IPCC Inventory Software

Training of GHG Inventory National Experts to prepare first Biennial Transparency Report under ETF of the Paris Agreement:

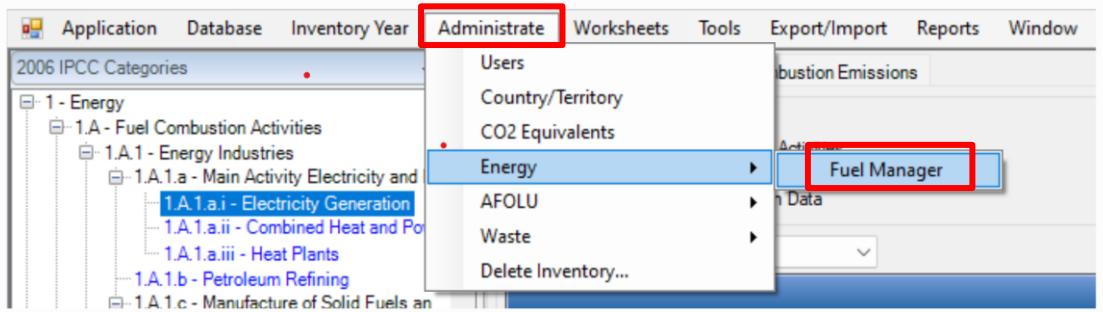
Energy Sector

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

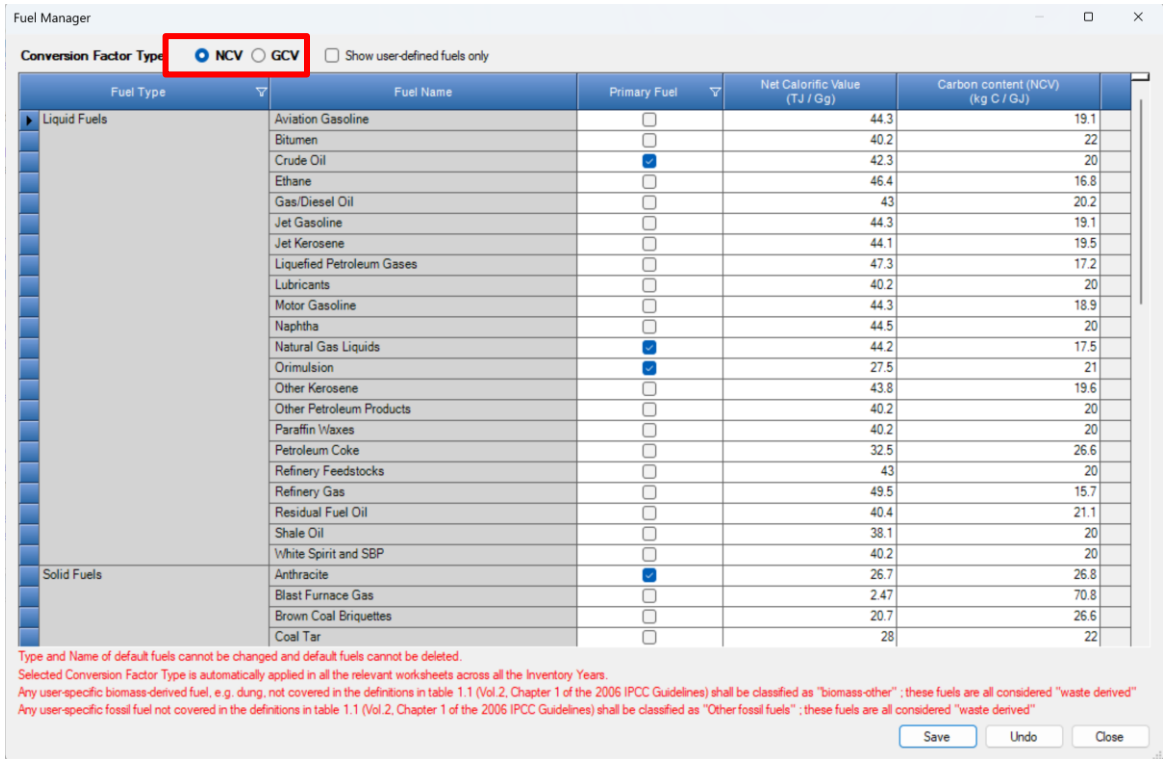
Step A: Set-up Fuel Manager

- The **Fuel Manager** contains data on carbon content and calorific value for each fuel used in the NGHGI.
- Access Fuel Manager from main ribbon – the fuel manager should be populated before you start a GHG Inventory, but you may always add additional fuels or change a parameter.



Important: Consider that if you change parameters, data in worksheets automatically linked from the **Fuel Manager** will be updated.

- On the window's top border, select either NCV (Net Calorific Value) or GCV (Gross Calorific Value) as the Conversion Factor Type. Note that:
  - For each IPCC default fuel, when NCV is selected, the Calorific Value and the Carbon Content are pre-filled with IPCC default values, which can be replaced with user-specific values.
  - For GCV no IPCC default values are available, and so those need to be entered by the user.



Fuel Type	Fuel Name	Primary Fuel	Net Calorific Value (TJ / Gg)	Carbon content (NCV) (kg C / GJ)
Liquid Fuels	Aviation Gasoline	☐	44.3	19.1
	Bitumen	☐	40.2	22
	Crude Oil	☑	42.3	20
	Ethane	☐	46.4	16.8
	Gas/Diesel Oil	☐	43	20.2
	Jet Gasoline	☐	44.3	19.1
	Jet Kerosene	☐	44.1	19.5
	Liquefied Petroleum Gases	☐	47.3	17.2
	Lubricants	☐	40.2	20
	Motor Gasoline	☐	44.3	18.9
	Naphtha	☐	44.5	20
	Natural Gas Liquids	☑	44.2	17.5
	Orimulsion	☑	27.5	21
	Other Kerosene	☐	43.8	19.6
	Other Petroleum Products	☐	40.2	20
	Paraffin Waxes	☐	40.2	20
	Petroleum Coke	☐	32.5	26.6
	Refinery Feedstocks	☐	43	20
	Refinery Gas	☐	49.5	15.7
	Residual Fuel Oil	☐	40.4	21.1
	Shale Oil	☐	38.1	20
	White Spirit and SBP	☐	40.2	20
Solid Fuels	Anthracite	☑	26.7	26.8
	Blast Furnace Gas	☐	2.47	70.8
	Brown Coal Briquettes	☐	20.7	26.6
	Coal Tar	☐	28	22

