-venting} + AD_{oil refining} * EF_{oil refining-flaring}$$

Where:

Emissions _{oil refining}	= emissions of CH ₄ , CO ₂ , NMVOC and N ₂ O from oil refining activities
Activity data _{oil refining}	= activity data of oil refining
EF _{oil refining-leaks/venting/flaring}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for leaks, venting and flaring for oil refining

1.3.2.3.4.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx

based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx
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The emission factors (EF) are related to throughput and presented in the unit of thousand cubic meters onshore oil production. Production data of crude oil, natural gas liquids (NGL)/condensate and GPL aux champ were used for estimating the fugitive emissions of CH₄, CO₂, N₂O and NMVOC for the years.

- 1990 - 2022 are taken from the energy balance provided by MEM and UN statistics²⁷⁹.
- 2010 – 2022 are taken from the national energy balance prepared by MEM²⁸⁰.

The data are provided above in section Choice of activity data in Chapter 3.3.2.3.2 Fugitive emissions from Oil production and upgrading (CRT category 1.B.2.a.ii).

The production data in energy statistics are provided in the physical units 'tonnes'. To convert these data to volume, country specific density was used which are presented in the following table.

Table 1-131 Country specific Density and NCV for selected fuels and default data for comparison

Fuel	Country specific (CS) Density	Country specific (CS) NCV	For comparison	
	kt / 10 ⁶ m ³	TJ/kt	Average Density kt / 10 ⁶ m ³	IPCC default NCV TJ/kt
Crude oil	0.799	46.2 * 0.95 = 43.89	0.853	42.3
Natural Gas Liquids (NGL) / Condensate	0.525 = Average (0.52 - 0.53)	47.4 * 0.95 = 45.03		44.2

Conversion from GCV to NCV	Default
Petroleum products	1 NCV = 0.95 x GCV

Source	CS Density	MEM
	Average Density	IEA (2019): Oil information: database documentation; page 65 ²⁸¹
	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²⁸²
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
	Conversion from GCV to NCV	International Recommendations for 150 Energy Statistics (IRES) (2018) ²⁸³ : Table 4 Difference between net and gross calorific values for selected fuels

Note:			
D	Default	CS	Country specific
PS	Plant specific		

1.3.2.3.4.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx

²⁷⁹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/>; <https://unstats.un.org/unsd/energystats/data/>

²⁸⁰ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

²⁸¹ IEA (2019): Oil information: database documentation (2019 first release) Table Oil products - Average densities, volume and heat equivalents; available on 08.07.2022 at https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/Oil_documentation%20aie.pdf

²⁸² Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

²⁸³ <https://unstats.un.org/unsd/energystats/methodology/ires/>

Sheet	EF_1B1
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The following Tier 1 emission factors of the 2006 IPCC GL and 2019 Refinement to the 2006 IPCC GL²⁸⁴ were applied.

Table 1-132 TIER 1 emission factors for oil refining and storage and disaggregation of TIER 1 EF

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
Refinery	TIER 1 Emission factors for oil refining and storage						
	All	0.03	5.85	0.26	0.0000877	Tonnes/thousand cubic meters oil refined	TABLE 4.2.4C (NEW)
	Disaggregation of TIER 1 emission factors for oil refining and storage						
	Leaks	99%	45%	98%	1%		TABLE 4A.2.3 (NEW)
	Vents	NA	NA	NA	NA		
	Flares	1%	55%	2%	99%		
	Disaggregated TIER 1 emission factors for oil refining and storage						
	Leaks	0.03	2.63	0.25	NA	Tonnes/thousand cubic meters oil refined	Calculated
	Vents	NA	NA	NA	NA		
	Flares	0.0003	3.22	0.005	0.0000868		
	TIER 1 emission factors for venting and flaring oil refining and storage						
	venting and flaring	0.012	2.0	-	0.000023	Tons/thousand cubic meters onshore oil production	Calculated
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor and Annex 4A.2 Disaggregation of Tier 1 factors presented in Section 4.2.2.3 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor, TABLE 4.2.4(CONTINUED) tier 1 emission factors for fugitive emissions (including venting and flaring) from oil and gas operations in developed countries ^{a,b}							

1.3.2.3.4.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx
	Are QC checks performed according to QA/QC checklist?
	Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph
	Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

²⁸⁴ Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor.

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.a.iv Oil refining and storage are presented in the following table.

The uncertainties relating to the emission factors for the gases CH₄, CO₂ and N₂O have been provided in interval form (see table 4.2.4C. 2019 Refinement to the 2006 IPCC Guidelines). For this, we have estimated the uncertainties for these gases by calculating the average of the interval values.

Table 1-133 Uncertainty for CRT category 1.B.2.a.iv Oil refining and storage.

Uncertainty	Oil exploration				Reference
	CO ₂	CH ₄	NMVOC	N ₂ O	
Activity data (AD)	10%	10%	10%	10 %	2006 IPCC GL. Chapter 4.2
Emission factor (EF)	139%	139%	100%	100%	TABLE 4.2.4C (NEW); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	139%	139%	100.5%	100.5%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

1.3.2.3.4.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all
NID CHAPTER	3.3.2.3.2 Fugitive emissions from Oil production and upgrading (CRT category 1.B.2.a.ii)

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,
 - use of units,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI
- time series consistency - plausibility checks of dips and jumps.

1.3.2.3.4.5 Category-specific recalculations including explanatory information and justifications

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Recalculation_all

The following table presents the main revisions and recalculations done since the last submissions to the UNFCCC and relevant to CRT category 1.B.2.a.iv Fugitive emissions from Oil refining and storage.

Table 1-134 Recalculations done since the last submission in CRT category 1.B.2.a.iv Fugitive emissions from Oil refining and storage

Source category	Revisions of data	Type of revision	Type of improvement
1.B.2.a.i	No revisions have been made		

1.3.2.3.4.6 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-135 Planned improvements for CRT category 1.B.2.a.iv Fugitive emissions from Oil refining and storage

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.a.iv	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of plant specific data: refining of crude oil and natural gas liquids (NGL)/ condensate				AD	Completeness Consistency Transparency	high
1.B.2.a.iv	Application of Tier 2 method				M	Accuracy	medium
1.B.2.a.iv	Use of activity data from installation: amount of gas flared				AD	Accuracy	medium
1.B.2.a.iv	Preparation of an overview of process units related to e.g., hydrogen production, bitumen, asphalt blowing, etc. and technology applied				AD	Transparency Completeness	high
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.3.5 Fugitive emissions from Distribution of oil products (CRT category 1.B.2.a.v)

Folder	\06_Inventory\2024_submission\01_Energy\1B	
File	1B2_Fugitive_emissions_DZA.xlsx	
Sheet	1.B.2.a.v_Oil_Distributio_2019R	
File	Information_OPEC.xlsx	
NID CHAPTER	3.3.2.3.5 Fugitive emissions from Distribution of oil products (CRT category 1.B.2.a.v)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	Oil_Distribution_T
	AD	emissions
	Table	Column E
	Graph	Row 175
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.3.2.3.5.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁸⁵ the segment Distribution of oil products includes fugitive emissions, including equipment leaks, venting and flaring from the

- transport and distribution of refined products.
- including those at bulk terminals and retail facilities.

Evaporation losses from storage, filling and unloading activities and equipment leaks are the primary sources of these emissions.

The following table provides an overview of occurring activities in Algeria.

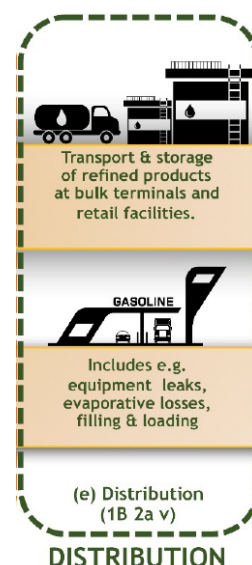


Table 1-136 Activities of segment Refined Product Distribution in Algeria

	Estimated	Occurring		Not occurring (NO)
		Included elsewhere (IE)	Not estimated (NE)	
Refined Product Distribution				
● gasoline	x			
● diesel				
● jet kerosene	x			
● aviation fuel				

²⁸⁵ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4: Fugitive Emissions, - 4.2.2.3 Choice of emission factor, page 4.60

1.3.2.3.5.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.v

1.3.2.3.5.2.1 Choice of method

For estimating fugitive emissions of CH₄, CO₂, N₂O and NMVOC from distribution of oil products activities the Tier 1 method according to 2019 Refinements to 2006 IPCC GL²⁸⁶ has been applied. Fugitive emissions include emissions from venting and leaks.

Equation 4.2.12 (new) General equation for estimating fugitive emissions from distribution of oil products (2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$Emissions_{fuel\ distribution} = AD_{gasoline\ distribution} * EF_{gasoline\ distribution} + AD_{diesel\ distribution} * EF_{diesel\ distribution} + AD_{jet\ kerosene\ distribution} * EF_{jet\ kerosene\ distribution}$$

Where:

Emissions _{fuel distribution}	= emissions of NMVOC emitted due to all relevant activities on distribution of oil products
AD _{gasoline distribution}	= activity data - volumes of gasoline consumed
EF _{gasoline distribution}	= default emission factor of NMVOC for leaks and venting from gasoline distribution
AD _{diesel distribution}	= activity data - volumes of diesel consumed
EF _{diesel distribution}	= default emission factor of NMVOC for leaks and venting from diesel distribution
AD _{jet kerosene distribution}	= activity data - volumes of jet kerosene consumed
EF _{jet kerosene distribution}	= default emission factor of NMVOC for leaks and venting from jet kerosene distribution

1.3.2.3.5.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The emission factors (EF) are related to throughput and presented in the unit of Tonnes per thousand cubic meters product consumed. Gross consumption data of gasoline, diesel and jet kerosene were used for estimating the fugitive emissions of NMVOC for the years

- 1990 - 2009 are taken from the Energy balance provided by UN statistics²⁸⁷ for and from Algeria
- 2010 – 2022 are taken from the National Energy balance prepared by MEM²⁸⁸.