Step A: Set-up Fuel Manager

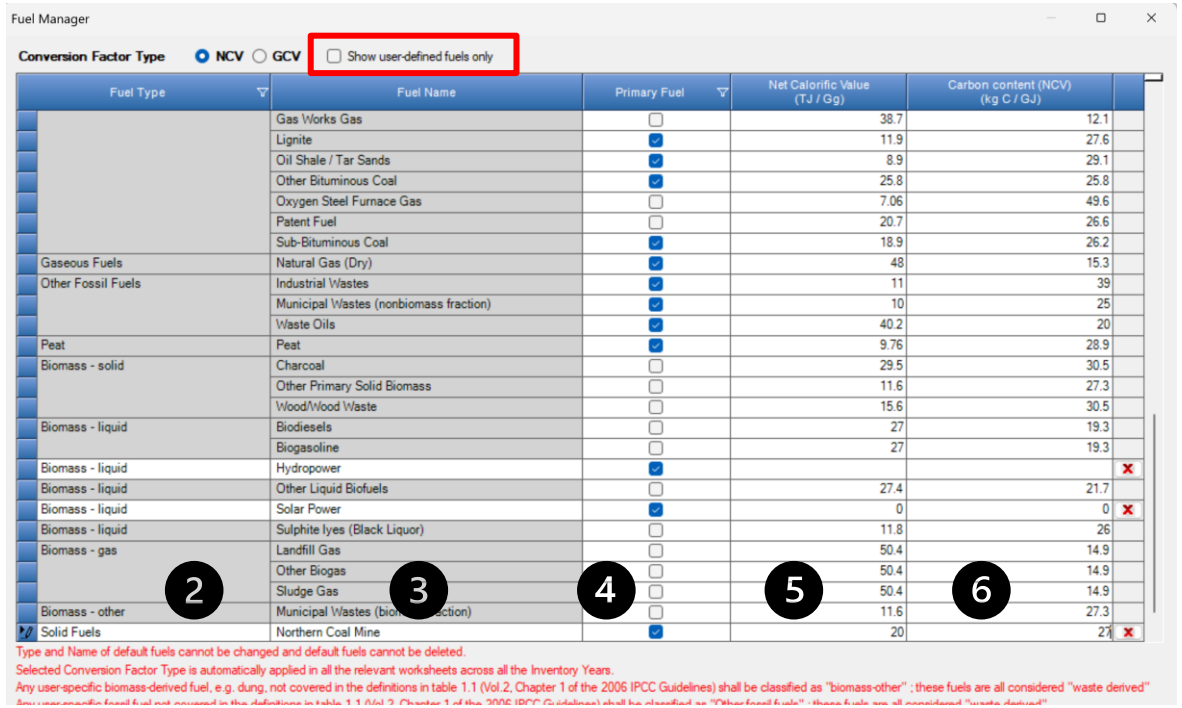
For each new (user-specific) fuel entry the following steps apply:

1. Click on the **asterisk** in the bottom-most row to add the user-specific fuel.
2. Select **fuel type** from the drop-down menu.
3. Enter specific **fuel name**.
4. Indicate (checkbox) if a **primary fuel** or not.
5. Enter its **calorific value** in TJ/Gg, (either NCV or GCV according to the selection made for entire Fuel Manager).
6. Enter **carbon content** in kg C/GJ.
7. **Save**

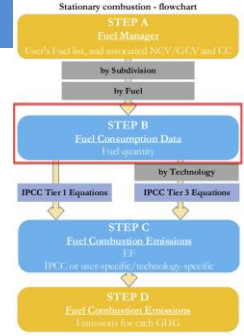
[To single out user-defined fuels only, the corresponding box on the window's top border shall be marked].

Enter the following in the Fuel Manager

New Fuel Type: Northern Coal Mine, Primary fuel, NCV=20 and CC=27



Note: If the values assigned to a user-defined fuel added to the Fuel Manager are subsequently changed, such change is propagated by the Software to each calculation worksheet where that fuel is used.



Step B: Fuel Consumption Data

Step B, users compile worksheet **Fuel Consumption Data** either with a single row of data for the entire category, with its univocal name/code entered in Column |S| [e.g. "*country name*" or "*unspecified*" as selected from the dropdown menu], or with subnational aggregations, and for each of those the univocal name/code entered in **Column |S|**

Then, for each subdivision in Column |S| data are entered in worksheet **Fuel Consumption Data** row by row as follows:

1. Column |F|: select each fuel used from the drop-down menu (one row for each fuel)
(N*ote that fuels shown in the dropdown menu are those listed in the Fuel Manager. Note that user shall select "Fuel Type" in the "Fuel Type" bar at the top, to enter data for each fuel one by one.)*

Fuel Consumption Data | Fuel Combustion Emissions

Worksheet
Sector: Energy
Category: Fuel Combustion Activities
Subcategory: 1.A.1.a.i - Electricity Generation
Sheet: Fuel Consumption Data

2022

Data
Fuel Type (All fuels)

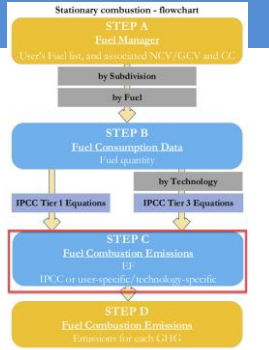
Equation 2.4

Subdivision (S)	Fuel (F)	Consumption Unit (U)	Consumption (Mass, Volume or Energy Unit) (C)	Conversion Factor (TJ/Unit) (NCV) (CF)	Total consumption (TJ) (TC = C * CF)
Northern	Municipal Wastes (nonbiomass fraction)	TJ	4,000	1	4,000
Power City 1	Charcoal	TJ	200	1	200
Power City 1	Liquefied Petroleum Gases	TJ	2,900	1	2,900
Unspecified	Anthracite	TJ	40,000	1	40,000
Unspecified	Gas/Diesel Oil	TJ	1,000	1	1,000
Unspecified	Natural Gas (Dry)	TJ	10,000	1	10,000
Unspecified	Peat	TJ	3,500	1	3,500
Total					61,600

2. Column |U|: enter unit of fuel consumption data (e.g. Gg, TJ, m^3). To enter a user-specific unit (e.g. m3) select *Gg (Manual CF)* from the dropdown menu and overwrite *Gg* with the user-specific unit.

3. Column |C|: enter amount of fuel consumed.

4. Column |CF|: enter conversion factor to convert the consumption unit to an energy unit (TJ). *Note that where Gg of fuel are converted to TJ, the NCV/GCV is sourced from the Fuel Manager and compiled by the Software as the conversion factor; while if the consumption unit is TJ the Software compiles the conversion factor cell with the value 1. Where other units are applied (e.g. m3) the user shall enter the relevant conversion factor here.*



Step C: Fuel Consumption Emissions

In Step C, the **Fuel Combustion Emissions** worksheet is prefilled by the *Software* with a number of rows corresponding to the number of subdivision/fuel combinations entered in worksheet **Fuel Consumption Data**.

Then:

1. For each row, users click the symbol "⊞" on the left of the row to open a drop-down table where EF values are to be compiled.
2. Drop-down table can be filled: either with a single row of data, this is the case for IPCC default method; or with several rows, one row for each technology type, this is the case for IPCC Tier 3 method.

- *Note that user shall select "Fuel Type" in the "Fuel Type" bar at the top, to enter data for each fuel one by one.*

Fuel Consumption Data | Fuel Combustion Emissions

Worksheet

Sector: Energy
Category: Fuel Combustion Activities
Subcategory: 1.A.1.a.i - Electricity Generation
Sheet: Fuel Combustion Emissions

2022

Data

Fuel Type (All fuels)

(All fuels)
Liquid Fuels
Solid Fuels
Gaseous Fuels
Other Fossil Fuels
Peat
Biomass - solid
Biomass - liquid
Biomass - gas
Biomass - other

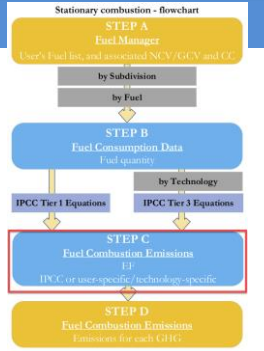
Equation 2.4

	Fuel	Total consumption (TJ)	CO2 Emissions (Gg CO2)	CH4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
	F	TC	CO2	CH4	N2O
North	Municipal Wastes (nonbiomass fraction)	4,000	0	0	0
Powe	Charcoal	200	17.4	0.02	0.0004
Powe	Liquefied Petroleum Gases	2,900	177.99	0.00145	0.000029
Unspecified	Anthracite	40,000	3,922	0.76	0.096
Unspecified	Gas/Diesel Oil	1,000	80	0.003	0.0006
Unspecified	Natural Gas (Dry)	10,000	558	0.01	0.001
Unspecified	Peat	3,500	366	0.0035	0.00525

Technology			CO2			CH4		N2O		
Type of Technology	Technology penetration (%)	Consumption (TJ)	CO2 Emission Factor (kg CO2/TJ)	Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)	CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)	
T	P	C=TC*(P/100)	EF(CO2)	Z	CO2=C*EF (CO2)/10^6-Z	EF(CH4)	CH4=C*EF (CH4)/10^6	EF(N2O)	N2O=C*EF (N2O)/10^6	
Technology 3	100	3,500	106,000	5	366	1	0.0035	1.5	0.00525	

Fuel Manager... | Time Series data entry...

1 2 3



Step C: Fuel Consumption Emissions - EFs

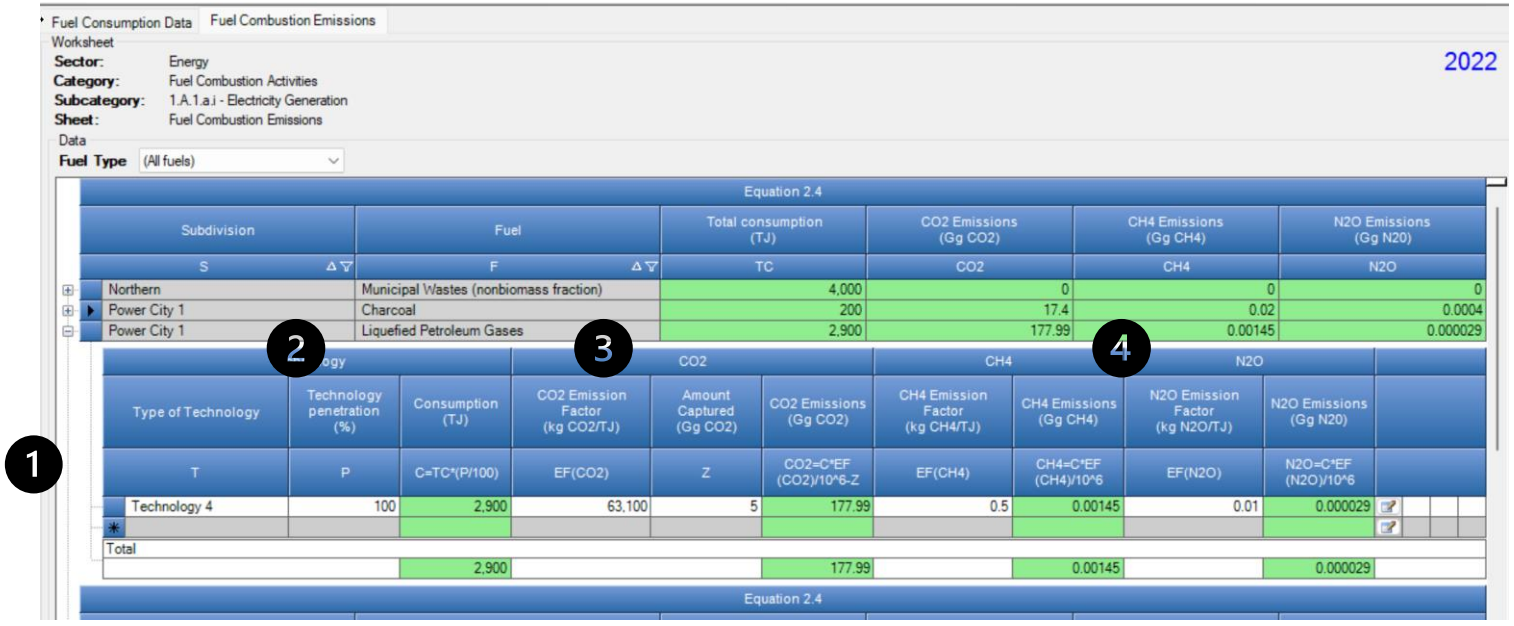
Compile each row as follows:

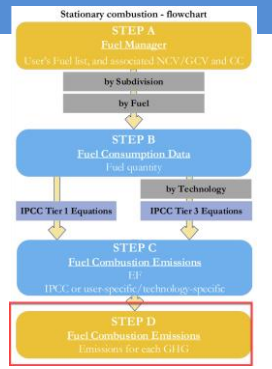
1. **Column |T|:** enter technology type. Where the IPCC default method is applied, the notation "unspecified" is selected.

2. **Column |P|:** enter technology penetration rate (%) associated with each technology type. The technology penetration rate apportions the total fuel consumed in the subdivision among technology types. Where the IPCC default method is applied, the value *100* is automatically entered by the *Software*. (*Note that for each fuel in each subdivision, summing up technology penetration rates of technologies reported shall always result in 100%)*

3. **Column |EF(CO_2)|:** select from the drop-down menu the IPCC default value or, for user-specific fuels, the value calculated by the *Software* as the carbon content multiplied by 44/12; otherwise enter the technology-type-specific value, in kg of CO_2 per TJ.

4. **Column |EF(CH_4)|** and **Column |EF(N_2O)|:** select from the drop-down menu the IPCC default value for the given fuel or enter the technology- type-specific value, in kg of CH_4 per TJ or kg of N_2O per TJ, respectively.





Step D: Fuel Combustion Emissions- Results

1. To estimate the total CO_2 emitted into the atmosphere, the amount of CO_2 produced across the process from that fuel used by that technology in that subdivision that has been **captured instead of emitted** into the atmosphere is to be entered in Gg CO_2 **in Column |Z|** of worksheet **Fuel Combustion Emissions**.