The total fuel consumption decreased by 96% in the period 1990 –2015 due to the allocation of Jet kerosene used in international aviation with the Jet kerosene exported according to the energy balance.

²⁸⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2 Methodological issues - Choice of method

²⁸⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

²⁸⁸ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

Due to allocation of Jet kerosene used in international aviation and Jet kerosene exported, the emissions in the period 2010 – 2022 are not complete or not estimated.

In the following figure and table, the used activity data are provided.

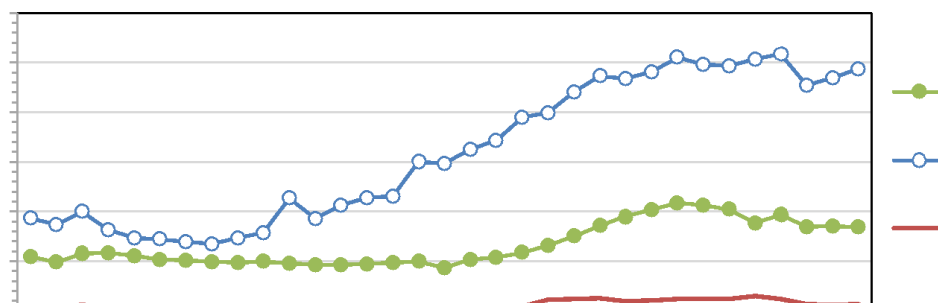


Figure 1-14 Activity data for Distribution of oil products (CRT category 1.B.2.a.v)

Table 1-137 Activity data for Distribution of oil products (CRT category 1.B.2.a.v)

Activity data	Total	Gasoline			Gas/Diesel Oil			Jet Kerosene		
	PJ	Kt	TJ	10 ³ m ³	kt	TJ	10 ³ m ³	kt	PJ	10 ³ m ³
1990	283.1	2,177	92.5	2,938	3,722	153.4	4,410	160	6.7	199
1991	303.4	1,954	83.1	2,637	3,468	142.9	4,109	140	5.8	174
1992	332.2	2,301	97.8	3,105	3,995	164.6	4,733	240	10.0	299
1993	307.9	2,328	99.0	3,142	3,259	134.3	3,861	149	6.2	186
1994	283.0	2,210	94.0	2,982	2,922	120.4	3,462	101	4.2	126
1995	271.7	2,060	87.6	2,780	2,885	118.9	3,418	97	4.0	121
1996	267.0	2,023	86.0	2,730	2,777	114.4	3,290	99	4.1	123
1997	263.0	1,963	83.5	2,649	2,692	110.9	3,190	124	5.2	154
1998	278.6	1,933	82.2	2,609	2,931	120.8	3,473	116	4.8	144
1999	292.7	1,982	84.3	2,675	3,124	128.7	3,701	117	4.9	146
2000	347.5	1,902	80.9	2,567	4,533	186.8	5,371	103	4.3	128
2001	312.2	1,861	79.1	2,511	3,702	152.6	4,386	130	5.4	162
2002	332.6	1,844	78.4	2,489	4,242	174.8	5,026	30	1.3	37
2003	344.4	1,877	79.8	2,533	4,542	187.2	5,382	15	0.6	19
2004	362.4	1,925	81.8	2,598	4,609	189.9	5,461	128	5.3	159
2005	413.0	1,982	84.3	2,675	5,996	247.1	7,104	52	2.2	65
2006	391.0	1,718	73.0	2,318	5,937	244.7	7,034	0	0.0	0
2007	428.3	2,060	87.6	2,780	6,491	267.5	7,691	0	0.0	0
2008	457.5	2,157	91.7	2,911	6,850	282.3	8,116	215	9.0	268
2009	515.1	2,340	99.5	3,158	7,796	321.3	9,237	155	6.5	193
2010	545.3	2,627	111.7	3,546	7,965	328.2	9,437	450	18.8	560
2011	596.7	2,998	127.5	4,046	8,798	362.6	10,424	454	19.0	566
2012	649.0	3,429	145.8	4,628	9,451	389.5	11,198	506	21.1	630
2013	651.8	3,784	160.9	5,106	9,340	384.9	11,067	387	16.2	482

Activity data	Total	Gasoline			Gas/Diesel Oil			Jet Kerosene		
	PJ	Kt	TJ	10 ³ m ³	kt	TJ	10 ³ m ³	kt	PJ	10 ³ m ³
2014	669.1	4,057	172.5	5,475	9,613	396.2	11,390	415	17.3	517
2015	706.8	4,339	184.5	5,855	10,196	420.2	12,080	454	18.9	565
2016	690.3	4,234	180.0	5,714	9,914	408.6	11,746	460	19.2	572
2017	686.3	4,082	173.6	5,509	9,856	406.2	11,678	473	19.7	589
2018	688.3	3,538	150.4	4,775	10,128	417.4	12,000	579	24.2	721
2019	715.3	3,863	164.2	5,213	10,334	425.9	12,244	472	19.7	588
2020	634.3	3,375	143.5	4,555	9,077	374.1	10,754	255	10.6	318
2021	663.05	3,397	149	4,584	9,373	386	11,106	234	10.3	292
2022	686.64	3,361	148	4,535	9,728	401	11,526	249	10.9	310
Trend										
1990 – 2022	68.4%	54.4%			161.4%			55.6%		
2010 – 2022	27.2%	27.9%			22.1%			-44.6%		
2021 - 2022	-0.016%	-1.1%			3.8%			6.3%		

The production data in energy statistics are provided in the physical units 'tonnes'. To convert these data to volume, default densities were used which are presented in the following table.

Table 1-138 Country specific Density and NCV for selected fuels and default data for comparison

Fuel	Country specific (CS) Density	Country specific (CS) NCV	Average Density	For comparison IPCC default NCV
	kt / 10 ³ m ³	TJ/kt	kt / 10 ³ m ³	TJ/kt
Gasoline	-	44.75 * 0.95 = 42.51	0.741	44.3
Gas/Diesel Oil	-	43.38 * 0.95 = 41.21	0.844	43.0
Jet Kerosene	-	46.02 * 0.95 = 43.72	0.803	44.1

Conversion from GCV to NCV	Default
Petroleum products	1 NCV = 0.95 x GCV

Source	CS Density	MEM
	Average Density	IEA (2019): Oil information: database documentation; page 65 ²⁸⁹
	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés. Annex 3. ²⁹⁰
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
	Conversion from GCV to NCV	International Recommendations for 150 Energy Statistics (IRES) (2018) ²⁹¹ : Table 4 Difference between net and gross calorific values for selected fuels

Note:			
D	Default	CS	Country specific
PS	Plant specific		

1.3.2.3.5.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
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²⁸⁹ IEA (2019): Oil information: database documentation (2019 first release) Table Oil products - Average densities, volume and heat equivalents; available on 08.07.2022 at https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/Oil_documentation%20aie.pdf

²⁹⁰ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines. <https://www.energy.gov.dz/?rubrique=textes-legislatifs-et-reglementaires>

²⁹¹ <https://unstats.un.org/unsd/energystats/methodology/ires/>

File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The following Tier 1 emission factors of the 2019 Refinement to the 2006 IPCC GL²⁹² were applied.

Table 1-139 TIER 1 emission factors for Distribution of oil products

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
Gasoline	All	NA	NA	2.27	NA	Tonnes per thousand cubic meters product consumed	TABLE 4.2.4D (NEW)
Gas/Diesel Jet kerosene	All	NA	NA	0.15	NA	Tonnes per thousand cubic meters product consumed	
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor							

1.3.2.3.5.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.a.v Distribution of oil products are presented in the following table.

Table 1-140 Uncertainty for CRT category 1.B.2.a.v Distribution of oil products.

Uncertainty	Distribution of Oil products				Reference
	CO ₂	CH ₄	NM VOC	N ₂ O	
Activity data (AD)	NA	NA	10%	NA	2006 IPCC GL. Chapter 4.2
Emission factor (EF)	NA	NA	28%	NA	Table 4.2.4D (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	NA	NA	30%	NA	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

²⁹² Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor

1.3.2.3.5.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,
 - use of units,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI
- time series consistency - plausibility checks of dips and jumps.

1.3.2.3.5.5 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective. Developments presented in the following table will be explored.