Note that Column |Z | is accessed in worksheet **Fuel Combustion Emissions** *by clicking the symbol "⊞" on the left of the row (a drop-down table opens and Column |Z| becomes visible*

2. Then, for each GHG, emissions from each source are calculated by the *Software*, in mass unit (Gg). Total emissions from each source of stationary combustion is the sum of all emissions from combustion of all fuels listed in all subdivisions.

Fuel Consumption Data | Fuel Combustion Emissions

Worksheet
Sector: Energy
Category: Fuel Combustion Activities
Subcategory: 1.A.1.a.i - Electricity Generation
Sheet: Fuel Combustion Emissions

2022

Data
Fuel Type (All fuels)

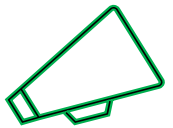
Equation 2.4

Subdivision	Fuel	Total consumption (TJ)	CO2 Emissions (Gg CO2)	CH4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
S	F	TC	CO2	CH4	N2O
Northern	Municipal Wastes (nonbiomass fraction)	4,000	383.48	0.132	0.0176

Technology			CO2			CH4		N2O	
Type of Technology	Technology penetration (%)	Consumption (TJ)	CO2 Emission Factor (kg CO2/TJ)	Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)	CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)
T	P	C=TC*(P/100)	EF(CO2)	Z	CO2=C*EF (CO2)/10^6-Z	EF(CH4)	CH4=C*EF (CH4)/10^6	EF(N2O)	N2O=C*EF (N2O)/10^6
Technology 1	60	2,400	91,700	10	210.08	30	0.072	4	0.0096
Technology 2	50	2,000	91,700	10	173.4	30	0.06	4	0.008
Total		4,400			383.48		0.132		0.0176

1

2



Do you notice the error in the image?

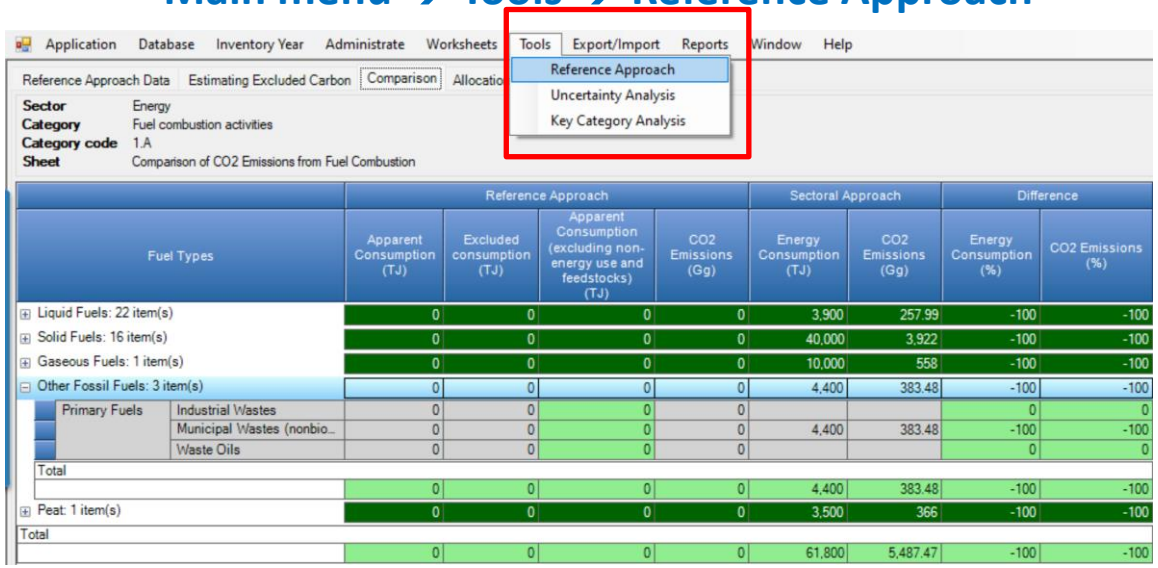
The *Software* has alerted you that the technology penetration rates are greater than 100%.

Comparing Sectoral and Reference Approaches

- You have just estimated GHG emissions from electricity generation – this estimation methodology is based on sectoral consumption, and part of the **Sectoral Approach.**

- **The Reference Approach** is designed to calculate CO_2 emissions from fuel combustion, starting from high-level energy supply data. This approach does not distinguish between different source categories within the energy sector and only estimates total emissions from source category 1.A Fuel Combustion.

Main menu → Tools → Reference Approach

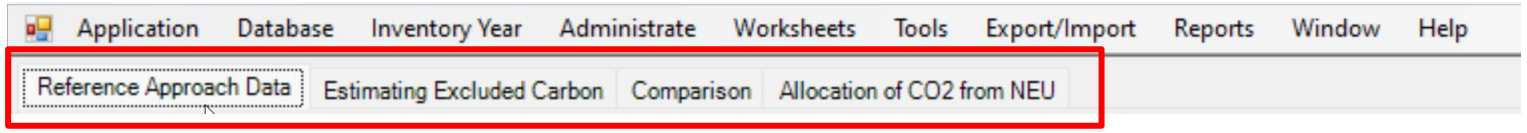


Fuel Types		Reference Approach: Apparent Consumption (TJ)	Reference Approach: Excluded consumption (TJ)	Reference Approach: Apparent Consumption (excluding non-energy use and feedstocks) (TJ)	Reference Approach: CO2 Emissions (Gg)	Sectoral Approach: Energy Consumption (TJ)	Sectoral Approach: CO2 Emissions (Gg)	Difference: Energy Consumption (%)	Difference: CO2 Emissions (%)
Liquid Fuels: 22 item(s)		0	0	0	0	3,900	257.99	-100	-100
Solid Fuels: 16 item(s)		0	0	0	0	40,000	3,922	-100	-100
Gaseous Fuels: 1 item(s)		0	0	0	0	10,000	558	-100	-100
Other Fossil Fuels: 3 item(s)		0	0	0	0	4,400	383.48	-100	-100
Primary Fuels	Industrial Wastes	0	0	0	0			0	0
	Municipal Wastes (nonbio...	0	0	0	0	4,400	383.48	-100	-100
	Waste Oils	0	0	0	0			0	0
Total		0	0	0	0	4,400	383.48	-100	-100
Peat: 1 item(s)		0	0	0	0	3,500	366	-100	-100
Total		0	0	0	0	61,800	5,487.47	-100	-100

- The *Software* can calculate the Reference Approach and make a comparison between emissions estimated using the Reference and Sectoral Approaches.