Table 1-141 Planned improvements for CRT category 1.B.2.a.v Distribution of oil products

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.B.2.a.v	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of plant specific data: consumption of gasoline, gas/diesel, jet kerosene	AD	Completeness Consistency Transparency	high
1.B.2.a.v	Application of Tier 2 method for CO ₂ and CH ₄ for flaring	M	Accuracy Comparability	medium
1.B.2.a.v	Use of activity data from installation: amount of gas flared	AD	Accuracy	medium
1.B.2.a.v	Development of country-specific EF for CO ₂ and CH ₄	EF	Accuracy	medium
1.B.2.a.v	Investigation regarding technology applied at gas station	EF	Accuracy	medium

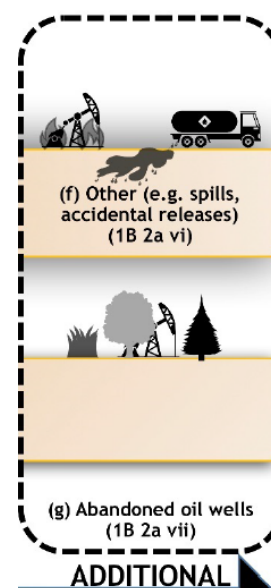
GHG source & sink category	Planned improvement				Type of improvement	Priority
Note	AD	Activity data	EF	Emission factor	M	Method

1.3.2.3.6 Fugitive emissions from *Other* (CRT category 1.B.2.a.vi)

Folder	\06_Inventory\2024_submission\01_Energy\1B
Sheet	1.B.2.a.vi_Other
NID CHAPTER	3.3.2.3.7 Fugitive emissions from Abandoned Oil Wells (CRT category 1.B.2.a.vii)

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁹³ the segment Abandoned wells includes fugitive emissions from

- Spills and other accidental releases.
- Anomalous leak events: releases from emergency pressure relieving equipment such as
 - emergency shutdowns (ESD).
 - emergency safety blowdowns (ESB).
 - breakout/surge tanks.
- Waste oil treatment facilities and.
- Oilfield waste disposal facilities.



The following table provides an overview of occurring activities in Algeria.

Table 1-142 Activities of segment *Other* (Oil) occurring in Algeria

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
• Spills and other accidental releases.			x	
• Anomalous leak events (emergency releases).			x	
• Waste oil treatment facilities.			x	
• Oilfield waste disposal facilities.			x	

This category has not been estimated due to lack of activity data and resources.

1.3.2.3.6.1 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy

²⁹³ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.2.2.3 Choice of emission factor, page 4.62

- 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-143 Planned improvements for CRT category 1.B.2.a.vi *Other*

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.B.2.a.vi	Estimation of emission from activities listed under <i>Other</i>	M	Completeness	high
1.B.2.a.vi	Collection of activity data per year - Spills and other accidental releases. - Anomalous leak events: releases from emergency pressure relieving equipment such as - emergency shutdowns (ESD). - emergency safety blowdowns (ESB). - breakout/surge tanks - waste oil treatment facilities and - oilfield waste disposal facilities	AD	Completeness	high

1.3.2.3.7 Fugitive emissions from Abandoned Oil Wells (CRT category 1.B.2.a.vii)

Folder	\06_Inventory\2024_submission\01_Energy\1B
Sheet	1.B.2.a.vii_ Abandoned Oil Wells
NID CHAPTER	3.3.2.3.7 Fugitive emissions from Abandoned Oil Wells (CRT category 1.B.2.a.vii)

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁹⁴ the segment Abandoned Oil Wells includes fugitive emissions, including leaks from

- plugged or properly decommissioned wells.
- unplugged wells.
- Onshore.

The following table provides an overview of occurring activities in Algeria.

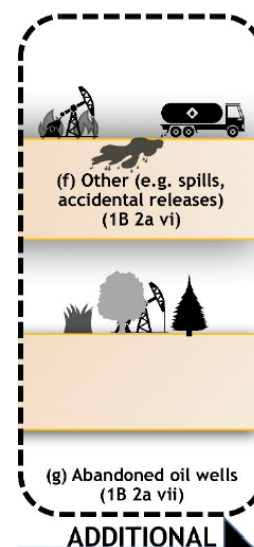


Table 1-144 Activities of segment Abandoned Oil Wells occurring in Algeria

	Occurring			Not occurring (NO)
	Estimated	Included elsewhere (IE)	Not estimated (NE)	
Onshore				
plugged or properly decommissioned wells				x

²⁹⁴ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.2.2.3 Choice of emission factor, page 4.62

	Estimated	Occurring		Not occurring (NO)
		Included elsewhere (IE)	Not estimated (NE)	
• unplugged wells			x	
Offshore				
• plugged or properly decommissioned wells				x
• unplugged wells				x

This category has not been estimated due to lack of activity data and resources.

1.3.2.3.7.1 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-145 Planned improvements for CRT category 1.B.2.a.vii Abandoned oil wells

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.a.vii	Estimation of emission from abandoned wells applying Tier 1 method.				M	Completeness	high
1.B.2.a.vii	Collection of activity data counts of abandoned onshore wells in each year of the time series, including the fraction of wells that are effectively plugged.				AD	Completeness	high
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.4 Fugitive emissions from Gas systems (CRT category 1.B.2.b)

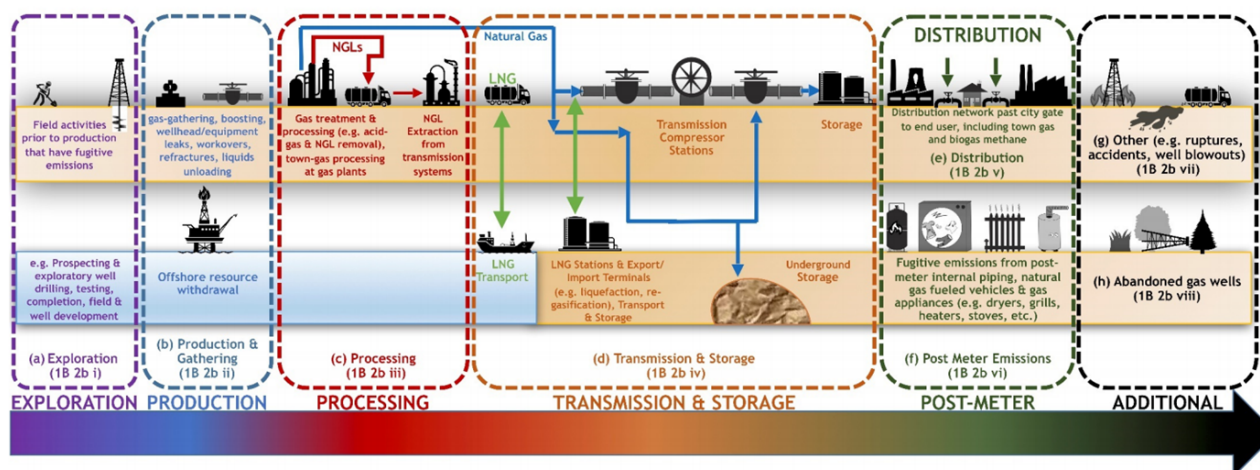


Figure 1-15 Key segments included in natural gas systems.

Source: 2019 Refinement to the 2006 IPCC GL. Chapter 4: Fugitive Emissions. Figure 4.2.0. Page 4.36.

In the following table is provided the status of reporting of sources of CRT category 1.B.2.b Natural gas.

Table 1-146 Status of reporting and key category of CRT category 1.B.2.b

IPCC code	Description		CH ₄		CO ₂		NMVOC		N ₂ O	
			Estimated	Key Category	Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
1.B.2.b	Natural gas	LA 1990 & 2022 TA								
1.B.2.b.i	Exploration	Leaks	NA		NA		NA		NA	
		Venting	IE in CRT category 1.B.2.a.ii Oil production and upgrading							
		Flaring	IE in CRT category 1.B.2.a.ii Oil production and upgrading							
1.B.2.b.ii	Production and gathering	Leaks	✓		✓		✓		✓	
		Venting	IE in CRT category 1.B.2.a.ii Oil production and upgrading							
		Flaring	IE in CRT category 1.B.2.a.ii Oil production and upgrading							
1.B.2.b.iii	Processing	All	✓		✓		✓		✓	
1.B.2.b.iv	Transmission and storage	All	IE in CRT category 1.B.2.a.iv Oil transport							
1.B.2.b.v	Distribution	All	✓		✓		✓		NA	
1.B.2.b.vi	Other									
1.B.2.b.vi.1	Gas post-meter	All	NE		NE		NE		NE	
1.B.2.b.vi.2	Abandoned wells	All	NE		NE		NE		NE	
1.B.2.b.vi.3	Other	All	NE		NE		NE		NE	
1.B.2.c.	Venting and flaring	LA 1990 & 2022								
1.B.2.c.i.	Venting									
1.B.2.c.i.1.	Oil		✓		✓		✓		✓	
1.B.2.c.i.2.	Gas		✓		✓		✓		✓	
1.B.2.c.i.3.	Combined		NO		NO		NO		NO	
1.B.2.c.ii.	Flaring									
1.B.2.c.ii.1.	Oil		✓		✓		✓		✓	
1.B.2.c.ii.2.	Gas		✓		✓		✓		✓	
1.B.2.c.ii.3.	Combined		NO		NO		NO		NO	

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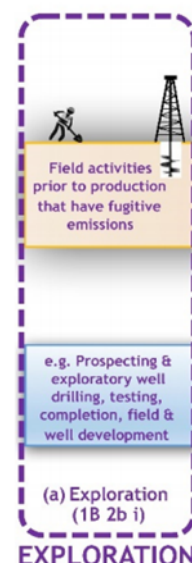
IPCC code	Description		CH ₄		CO ₂		NMVOC		N ₂ O	
			Estimated	Key Category	Estimated	Key Category	Estimated	Key Category	Estimated	Key Category
All: sum of leak, venting and flaring		A '✓' indicates: emissions from this category have been estimated. Notation keys: IE - included elsewhere. NO – not occurring. NE - not estimated. NA - not applicable. C – confidential								
LA – Level Assessment (in year) without LULUCF; TA – Trend Assessment without LULUCF										

1.3.2.4.1 Fugitive emissions from Natural gas exploration (CRT category 1.B.2.b.i)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	1.B.2.a.i_Gas_Exploratio_2019
NID CHAPTER	3.3.2.4.1 Fugitive emissions from Natural gas exploration (CRT category 1.B.2.b.i)

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁹⁵ the segment Natural gas Exploration includes fugitive emissions, including equipment leaks, venting and flaring from gas field activities prior to production. It must be noted that the GHG emissions from CRT category 1.B.2.c.i natural gas venting and flaring were included in CRT category 1.B.2.a.ii Oil production and upgrading for the whole period (1990 – 2022). In addition, Natural gas exploration (CRT category 1.B.2.b.i) does not generate fugitive emissions in the form of leaks.