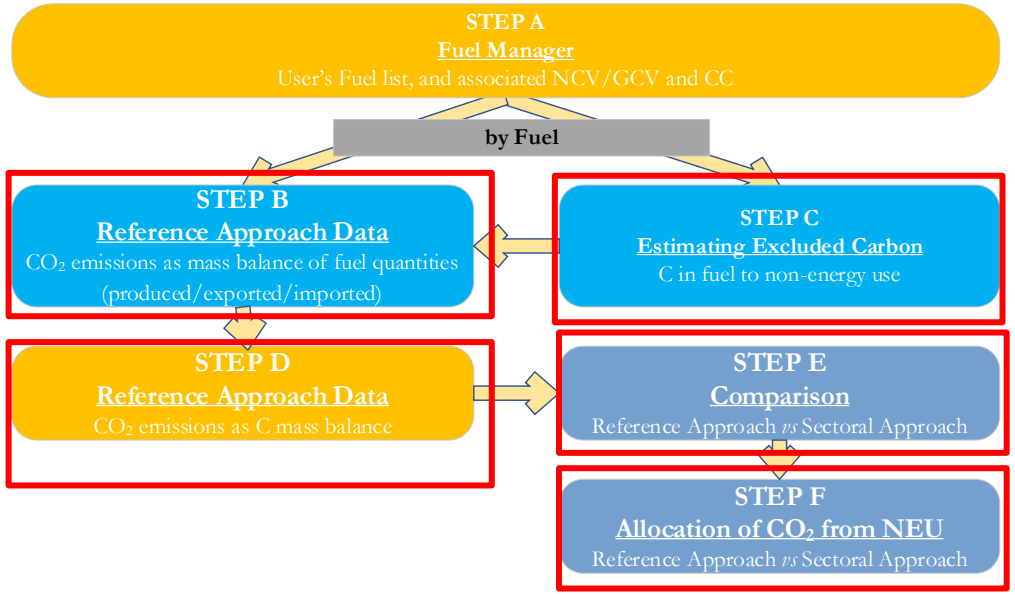
- In the **Comparison tab** of the Reference Approach menu, the energy consumption and emissions from the data entered for electricity generation (under Sectoral Approach).

Comparing Sectoral and Reference Approaches

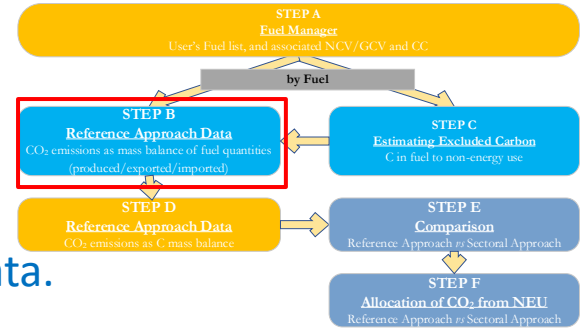


The *Software* calculates CO_2 emissions from fuel combustion categories for the top-down reference approach using the following worksheets:

- **Fuel Manager**: information on *carbon content* and *calorific value*
- **Reference Approach Data**: for each fuel type calculates apparent consumption; uses data *calorific value* and *carbon content* (filled in automatically from the **Fuel Manager**), the excluded carbon, and the fraction oxidized. From this information the worksheet calculates actual CO_2 emissions.
- **Estimating Excluded Carbon**: contains for specific fuels the amount of the total estimated quantity of carbon which does not lead to fuel combustion emissions, calculates the amount of carbon that shall be excluded from the emissions.
- **Comparison**: Compares summary information on total estimated AD and CO_2 emissions from the Reference and Sectoral approaches.
- **Allocation of CO_2 from NEU** summarizes the total CO_2 excluded from the reference approach, by fuel. This worksheet allows for reporting the CO_2 emissions from NEU reported elsewhere in the NGHGI, identifying in which category they are reported.



Step B. Reference Approach Data



We have already explored the Fuel Manager, so here we start with Step B. Reference Approach Data.
For each fuel, enter the following information:

1. **Column |Unit|:** select or enter manually the measurement unit used (e.g. Gg, TJ, m^3). (*see "+" sign to expand to the full fuel list)*

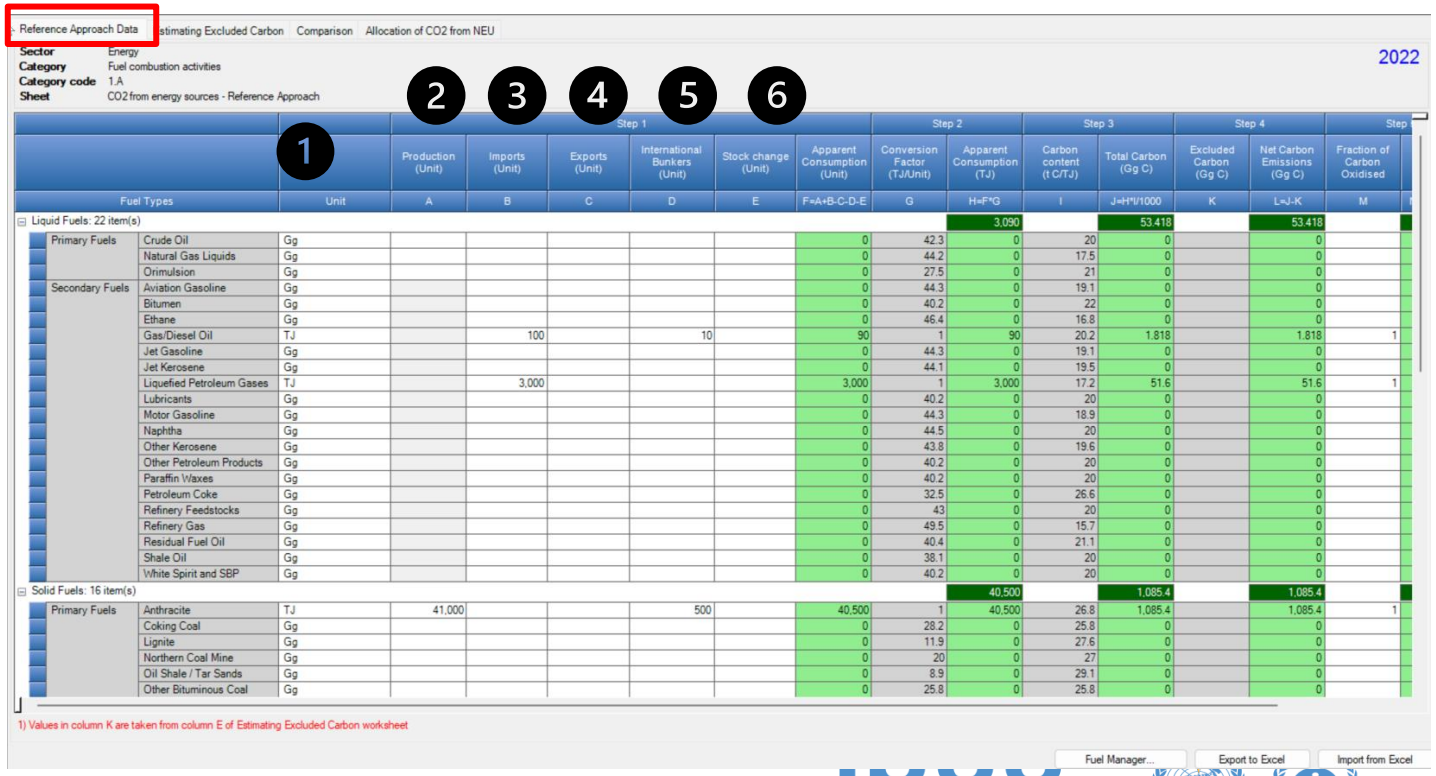
2. **Column |A|:** input the amount of production of the fuel (primary fuels only)