- geological and geophysical surveys and tests.
- prospecting and exploratory well drilling.
- well/drill stem testing.
- field development and well development
 - construction/drilling.
 - testing, well completion.
 - any fracture stimulation.



Note: Unlike the guidance of the 2006 IPCC GL, in this segment, factors are not disaggregated to drilling, testing and servicing operation; EFs are applied to the whole segment.

In the following figure an overview of the active rigs and completed well in Algeria is provided.

The following table provides an overview of occurring activities in Algeria.

Table 1-147 Activities of segment Natural gas Exploration occurring in Algeria

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
Onshore				
● Onshore conventional Gas exploration		x		
● Onshore unconventional gas exploration <u>without</u> flaring or gas capture				x
● Onshore unconventional gas exploration <u>with</u> flaring or gas capture				x

Note: Unconventional gas exploration refers to exploration that includes well completions with hydraulic fracturing.
Conventional gas exploration emission factors refers to exploration where hydraulic fracturing well completion practices are not used.

²⁹⁵ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.48

1.3.2.4.2 Fugitive emissions from Natural gas production (CRT category 1.B.2.b.ii)

Folder	\06_Inventory\2024_submission\01_Energy\1B	
File	1B2_Fugitive_emissions_DZA.xlsx	
Sheet	1.B.2.b.ii Gas Production_2019R	
NID CHAPTER	3.3.2.4.2 Fugitive emissions from Natural gas production (CRT category 1.B.2.b.ii)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	Gas Production_T
	AD	emissions
	Table	Column C-K
	Graph	Row 175
	Row 175 / 177	
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.3.2.4.2.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL²⁹⁶ the segment Natural gas production includes fugitive emissions from onshore production, including equipment leaks, venting and flaring, from the gas wellhead through to the inlet of gas processing plants, or, where processing is not required, to the tie-in points on gas transmission systems. In the production stage, wells are used to withdraw raw gas from underground formations. Leaks emissions are estimated for natural gas production. However, It must be noted that the GHG emissions from CRT category 1.B.2.c.ii natural gas venting and flaring were included in CRT category 1.B.2.a.ii Oil production and upgrading for the whole period (1990 – 2022).

- wells themselves (e.g., as wellhead leaks and from well workovers and refractures).
- well-site equipment such as pneumatic controllers, dehydrators, and separators.
- gathering and boosting stations (with multiple emission sources on site, such as compressors, pneumatic controllers and tanks).
- gathering pipelines.



The following table provides an overview of occurring activities in Algeria.

Table 1-148 Activities of segment Natural gas production occurring in Algeria

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
Onshore oil production				
● Onshore: Most activities occurring with <u>higher</u> -emitting technologies and practices	x ²⁹⁷	x ²⁹⁸		

²⁹⁶ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.68

²⁹⁷ Leaks emissions are estimated and reported separately for natural gas production.

²⁹⁸ Venting and flaring are estimated and reported under oil production fugitive emissions.

	Occurring			Not occurring (NO)
	Estimated	Included elsewhere (IE)	Not estimated (NE)	
- Onshore: Most activities occurring with <u>lower</u>-emitting technologies and practices - Onshore Coal Bed Methane - Gathering	X ³⁸¹	X ³⁸²		
Offshore oil production				X

1.3.2.4.2.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.b.ii

1.3.2.4.2.2.1 Choice of method

For estimating fugitive emissions (leaks) of CH₄, CO₂, N₂O and NMVOC from CRT category 1.B.2.b.ii Natural gas production, the Tier 1 method according to 2019 Refinements to 2006 IPCC GL has been applied. For estimating emissions from venting and flaring of CH₄, CO₂ and N₂O from CRT category 1.B.2.b.ii Natural gas production, the Tier 1 method according to 2006 IPCC GL has been applied.

Equation 4.2.14 (new) General equation for estimating fugitive emissions from Natural gas production and gathering
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$Emissions_{Natural\ gas\ production} = AD_{Natural\ gas\ production} * EF_{leaks} + AD_{Natural\ gas\ production} * EF_{venting} + AD_{Natural\ gas\ production} * EF_{flaring} + AD_{gathering} * EF_{gathering}$$

Where:

Emissions _{Natural gas production}	= emissions of CH ₄ , CO ₂ , NMVOC and N ₂ O from Natural gas production activities
AD _{Natural gas production}	= activity data on exploration of conventional natural gas
EF _{leaks/venting/flaring}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from leaks, venting and flaring from natural gas production
AD _{Natural gas production}	= activity data on exploration of conventional natural gas
EF _{leaks/venting/flaring}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from gathering of natural gas

1.3.2.4.2.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The emission factors (EF) are related to throughput and presented in the unit of thousand cubic meters onshore natural gas production. Production data of natural gas were used for estimating the fugitive emissions of CH₄, CO₂, N₂O and NMVOC for all years. Volumes of flared gas from CRT category 1.B.2.b.ii

Natural gas production activities for the period 2010-2022 have been used to calculate greenhouse gas emissions from venting and flaring CRT category 1.B.2.c.ii Natural gas production.

- 1990 - 2009 are taken from the Energy balance provided by MEM and UN statistics²⁹⁹.
- 2010 - 2022 are taken from the National Energy balance prepared by MEM³⁰⁰.

1.3.2.4.2.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The following Tier 1 emission factors of the 2019 Refinement to the 2006 IPCC GL³⁰¹ were applied. According to personal communication with national stakeholders, it was assumed that each 50% of the production of natural gas was carried out with

- lower-emitting technologies and practices, and
- higher-emitting technologies and practices.

Table 1-149 TIER 1 emission factors for natural gas production and gathering, and disaggregation of TIER 1 EF

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
Onshore: Most activities occurring with <u>higher- emitting</u> technologies and practices	TIER 1 Emission factors natural gas production and gathering						
	All	4.09	1.45	0.98	0.000025	Tonnes/million cubic meters onshore gas production	Table 4.2.4A (new)
	Disaggregation of TIER 1 emission factors for natural gas production and gathering						
	Leaks	11%	4%	11%	0%	%	Table 4A.2.5 (new)
	Vents	89%	31%	89%	0%		
	Flares	0%	65%	0%	100%		
	Disaggregated TIER 1 emission factors for natural gas production and gathering						
	Leaks	0.45	0.06	0.11	NA	Tonnes/million cubic meters onshore gas production	Calculated
	Vents	3.6401	0.4495	0.8722	NA		
	Flares	NA	0.9425	NA	0.000025		
Onshore: Most activities occurring with <u>lower-emitting</u> technologies and practices	TIER 1 Emission factors for gas production and gathering						
	All	2.54	3.60	0.61	0.000061	Tonnes/million cubic meters onshore gas production	Table 4.2.4G (new)
	Disaggregation of TIER 1 emission factors for gas production and gathering						
	Leaks	11%	4%	11%	0%	%	Table 4A.2.5 (new)
	Vents	89%	31%	89%	0%		
	Flares	0%	65%	0%	100%		
	Disaggregated TIER 1 emission factors for gas production and gathering						
	Leaks	0.28	0.14	0.07	NA	Tonnes/million cubic meters onshore gas production	Calculated
	Vents	2.26	1.12	0.54	NA		
	Flares	NA	2.34	NA	0.000061		

²⁹⁹ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

³⁰⁰ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

³⁰¹ Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor.

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Sub-segment	Emission source	CH ₄	CO ₂	NM VOC	N ₂ O	Units	Source
Gathering	TIER 1 Emission factors for gathering activities						
	All	3.20	0.35	0.77	0.000006	Tonnes/million cubic meters onshore gas production	Table 4.2.4G (new)
	TIER 1 emission factors for venting and flaring gas production and gathering						
	venting and flaring	0.012	2.0	-	0.000023	Tons/thousand cubic meters onshore oil production	Calculated
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor and Annex 4A.2 Disaggregation of Tier 1 factors presented in Section 4.2.2.3 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor TABLE 4.2.4 (CONTINUED) tier 1 emission factors for fugitive emissions (including venting and flaring) from oil and gas operations in developed countries a,b							

1.3.2.4.2.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.b.ii Natural gas production and gathering are presented in the following table.

Table 1-150 Uncertainty for CRT category 1.B.2.b.ii Natural Gas production and gathering.

Uncertainty	Oil exploration				Reference
	CO ₂	CH ₄	NM VOC	N ₂ O	
Activity data (AD)	10%	10%	10%	10%	2006 IPCC GL. vol. 2 Chapter 4.2
Emission factor (EF)	28%	28%	261%	1000%	Table 4.2.4G (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	30%	30%	261%	1000%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

1.3.2.4.2.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,
 - use of units,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI, OPEC
- cross-checked with 2006 IPCC default values
- time series consistency - plausibility checks of dips and jumps.

1.3.2.4.2.5 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective developments presented in the following table will be explored.