3. **Column |B|:** input the amount of imported fuel

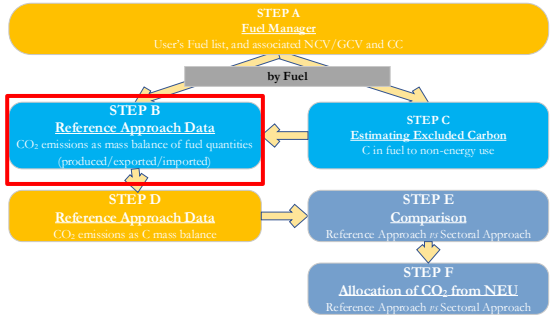
4. **Column |C|:** input the amount of exported fuel

5. **Column |D|:** input the amount of fuel used for international bunkers, if applicable

6. **Column |E|:** input the amount of stock change.
Note that an increase in stocks is a positive stock change which withdraws supply from consumption. A stock reduction is a negative stock change which, when subtracted in the equation, causes an increase in apparent consumption



Step B. Reference Approach Data



For each fuel, enter the following information *(continued)*:

7. **Column |F|:** the *Software* estimates the amount of apparent consumption of the fuel.

8. **Column |G|:** conversion factor in (TJ/Unit) is filled automatically from the Fuel Manager.

Note that where Gg of fuel are converted to TJ, the NCV/GCV is sourced from the Fuel Manager and compiled by the Software as a conversion factor; while if the consumption unit is TJ, the Software compiles the conversion factor cell with the value 1. Where other units are applied (e.g. m^3) the user shall enter relevant conversion unit here.

Reference Approach Data | Estimating Excluded Carbon | Comparison | Allocation of CO2 from NEU

2022

Category Fuel combustion activities
Category code 1.A
Sheet CO2 from energy sources - Reference Approach

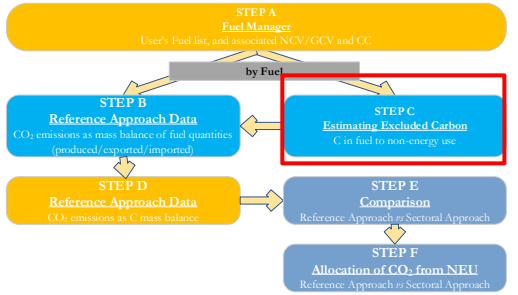
7 8

Fuel Types		Unit	Step 1: Production (Unit) A	Imports (Unit) B	Exports (Unit) C	International Bunkers (Unit) D	Stock change (Unit) E	Apparent Consumption (Unit) F=A+B-C-D-E	Conversion Factor (TJ/Unit) G	Step 2: Apparent Consumption (TJ) H=F*G	Step 3: Carbon content (t C/TJ) I	Total Carbon (Gg C) J=H*I/1000	Step 4: Excluded Carbon (Gg C) K	Net Carbon Emissions (Gg C) L=J-K	Fraction of Carbon Oxidised M
Liquid Fuels: 22 item(s)										3,090		53.418		53.418	
Primary Fuels	Crude Oil	Gg						0	42.3	0	20	0		0	
	Natural Gas Liquids	Gg						0	44.2	0	17.5	0		0	
	Orimulsion	Gg						0	27.5	0	21	0		0	
Secondary Fuels	Aviation Gasoline	Gg						0	44.3	0	19.1	0		0	
	Bitumen	Gg						0	40.2	0	22	0		0	
	Ethane	Gg						0	46.4	0	16.8	0		0	
	Gas/Diesel Oil	TJ		100		10		90	1	90	20.2	1.818		1.818	1
	Jet Gasoline	Gg						0	44.3	0	19.1	0		0	
	Jet Kerosene	Gg						0	44.1	0	19.5	0		0	
	Liquefied Petroleum Gases	TJ		3,000				3,000	1	3,000	17.2	51.6		51.6	1
	Lubricants	Gg						0	40.2	0	20	0		0	
	Motor Gasoline	Gg						0	44.3	0	18.9	0		0	
	Naphtha	Gg						0	44.5	0	20	0		0	
	Other Kerosene	Gg						0	43.8	0	19.6	0		0	
	Other Petroleum Products	Gg						0	40.2	0	20	0		0	
	Paraffin Waxes	Gg						0	40.2	0	20	0		0	
	Petroleum Coke	Gg						0	32.5	0	26.6	0		0	
	Refinery Feedstocks	Gg						0	43	0	20	0		0	
	Refinery Gas	Gg						0	49.5	0	15.7	0		0	
	Residual Fuel Oil	Gg						0	40.4	0	21.1	0		0	
	Shale Oil	Gg						0	38.1	0	20	0		0	
	White Spirit and SBP	Gg						0	40.2	0	20	0		0	
Solid Fuels: 16 item(s)										40,500		1,085.4		1,085.4	
Primary Fuels	Anthracite	TJ	41,000			500		40,500	1	40,500	26.8	1,085.4		1,085.4	1
	Coking Coal	Gg						0	28.2	0	25.8	0		0	
	Lignite	Gg						0	11.9	0	27.6	0		0	
	Northern Coal Mine	Gg						0	20	0	27	0		0	
	Oil Shale / Tar Sands	Gg						0	8.9	0	29.1	0		0	
	Other Bituminous Coal	Gg						0	25.8	0	25.8	0		0	

1) Values in column K are taken from column E of Estimating Excluded Carbon worksheet

Fuel Manager... | Export to Excel | Import from Excel

Step C. Estimating Excluded Carbon



For each fuel in the Column |Fuel Types|, enter the following information:

1. **Column |A|**: enter the estimated quantity of the fuel not used for combustion purposes (e.g. natural gas used as a feedstock for ammonia production, or coking coal used in the iron and steel industry).

2. **Column |Unit|:** select or enter manually the measurement unit used (e.g. Gg, TJ, m^3).

3. **Column |B|:** conversion factor in TJ/Unit is filled automatically from the Fuel Manager.

4. **Column |D|:** carbon content is filled automatically from the Fuel Manager in t C/TJ.

5. Excluded carbon in **Column |E|** is then automatically included in **Column |K|** of the **Reference Approach Data** tab.