Table 1-151 Planned improvements for CRT category 1.B.2.b.ii Natural Gas production and gathering

GHG source & sink category	Planned improvement	Type of improvement		Priority
1.B.2.b.ii	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of site specific data: production of natural gas (including LNG).	AD	Completeness Consistency Transparency	high
1.B.2.b.ii	Application of Tier 2 method	M	Accuracy Comparability	medium
1.B.2.b.ii	Preparation of data set related to active well population	AD	Transparency Accuracy	medium

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.b.ii	Investigation on share of activities occurring with lower-emitting or higher-emitting technologies and practices.				AD	Accuracy Transparency	high
1.B.2.b.ii	Use of activity data from installation: amount of gas vented and flared.				AD	Accuracy	medium
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.4.3 Fugitive emissions from Natural gas processing (CRT category 1.B.2.b.iii)

Folder	\06_Inventory\2024_submission\01_Energy\1B		
File	1B2_Fugitive_emissions_DZA.xlsx		
Sheet	1.B.2.b.iii GasProcessing_2019R		
NID CHAPTER	3.3.2.4.3 Fugitive emissions from Natural gas processing (CRT category 1.B.2.b.iii)		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	Gas Processing_T	
		AD	emissions
	Table	Column A-G	Column H--AF
	Graph	Row 175	Row 175 / 177
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

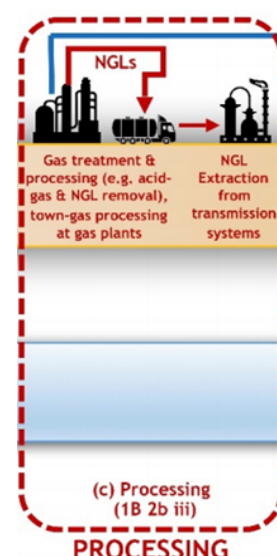
1.3.2.4.3.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL³⁰² the segment Natural gas processing includes fugitive emissions from gas processing facilities, including equipment leaks venting and flaring. It must be important to clarify that for the CRT category 1.B.2.b.iii, the 2006 IPCC GL were used to estimate GHG emissions from venting and flaring.

During natural gas processing natural gas liquids (NGLs) and various other constituents from the raw gas are removed resulting in “pipeline quality” gas which is injected into the transmission system.

Fugitive emission sources include:

- compressors.
- equipment leaks.
- pneumatic controllers.
- uncombusted gas from engines and flaring and
- CO₂ from flaring and sour gas removal.



³⁰² 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.68

Fugitive emissions from equipment leaks are not estimated but it planned to completeness. Under this category, emissions from only natural gas liquification are estimated.

The following table provides an overview of occurring technological segment in Algeria.

Table 1-152 Technological segment of Natural gas processing occurring in Algeria.

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
• Without LDAR or with limited LDAR or less than 50% of centrifugal compressors have dry seals.	x			
• Extensive LDAR and around 50% or more of centrifugal compressors have dry seals.	x			
• Sour gas (acid gas removal).				

1.3.2.4.3.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.iii

1.3.2.4.3.2.1 Choice of method

For estimating fugitive emissions of CH₄, CO₂, N₂O and NMVOC from Natural gas processing activities, Tier 1 method according to 2006 IPCC GL³⁰³ has been applied. Fugitive emissions include emissions from venting and Flaring.

Equation 4.2.14 (new) General equation for estimating fugitive emissions from gas processing
(2006 IPCC GL. Vol. 2. Chap. 4)

$$Emissions_{Natural\ gas\ processing} = AD_{Natural\ gas\ processing} * EF_{All} + AD_{Sour\ gas\ processed} * EF_{Sour\ gas\ processed}$$

Where:

Emissions _{Natural gas processing}	= emissions of CH ₄ , CO ₂ , NMVOC and N ₂ O from Natural gas processing activities
AD _{Natural gas processing}	= activity data on volume of natural gas processed or produced
EF _{All}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from All (sum of leaks, venting and flaring) from Natural gas processing
AD _{Natural gas processing}	= activity data on volume of sour gas processed
EF _{leaks/venting/flaring}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from sour gas processing

1.3.2.4.3.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx

³⁰³ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2 Methodological issues - Choice of method. Page 4.72

The emission factors (EF) are related to throughput and presented in the unit of thousand cubic meters onshore natural gas production. Production data of natural gas were used for estimating fugitive emissions of NMVOC for the all years. Volumes of flared gas from CRT category 1.B.2.b.ii Natural gas production activities for the period 1990-2022 were used for estimating the fugitive emissions of CH₄, CO₂ and N₂O from venting and flaring CRT category 1.B.2.c.iii Natural gas processing.

- 1990 - 2022 are taken from the Energy balance provided by UN statistics³⁰⁴ for and from Algeria.
- 2010 - 2022 are taken from the National Energy balance prepared by MEM³⁰⁵.

It is necessary to clarify that Activity data used to estimate emissions of venting and flaring from natural gas processing were provided by the MEM for the period between 2010-2022.

For the period 1990 – 2009, missing data of venting and flaring volumes have been completed by using a ratio of flaring and venting volumes to gas production of the times series 2010-2022 applied to the period 1990 -2009 to generate flaring and venting volumes based on annual natural gas production.

The data are provided in Chapter 1.3.2.4.1 and, respectively, **Error! Reference source not found.** above.

1.3.2.4.3.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The following Tier 1 emission factors of the 2019 Refinement to the 2006 IPCC GL³⁰⁶ were applied. According to personal communication with national oil and gas stakeholders in Algeria, it was assumed that each 50% of the production of natural gas was carried out

- without LDAR³⁰⁷, or with limited LDAR, or less than 50% of centrifugal compressors have dry seals.
- with extensive LDAR, and around 50% or more of centrifugal compressors have dry seals.

Table 1-153 TIER 1 emission factors for Natural gas processing

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
Without LDAR, or with limited LDAR, or less 50% of centrifugal compressors have dry seals	TIER 1 Emission factors natural gas production and gathering						
	All	1.65	0.11	0.13	0.0000012	Tonnes/million cubic meters gas produced	Table 4.2.6H (new)
	Disaggregation of TIER 1 emission factors for natural gas production and gathering						
	Leaks	4%	0%	4%	0%	%	Table 4A.2.6 (new)
	Vents	91%	1%	91%	0%		
	Flares	5%	99%	5%	100%		
	Disaggregated TIER 1 emission factors for natural gas production and gathering						

³⁰⁴ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

³⁰⁵ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

³⁰⁶ Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor.

³⁰⁷ LDAR - leak detection and repair practices

QA/QC Plan

Sub-segment	Emission source	CH ₄	CO ₂	NMVOC	N ₂ O	Units	Source
	Leaks	0.066	NA	0.0052	NA	Tonnes/million cubic meters gas produced	Calculated
	Vents	1.5015	0.0011	0.1183	NA		
	Flares	0.0825	0.1089	0.0065	0.0000012		
Extensive LDAR, and around 50% or more of centrifugal compressors have dry seals	TIER 1 Emission factors for gas production and gathering						
	All	0.57	7.21	0.05	0.000079	Tonnes/million cubic meters gas produced	Table 4.2.6 H (new)
	Disaggregation of TIER 1 emission factors for gas production and gathering						
	Leaks	5%	0%	5%	0%	%	Table 4A.2.6 (new)
	Vents	95%	1%	95%	0%		
	Flares	0%	99%	0%	100%		
	Disaggregated TIER 1 emission factors for gas production and gathering						
	Leaks	0.0285	NA	0.0025	NA	Tonnes/million cubic meters gas produced	Calculated
	Vents	0.5415	0.0721	0.0475	NA		
	Flares	0.0285	7.1379	NA	0.000079		
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor and Annex 4A.2 Disaggregation of Tier 1 factors presented in Section 4.2.2.3							
2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor TABLE 4.2.4(CONTINUED) tier 1 emission factors for fugitive emissions (including venting and flaring) from oil and gas operations in developed countries a,b							

1.3.2.4.3.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.b.iii Natural gas processing are presented in the following table.

Table 1-154 Uncertainty for CRT category 1.B.2.b.iii Natural gas processing.

Uncertainty	Oil exploration	Reference
-------------	-----------------	-----------

QA/QC Plan

	CO ₂	CH ₄	NM VOC	N ₂ O	
Activity data (AD)	10%	10%	10%	10%	2006 IPCC GL. Vol. 2. Chapter 4.2
Emission factor (EF)	14%	14%	261%	1000%	Table 4.2.4H (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	17%	17%	261%	1000%	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

1.3.2.4.3.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,
 - use of units,
 - strictly defined interfaces between spreadsheets/calculation modules,
 - record keeping, use of write protection,
 - unique use of formulas, special cases are documented/highlighted,
 - quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI, OPEC
- cross-checked with 2006 IPCC default values
- time series consistency - plausibility checks of dips and jumps.