Reference Approach Data | Estimating Excluded Carbon | Comparison | Allocation of CO2 from NEU

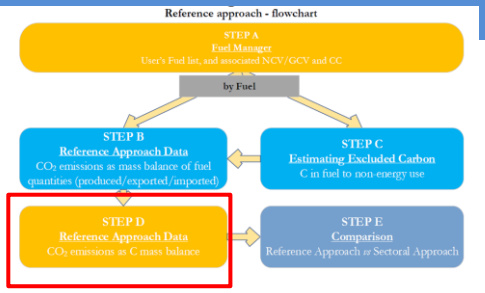
Sector Energy
Category Fuel combustion activities
Category code 1.A
Sheet Auxiliary Worksheet: Estimating Excluded Carbon

2022

Fuel Types	1 Estimated Quantities (Unit) A	Unit	2	3 Conversion Factor (TJ/Unit) B	Estimated Quantities (TJ) C = A * B	4 Carbon content (t C/TJ) D	5 Excluded Carbon (Gg C) E = C * D / 1000
Liquid Fuels: 22 item(s)					1,000		17.2
Aviation Gasoline		Gg		44.3	0	19.1	0
Bitumen		Gg		40.2	0	22	0
Crude Oil		Gg		42.3	0	20	0
Ethane		Gg		46.4	0	16.8	0
Gas/Diesel Oil		Gg		43	0	20.2	0
Jet Gasoline		Gg		44.3	0	19.1	0
Liquefied Petroleum Gases	1,000	TJ		1	1,000	17.2	17.2
Motor Gasoline		Gg		44.3	0	18.9	0
Naphtha		Gg		44.5	0	20	0
Natural Gas Liquids		Gg		44.2	0	17.5	0
Orimulsion		Gg		27.5	0	21	0
Other Kerosene		Gg		43.8	0	19.6	0
Other Petroleum Products		Gg		40.2	0	20	0
Paraffin Waxes		Gg		40.2	0	20	0
Petroleum Coke		Gg		32.5	0	26.6	0
Refinery Feedstocks		Gg		43	0	20	0
Refinery Gas		Gg		49.5	0	15.7	0
Residual Fuel Oil		Gg		40.4	0	21.1	0
Shale Oil		Gg		38.1	0	20	0
White Spirit and SBP		Gg		40.2	0	20	0
Solid Fuels: 16 item(s)					0		0
Gaseous Fuels: 1 item(s)					200		3.06
Natural Gas (Dry)	200	TJ		1	200	15.3	3.06
Other Fossil Fuels: 3 item(s)					0		0
Peat: 1 item(s)					0		0
Biomass - solid: 3 item(s)					0		0
Biomass - liquid: 6 item(s)					0		0
Biomass - gas: 3 item(s)					0		0
Biomass - other: 1 item(s)					0		0

Fuel Manager... | Export to Excel | Import from Excel

Step D. Reference Approach Data Tab



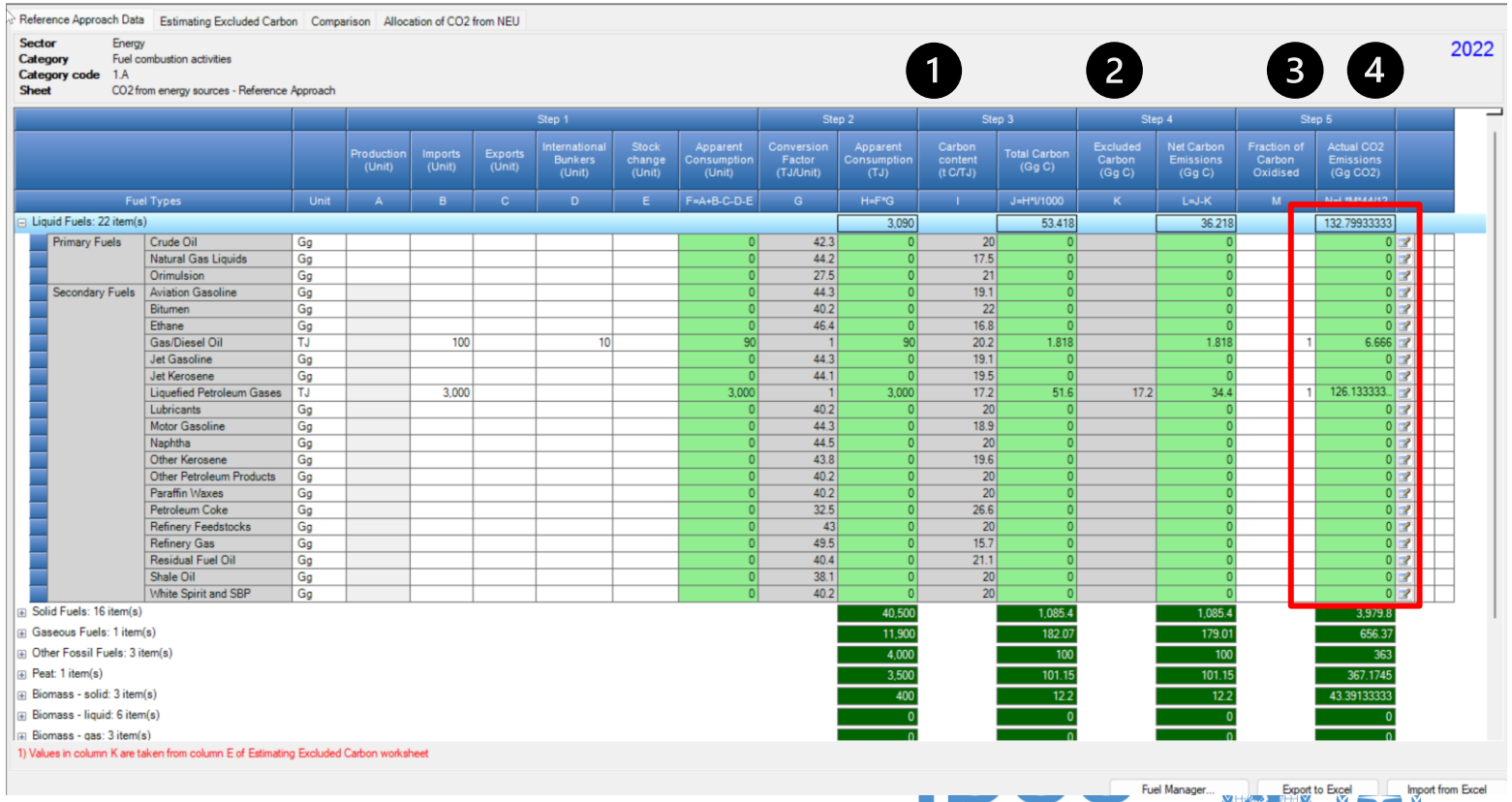
Input of EFs for the Reference Approach requires the following steps:

1. **Column |I|:** carbon content is filled automatically from the Fuel Manager in t C/TJ.

2. Excluded carbon in **Column |K|** is taken automatically from the **Excluded Carbon** worksheet

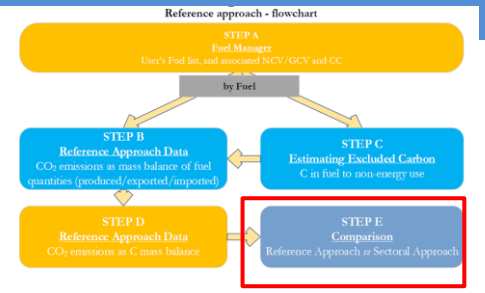
3. **Column |M|:** enter fraction of oxidized carbon.
Note if no information on this factor is available, the value "1" shall be entered to proceed with calculations

4. *Software* estimate CO_2 emissions following the Reference Approach



Recall: gray shading means that data contained in that cell are automatically pooled from somewhere else.