1.3.2.4.3.5 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-155 Planned improvements for CRT category 1.B.2.b.iii Natural gas processing

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.b.iii	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of site-specific data: production and processing of natural gas (including LNG)				AD	Completeness Consistency Transparency	high
1.B.2.b.iii	Application of Tier 2 method				M	Accuracy Comparability	medium
1.B.2.b.iii	Data collection to estimate - Fugitives emissions from equipment leaks - Fugitives emissions (leaks, venting and flaring) from natural gas processing				AD	Completeness	high
1.B.2.b.iii	Preparation of data set related to applied technology for natural gas processing				AD	Transparency	medium
1.B.2.b.iii	Estimation of fugitive emissions from sour gas processing Preparation of data set related to sour gas processing				AD	Completeness	high
1.B.2.b.iii	Investigation on share of - most activities occurring with higher-emitting technologies and practices - most activities occurring with lower-emitting technologies and practices				AD	Accuracy Transparency	high
1.B.2.b.iii	Use of activity data from installation: amount of gas vented and flared				AD	Accuracy	medium
Note	AD	Activity data	EF	Emission factor	M	Method	

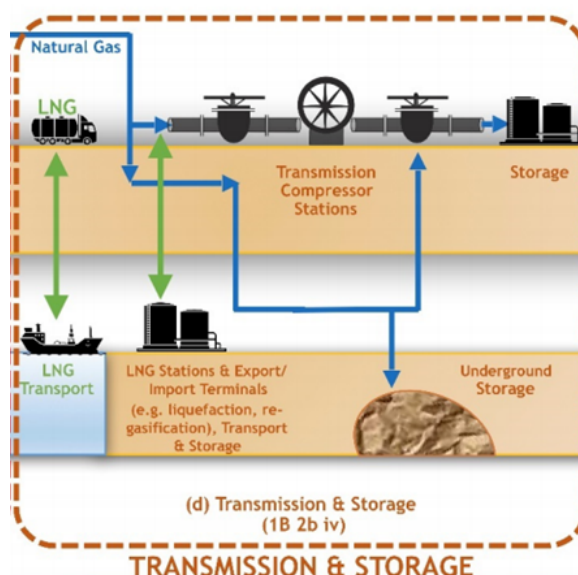
1.3.2.4.4 Fugitive emissions from Natural gas Transmission and Storage (CRT category 1.B.2.b.iv)

Folder	\06_Inventory\2024_submission\01_Energy\1B		
File	1B2_Fugitive_emissions_DZA.xlsx		
Sheet	1.B.2.b.iv Gas TransStor_2019R		
ToDo	Check for updated reasons for trend in sectoral chapter		
	Update GHG emissions and AD in tables & graphs		
	from sheet	Gas TransStor_T	
	AD		emissions
	Table	Column A-G	Column H--AB
	Graph	Row 175	Row 175 / 177
	Check for updated reasons for trend in chapter		
	- Trend -> 2.2.1 Energy - Executive Summary		

1.3.2.4.4.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL³⁰⁸ the segment Natural gas Transmission and Storage includes fugitive emissions from systems used to transport processed natural gas to market (i.e., to industrial consumers and natural gas distribution systems), including natural gas storage systems.

- Natural gas transmission involves high pressure, large diameter pipelines that transport gas long distances from field production and processing areas to distribution systems or large volume customers such as power plants or chemical plants.
- Compressor station facilities are used to move the gas throughout the transmission system.



This source also includes Liquefied Natural Gas (LNG) stations and import and export terminals.

The following table provides an overview of occurring activities in Algeria.

Table 1-156 Activities of segment Natural gas Transmission and Storage occurring in Algeria

			Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
•	Transmission:	Limited LDAR or less than 50% of centrifugal compressors have dry seals	x			
•	Transmission:	Extensive LDAR, and around 50% or more of centrifugal compressors have dry seals	x			
•	Storage:	Limited LDAR or most activities occurring with higher- emitting technologies and practices	x			
•	Storage:	Storage: Extensive LDAR and lower-emitting technologies and practices	x			
•	LNG: Import/Export		x			
•	LNG: Storage		x			

1.3.2.4.4.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.iv

³⁰⁸ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.74

1.3.2.4.4.2.1 Choice of method

For estimating fugitive emissions of CH₄, CO₂, N₂O and NMVOC from Natural gas Transmission and Storage activities, the Tier 1 method according to 2019 Refinements to 2006 IPCC GL³⁰⁹ has been applied. Fugitive emissions include emissions from venting, flaring, and leaks.

Equation 4.2.16 (new) General equation for estimating fugitive emissions from
Natural gas transmission and storage
(2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$\begin{aligned}
 Emissions_{Transmission\ and\ storage} = & AD_Natural_gas_{Transmission} * EF_{All_transmission_Natural_gas} \\
 & + AD_Natural_gas_{Storage} * EF_{All_storage_Natural_gas} \\
 & + AD_LNG_{Import/export} * EF_{All_Import/export_LNG} \\
 & + AD_LNG_{Storage} * EF_{All_storage_LNG}
 \end{aligned}$$

Where:

Emissions _{Transmission and Storage}	= emissions of CH ₄ , CO ₂ , NMVOC and N ₂ O from Natural gas Transmission and Storage activities
AD_Natural gas _{Transmission}	= activity data on volume of natural gas consumed or length of transmission pipeline
EF _{All_transmission_Natural_gas}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from All (sum of leaks, venting and flaring) of Natural gas transmitted
AD_Natural gas _{Storage}	= activity data on volume of natural gas consumed
EF _{All_storage_Natural_gas}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from All (sum of leaks, venting and flaring) for Natural gas consumed
AD_LNG _{Import/export}	= activity data on number of export/import LNG stations
EF _{All_import/export_LNG}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for for LNG imports and exports
AD_LNG _{storage}	= activity data on number of LNG stations
EF _{All_storage_LNG}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for for LNG storage

1.3.2.4.4.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The emission factors (EF) is related to throughput and presented in the unit of thousand cubic meters natural gas transmission and storage. Consumption data of natural gas were used for estimating the fugitive emissions of CH₄, CO₂, N₂O and NMVOC for the years.

- 1990 - 2022 are taken from the Energy balance provided by UN statistics³¹⁰ for and from Algeria
- 2010 – 2022 are taken from the National Energy balance provided by MEM³¹¹.

³⁰⁹ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2 Methodological issues - Choice of method. Page 4.76

³¹⁰ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

³¹¹ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

The data are provided in Chapter 1.3.2.4.1 and **Error! Reference source not found..** respectively, and **Error! Reference source not found.** above.

The number of LNG stations were provided by SONATRACH³¹²

Table 1-157 Number of LNG stations

	1990 - 1995	1995 - 2003	2004 - 2008	2009 - 2013	2014 - 2022
LNG stations	2	3	4	5	6

1.3.2.4.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The following Tier 1 emission factors of the 2019 Refinement to the 2006 IPCC GL³¹³ were applied. According to personal communication with national stakeholders, it was assumed that each 50% of the production of natural gas was carried out

- without LDAR³¹⁴, or with limited LDAR, or less than 50% of centrifugal compressors have dry seals
- with extensive LDAR, and around 50% or more of centrifugal compressors have dry seals.

Table 1-158 TIER 1 emission factors for Natural gas Transmission and Storage

Sub-segment	Emission source	CH ₄	CO ₂	NM VOC	N ₂ O	Units	Source
Transmission	TIER 1 Emission factors for Natural gas Transmission						
Limited LDAR or less than 50% of centrifugal compressors have dry seals	All	3.36	0.23	0.05	NA	Tonnes/ million cubic meter gas consumption	Table 4.2.4I (new)
Extensive LDAR. and around 50% or more of centrifugal compressors have dry seals	All	1.29	0.15	0.02	NA	Tonnes/ million cubic meter gas consumption	
Storage	TIER 1 Emission factors for Storage						
Limited LDAR or most activities occurring with higher- emitting technologies and practices	All	0.67	0.06	0.0094	NA	Tonnes/ million cubic meter gas consumption	Table 4.2.4I (new)
Extensive LDAR and lower-emitting technologies and practices	All	0.67	0.06	0.0094	NA	Tonnes/ million cubic meter gas consumption	
LNG	TIER 1 Emission factors for LNG import/export and storage						
Import/Export	All	1.600	14.687	NA	NA	Tonnes/ station	Table 4.2.4I (new)
Storage	All	22	277	NA	NA	Tonnes/ station	

³¹²

³¹³ Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor.

³¹⁴ LDAR - leak detection and repair practices

Sub-segment	Emission source	CH ₄	CO ₂	NM VOC	N ₂ O	Units	Source
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor							

1.3.2.4.4.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.b.iv Natural gas Transmission and Storage are presented in the following table.

Table 1-159 Uncertainty for CRT category 1.B.2.b.iv Natural gas Transmission and Storage.

Uncertainty	Natural gas Transmission and Storage				Reference
	CO ₂	CH ₄	NM VOC	N ₂ O	
Activity data (AD)	10%	10%	10%	10%	2006 IPCC GL. Vol. 2. Chapter 4.2
Emission factor (EF)	36%	36%	269%	NA	Table 4.2.4I (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	37%	37%	269%	NA	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

1.3.2.4.4.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets
 - consistent use of energy balance data,
 - documented sources,

- use of units,
- strictly defined interfaces between spreadsheets/calculation modules,
- record keeping, use of write protection,
- unique use of formulas, special cases are documented/highlighted,
- quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI, OPEC
- cross-checked with 2006 IPCC default values
- time series consistency - plausibility checks of dips and jumps.

1.3.2.4.4.5 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter ● Sectoral chapter ● 10.4.2. Planned improvements for CRT sector 1 Energy ● 10.4.2. Planned improvements for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-160 Planned improvements for CRT category 1.B.2.b.iv Natural gas Transmission and Storage

GHG source & sink category	Planned improvement			Type of improvement		Priority
1.B.2.b.iv	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of site specific data: production and Transmission and Storage of natural gas (including LNG)			AD	Completeness Consistency Transparency	high
1.B.2.b.iv	Application of Tier 2 method			M	Accuracy Comparability	medium
1.B.2.b.iv	Preparation of data set related to pipeline length which are in operation			AD	Transparency	high
1.B.2.b.iv	Preparation of data set related to applied equipment and technology for natural gas transmission and storage			AD	Transparency	medium
1.B.2.b.iv	Investigation for transmission and storage on share of ● most activities occurring with higher-emitting technologies and practices. ● most activities occurring with lower-emitting technologies and practices.			AD	Accuracy Transparency	high
Note	AD	Activity data	EF	Emission factor	M	Method

1.3.2.4.5 Fugitive emissions from Natural gas distribution (CRT category 1.B.2.b.v)

Folder	\06_Inventory\2024_submission\01_Energy\1B	
File	1B2_Fugitive_emissions_DZA.xlsx	
Sheet	1.B.2.b.v Gas_Distributi_2019R	
NID CHAPTER	3.3.2.4.5 Fugitive emissions from Natural gas distribution (CRT category 1.B.2.b.v)	
ToDo	Check for updated reasons for trend in sectoral chapter	
	Update GHG emissions and AD in tables & graphs	
	from sheet	Gas_Distribution_T
	AD	emissions
	Table	Column C-K
	Graph	Row 175
	Row 175 / 177	
	Check for updated reasons for trend in chapter	
	- Trend -> 2.2.1 Energy - Executive Summary	

1.3.2.4.5.1 Category description

According to the 2019 IPCC Refinements to the 2006 IPCC GL³¹⁵ the segment Natural gas distribution includes fugitive emissions from the distribution of natural gas. Distribution pipelines take the high-pressure gas from the transmission system at “city gate” stations, reduce the pressure and distribute the gas through primarily underground mains and service lines to individual end users.

- Emission sources include leaks from pipelines, metering and regulating stations, meters and short-term surface storage.

The following table provides an overview of occurring activities in Algeria.

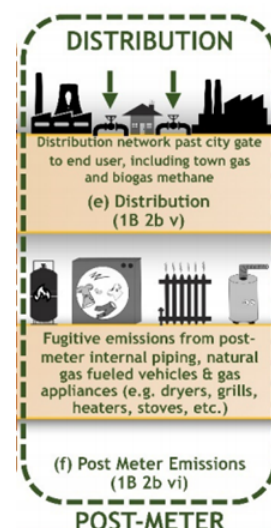


Table 1-161 Activities of segment Natural gas distribution occurring in Algeria

		Estimated	Occurring		Not occurring (NO)
			Included elsewhere (IE)	Not estimated (NE)	
•	Gas Distribution: Less than 50% plastic pipelines or limited or no leak detection and repair programs.	x			
•	Gas Distribution: Greater than 50% plastic pipelines and leak detection and repair programs are in use.	x			
•	Short term surface storage.			x	
•	Town gas distribution.			x	

³¹⁵ 2019 Refinement to the 2006 IPCC Guidelines, Chapter 4.2.2.3 Choice of emission factor, page 4.74

1.3.2.4.5.2 Methodological issues

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Method_1.B.2.a.v

1.3.2.4.5.2.1 Choice of method

For estimating fugitive emissions of CH₄, CO₂, N₂O and NMVOC from Natural gas distribution activities the Tier 1 method according to 2019 Refinements to 2006 IPCC GL³¹⁶ has been applied. Fugitive emissions include emissions from venting, flaring, and leaks.

Equation 4.2.17 (new) General equation for estimating fugitive emissions from Natural gas distribution (2019 Refinement to 2006 IPCC GL. Vol. 2. Chap. 4)

$$\begin{aligned}
 Emissions_{distribution} = & AD_{gas\ distribution} * EF_{gas\ distribution} \\
 & + AD_{surface\ storage} * EF_{surface\ storage} \\
 & + AD_{distribution\ of\ town\ gas} * EF_{distribution\ of\ town\ gas}
 \end{aligned}$$

Where:

Emissions _{Transmission and Storage}	= emissions of CH ₄ , CO ₂ , NMVOC and N ₂ O due to all relevant natural gas distribution activities
AD _{gas distribution}	= activity data on volume of natural gas consumed or length of distribution pipeline
EF _{gas distribution}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for fugitive emissions from gas distribution
AD _{Surface storage}	= activity data on volume of natural gas stored (in surface storage) or consumed
EF _{surface storage}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for surface storage
AD _{distribution of town gas}	= activity data on length of town gas distribution pipeline
EF _{distribution of town gas}	= default emission factor of CH ₄ , CO ₂ , NMVOC and N ₂ O for town gas distribution

1.3.2.4.5.2.2 Choice of Activity data (AD)

Folder	\06_Inventory\2024_submission\01_Energy\EnergyBalance
File	BilansEnergetique_1990-2022.xlsx
based on	Base de données pour le BTR1_Sonalgaz-Sonatrach.xlsx UNSD_DF_UNDATA_ENERGY_1990-2022.xlsx BEN 2021 & 2022.xlsx

The emission factors (EF) are related to throughput and presented in the unit of thousand cubic meters natural gas distribution. Consumption data of natural gas were used for estimating the fugitive emissions of CH₄, CO₂, N₂O and NMVOC for the years

- 1990 - 2009 are taken from the Energy balance provided by UN statistics³¹⁷ for and from Algeria,
- 2010 - 2022 are taken from the National Energy balance prepared by MEM³¹⁸.

³¹⁶ Source: 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2 Methodological issues - Choice of method. Page 4.76

³¹⁷ United Nations - Statistics Division - Energy Statistics: <https://unstats.un.org/unsd/energystats/> ; <https://unstats.un.org/unsd/energystats/data/>

³¹⁸ Ministère de l'Énergie et des Mines (MEM): Bilan Énergétique National - several years
<https://www.energy.gov.dz/?article=bilan-energetique-national-du-secteur>

The production data in energy statistics are provided in the physical units 10^6 m^3 . To convert these data to energy unit, country specific NCV was used which is presented in the following table.

Table 1-162 Country specific Density and NCV for selected fuels and default data for comparison

Fuel	Country specific (CS) Density	Country specific (CS) NCV	For comparison	
	kt / 10^6 m^3	TJ/kt	Average Density kt / 10^6 m^3	IPCC default NCV TJ/kt
Natural gas (including LNG)	-	$39.565 * 0.9 = 35.609$	-	48.0

Conversion from GCV to NCV	Default
Natural gas	1 NCV = 0.9 x GCV

Source	CS Density	MEM (2023)
	CS Gross Caloric Value (GCV)	Décision n°271 du 27 décembre 2012 fixant les unités des mesures et taux de conversion utilisés. Annex 3. ³¹⁹
	Default Net Calorific values (NCVs)	2006 IPCC Guidelines. Vol. 2. Chap. 1 (1.4.1.3). Table 1.2
	Conversion from GCV to NCV	International Recommendations for 150 Energy Statistics (IRES) (2018) ³²⁰ : Table 4 Difference between net and gross calorific values for selected fuels.

Note:			
D	Default	CS	Country specific
PS	Plant specific		

1.3.2.4.5.2.3 Choice of Emission factor (EF)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1.B.1.a.Fugitive emissions from solid fuels.xlsx
Sheet	EF_1B1

The following Tier 1 emission factors of the 2019 Refinement to the 2006 IPCC GL³²¹ were applied. According to personal communication with national stakeholders, it was assumed that each 50% of the production of natural gas was carried out

- less than 50% plastic pipelines, or limited or no leak detection and repair programs,
- greater than 50% plastic pipelines and leak detection and repair programs are in use.

Table 1-163 TIER 1 emission factors for Natural gas distribution

Sub-segment	Emission source	CH ₄	CO ₂	NM VOC	N ₂ O	Units	Source
Gas Distribution	TIER 1 Emission factors for Natural gas distribution						
Less than 50% plastic pipelines, or limited or no leak detection and repair programs.	All	2.92	0.09	0.04	NA	Tonnes/ million cubic meter gas consumption	Table 4.2.4J (new)

³¹⁹ Décision n°271 du 27 décembre 2012 fixant les unités des mesure et taux de conversion utilisés en matière des reporting et de circulation de l'information statistique dans le secteur de l'énergie et des mines.

³²⁰ <https://unstats.un.org/unsd/energystats/methodology/ires/>

³²¹ Source: 2019 Refinement to the 2006 IPCC Guidelines, Volume 2: Energy, Chapter 4: Fugitive Emissions - 4.2.2.3 Choice of emission factor.

QA/QC Plan

Sub-segment	Emission source	CH ₄	CO ₂	NM VOC	N ₂ O	Units	Source
Greater than 50% plastic pipelines, leak detection and repair programs are in use.	All	0.62	0.02	0.01	NA	Tonnes/ million cubic meter gas consumption	
Source: 2019 Refinement to the 2006 IPCC GL. Volume 2. Chapter 4.2.2.3 Choice of emission factor							

1.3.2.4.5.3 Uncertainty assessment and time-series consistency

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	EF_2019R_TABLE 4.2.4_uncertain
ToDo	Check for updated information in file EF_2019R_TABLE 4.2.4_uncertain.xlsx Are QC checks performed according to QA/QC checklist? Cross-check and/or update in file 19R_V1_IPCC_Tool_Uncertainty_Analysis_DZA-v2_230124_graph Cross-check and/or update in chapter 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals 11.2 Annex II: Uncertainty assessment

The time-series are considered to be consistent as the same methodology is applied to the whole period. Activity data are considered to be almost consistent as two data sets were used. The data set from UN statistics are official data from and for Algeria.

The uncertainties for activity data and emission factors used for CRT category 1.B.2.b.v Natural gas distribution are presented in the following table.

Table 1-164 Uncertainty for CRT category 1.B.2.b.v Natural gas distribution.

Uncertainty	Natural gas distribution				Reference
	CO ₂	CH ₄	NM VOC	N ₂ O	
Activity data (AD)	10%	10%	10%	10%	2006 IPCC GL. Vol. 2. Chapter 4.2
Emission factor (EF)	122%	122%	500%	NA	Table 4.2.4J (new); 2019 Refinement to the 2006 IPCC GL. Chapter 4.2.2.3
Combined Uncertainty (U)	122%	122%	500%	NA	$U_{total} = \sqrt{U_{AD}^2 + U_{EF}^2}$

1.3.2.4.5.4 Category-specific QA/QC and verification

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	QC CHECKLIST_all

The following source-specific QA/QC activities were performed out:

- Consistent use of definition of fuel
- Checked of calculations by spreadsheets

- consistent use of energy balance data,
- documented sources,
- use of units,
- strictly defined interfaces between spreadsheets/calculation modules,
- record keeping, use of write protection,
- unique use of formulas, special cases are documented/highlighted,
- quick-control/visual checks for data consistency through all steps of calculation.
- cross-checked from different sources: Energy statistics of MEM, national statistics of ONS, international energy statistics of UN, IEA, JODI, OPEC,
- cross-checked with 2006 IPCC default values,
- time series consistency - plausibility checks of dips and jumps.

1.3.2.4.5.5 Category-specific recalculations including explanatory information and justifications

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	Recalculation_all

The following table presents the main revisions and recalculations done since the last submission to the UNFCCC and relevant to CRT category 1.B.2.b.v Natural gas distribution.

Table 1-165 Recalculations since the last submission in CRT category 1.B.2.b.v Natural gas distribution

Source category	Revisions of data				Type of revision	Type of improvement
1.B.2.b.v	Revision of activity data due to updated energy statistics and use of data of UN statistics.				AD	Accuracy Comparability Completeness
Note	AD	Activity data	EF	Emission factor	M	Method

1.3.2.4.5.6 Category-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter ● Sectoral chapter ● 10.4.2. Planned improvements for CRT sector 1 Energy ● 10.4.2. Planned improvements for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-166 Planned improvements for CRT category 1.B.2.b.v Natural gas distribution

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.b.v	Revision of the energy balance (1990-2022): improvement of time series consistency by collection of site specific data: gas distribution of natural gas (including LNG)				AD	Completeness Consistency Transparency	high
1.B.2.b.v	Application of Tier 2 method				M	Accuracy Comparability	medium
1.B.2.b.v	Preparation of data set related to pipeline length which are in operation				AD	Transparency	high
1.B.2.b.v	Preparation of data set related to applied equipment, technology and material for natural gas distribution.				AD	Transparency	medium
1.B.2.b.v	Investigation for gas distribution on share of - less than 50% plastic pipelines or limited or no leak detection and repair programs. - greater than 50% plastic pipelines and leak detection and repair programs are in use.				AD	Accuracy Transparency	high
1.B.2.b.v	Investigation regarding short term surface storage.				AD	Accuracy Transparency	high
1.B.2.b.v	Investigation regarding town gas distribution.				AD	Accuracy Transparency	high
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.4.6 Fugitive emissions from Post-Meter (CRT category 1.B.2.b.vi)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	1.B.2.b.vi Post-Meter
NID CHAPTER	3.3.2.4.6 Fugitive emissions from Post-Meter (CRT category 1.B.2.b.vi)

According to the 2019 IPCC Refinements to the 2006 IPCC GL³²² the segment Post-Meter includes fugitive emissions beyond

- gas meters and from internal piping and the end of pipe appliances (e.g., home heating, water heating, stoves, barbecues).
- natural gas-fueled vehicles.

The following table provides an overview of occurring activities in Algeria.

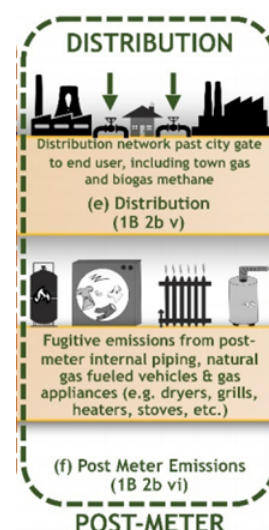


Table 1-167 Activities of segment Post-Meter occurring in Algeria

	Estimated	Occurring		Not occurring (NO)
		Included elsewhere (IE)	Not estimated (NE)	
• Natural gas-fueled vehicles.			x	
• Appliances in commercial and residential sector.			x	
• Leakage at industrial plants and power stations.			x	

This category has not been estimated due to lack of activity data and resources.

1.3.2.4.6.1 Category-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-168 Planned improvements for CRT category 1.B.2.b.vi Post-Meter

GHG source & sink category	Planned improvement	Type of improvement		Priority
		M	Completeness	
1.B.2.a.vi	Estimation of emission from Post-Meter activities -	AD	Completeness	high
1.B.2.a.vi	Collection of activity data:	AD	Completeness	high

³²² 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.2.2.3 Choice of emission factor, page 4.74

GHG source & sink category	Planned improvement				Type of improvement		Priority
	- Number of cars with LPG as fuel. - Number of appliances. - Number of Non-residential and commercial gas consumed.						
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.4.7 Fugitive emissions from Other (CRT category 1.B.2.b.vii)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	1.B.2.b.vii Other
NID CHAPTER	3.3.2.4.7 Fugitive emissions from Other (CRT category 1.B.2.b.vii)

According to the 2019 IPCC Refinements to the 2006 IPCC GL³²³ the segment Abandoned wells includes fugitive emissions from

- well blowouts and pipeline ruptures or dig-ins.
- accidents, and.
- emergency pressure releases.

The following table provides an overview of occurring activities in Algeria.

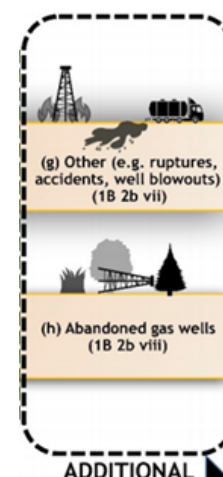


Table 1-169 Activities of segment Other (Natural Gas) occurring in Algeria

	Estimated	Occurring Included elsewhere (IE)	Not estimated (NE)	Not occurring (NO)
• well blowouts			x	
• pipeline ruptures			x	
• dig-ins			x	
• accidents			x	
• emergency pressure releases			x	

This category has not been estimated due to lack of activity data and resources.

1.3.2.4.7.1 Category-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all

³²³ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.2.2.3 Choice of emission factor, page 4.82

ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for Cross-cutting topics
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Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-170 Planned improvements for CRT category 1.B.2.a.vii Other

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.a.vi	Estimation of emission from activities listed under Other				M	Completeness	high
1.B.2.a.vi	Collection of activity data per year • well blowouts • pipeline ruptures • dig-ins • accidents, and • emergency pressure releases				AD	Completeness	high
Note	AD	Activity data	EF	Emission factor	M	Method	

1.3.2.4.8 Fugitive emissions from Abandoned Gas Wells (CRT category 1.B.2.b.viii)

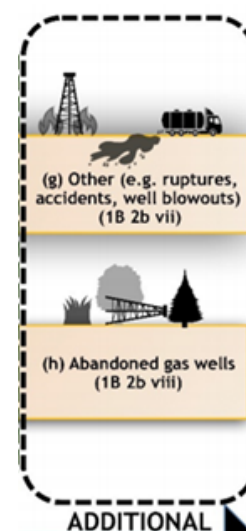
According to the 2019 IPCC Refinements to the 2006 IPCC GL³²⁴ the segment Abandoned Oil Wells includes fugitive emissions, including leaks from

- plugged or properly decommissioned wells,
- unplugged wells,
- Onshore.

The following table provides an overview of occurring activities in Algeria.

Table 1-171 Activities of segment Abandoned Gas Wells occurring in Algeria

	Occurring			Not occurring (NO)
	Estimated	Included elsewhere (IE)	Not estimated (NE)	
Onshore				
● plugged or properly decommissioned wells			x	
● unplugged wells			x	
Offshore				
● plugged or properly decommissioned wells				X
● unplugged wells				X



³²⁴ 2019 Refinement to the 2006 IPCC Guidelines, Volume 2, Chapter 4.2.2.3 Choice of emission factor, page 4.82

This category has not been estimated due to lack of activity data and resources.

1.3.2.4.8.1 Source-specific improvements

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	1B2_Fugitive_emissions_DZA.xlsx
Sheet	PlannedImprovements_all
ToDo	Check for updated planned improvements in chapter • Sectoral chapter • 10.4.2. Planned improvements for CRT sector 1 Energy • 10.4.2. Planned improvements for Cross-cutting topics

Considering the potential contribution of identified improvements in the total GHG emissions and the corresponding resources needed to make these improvements effective, developments presented in the following table will be explored.

Table 1-172 Planned improvements for CRT category 1.B.2.a.viii Abandoned oil wells

GHG source & sink category	Planned improvement				Type of improvement		Priority
1.B.2.a.vii	Estimation of emission from abandoned wells applying Tier 1 method.				M	Completeness	high
1.B.2.a.vii	Collection of activity data: counts of abandoned onshore wells in each year of the time series, including the fraction of wells that are effectively plugged.				AD	Completeness	high
Note	AD	Activity data	EF	Emission factor	M	Method	

1.4 Carbon dioxide Transport and Storage (CRT category 1.C)

Folder	\06_Inventory\2024_submission\01_Energy\1B
File	
Sheet	
NID CHAPTER	3.4 Carbon dioxide Transport and Storage (CRT category 1.C)

This section describes GHG emissions resulting from carbon dioxide transport, injection, and geological storage (CCGS) only. All these activities are not existing in Algeria.

2 References

Folder	\07_NIR\2024_NID\17_References
File	NID_Algeria_2024_references.docx 1B2_Fugitive_emissions_DZA.xlsx Information_OPEC.xlsx
NID CHAPTER	3.3.2 Oil and Natural Gas (CRT category 1.B.2)
ToDo	Check for updated references in chapter 3.3 Fugitive emissions from fuels (CRT category 1.B)

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