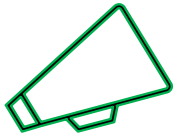
Step E. Comparison



The *Software* provides results of CO_2 estimations under the Reference and Sectoral approaches and performs a comparison between the two approaches by each fuel, fuel type and total for the NGHGI
For each fuel, enter following information:

- Worksheet **Comparison** presents the results for the **Reference Approach**, as well as main AD (apparent consumption). This worksheet also summarizes the main AD and CO_2 emissions calculated under the **Sectoral Approach**, by fuel type. In the Columns **|Difference|**, the *Software* provides the comparative difference between the Reference and Sectoral approaches in terms of energy consumption and CO_2 emissions.

- The 2006 IPCC Guidelines, Section 6.8, provide possible reasons for a gap between the two approaches, which is generally expected to be less than 5%. For higher percent differences, reporting programs typically require users to provide a clear explanation and justification.



In this example, which reason might you provide for the sectoral approach being greater than the sectoral approach for liquid fuels?

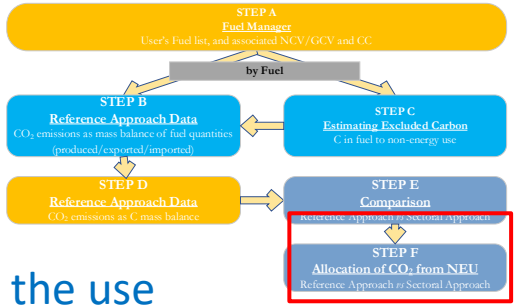
Application | Database | Inventory Year | Administrate | Worksheets | Tools | Export/Import | Reports | Window | Help

Reference Approach Data | Estimating Excluded Carbon | Comparison | Allocation of CO2 from NEU

Sector Energy
Category Fuel combustion activities
Category code 1.A
Sheet Comparison of CO2 Emissions from Fuel Combustion

Fuel Types	Reference Approach				Sectoral Approach		Difference	
	Apparent Consumption (TJ)	Excluded consumption (TJ)	Apparent Consumption (excluding non-energy use and feedstocks) (TJ)	CO2 Emissions (Gg)	Energy Consumption (TJ)	CO2 Emissions (Gg)	Energy Consumption (%)	CO2 Emissions (%)
Liquid Fuels: 22 item(s)	3,090	1,000	2,090	132.79933333	3,900	257.99	-46.41025641	-48.52539504
Solid Fuels: 16 item(s)	40,500	0	40,500	3,979.8	40,000	3,922	1.25	1.47373789
Gaseous Fuels: 1 item(s)	11,900	200	11,700	656.37	10,000	558	17	17.62903226
Other Fossil Fuels: 3 item(s)	4,000	0	4,000	363	4,400	383.48	-9.09090909	-5.34056535
Peat: 1 item(s)	3,500	0	3,500	367.1745	3,500	366	0	0.32090164
Total								
	62,990	1,200	61,790	5,499.14383...	61,800	5,487.47	-0.01618123	0.21273617

Step F. Allocation of CO2 from NEU



For each relevant fuel in Column |Fuel Types| that is used for NEU and for which CO_2 emissions from the use of that fuel are reported elsewhere, enter the following information:

1. Column |CO2neu|: enter the quantity of CO_2 emissions from NEU that is reported elsewhere in the NGHGI, in $GgCO_2$ (e.g. CO2 emissions from the liquified petroleum gases used in petrochemical production).

2. Column |CAT|: for each relevant fuel, click on the editing box in the left-hand side of the column and select one or more categories of the inventory where these CO_2 emissions are reported.

Reference Approach Data | Estimating Excluded Carbon | Comparison | Allocation of CO2 from NEU

Sector Energy
Category Fuel combustion activities
Category code 1.A
Sheet Allocation of CO2 from NEU

2022

Fuel Types	CO2 Excluded from Reference Approach (Gg CO2) EXCLra	CO2 emissions from NEUs reported in the inventory (Gg CO2) CO2neu	Categories under which CO2 emissions from NEU are reported CAT
Liquid Fuels: 22 item(s)	63.06666667	63	
Aviation Gasoline			
Bitumen			
Crude Oil			
Ethane			
Gas/Diesel Oil			
Jet Gasoline			
Jet Kerosene			
Liquefied Petroleum Gases	63.06666667	63	Ethylene
Lubricants			
Motor Gasoline			
Naphtha			
Natural Gas Liquids			
Orimulsion			
Other Kerosene			
Other Petroleum Products			
Paraffin Waxes			
Petroleum Coke			
Refinery Feedstocks			
Refinery Gas			
Residual Fuel Oil			
Shale Oil			
White Spirit and SBP			
Solid Fuels: 16 item(s)	0	0	
Natural Gas (Dry)	11.22	11	Methanol

1

2

Energy Sector:
Hands-on Exercise

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Selected key categories in Energy

- 1A1a Electricity production, CO_2
- 1A3b Road transport, CO_2
- 1A2m Nonspecific Industries, CO_2
- 1A3a Civil Aviation, CO_2
- 1B2b Natural gas, CH_4 (Trend only)

Electricity Generation – CO2

Tier applied	Tier 1/Tier 2
Key category	Yes, CO2 level and trend

Data Needs – red requires country-specific data entry	
IPCC Default Method	**Tier 2**
Worksheet : Fuel consumption Data Fuel Combustion Emissions	**Worksheet :** Fuel consumption Data Fuel Combustion Emissions
Amount of fuel combusted, by fuel/category EF (assumes a carbon oxidation factor of 1)	Amount of fuel combusted by fuel/category Country-specific EF (based on country-specific carbon contents, oxidation factors, fuel quality)

- India has calculated directly based on carbon content, and not exactly used IPCC defaults (which are rounded). In this case, for *Software,* probably best to directly use defaults for those fuels
- Country-specific fuels have fraction oxidized <1 so EFs should be overwritten for these fuels to account for fraction oxidized (carbon content will already be reflected from fuel manager)
- India includes some carbon stored (e.g. from use of coking coal)-is this correct or is this an NEU of fuel that is to be subtracted from AD consumption?
- I see case where the same fuel has different EF in different sector (e.g. non-coking coal in files) you can overwrite value

Road Transport – CO2

Tier applied	??
Key category	Yes, CO2 level and trend

Data Needs – red requires country-specific data entry	
IPCC Default Method	**Tier 2**
Worksheet : Fuel consumption Data Fuel Combustion Emissions	**Worksheet :** Fuel consumption Data Fuel Combustion Emissions
Amount of fuel combusted, by fuel/category EF (assumes a carbon oxidation factor of 1)	Amount of fuel combusted by fuel/category Country-specific EF (based on country-specific carbon contents)
CO2 emissions from use of urea-based additives in catalytic converters (non-combustive emissions) are included in the GL in this section, and in the category tree of the *Software,* but will be reported in 2.D.3.d in CRT	

- Calculation worksheet not available

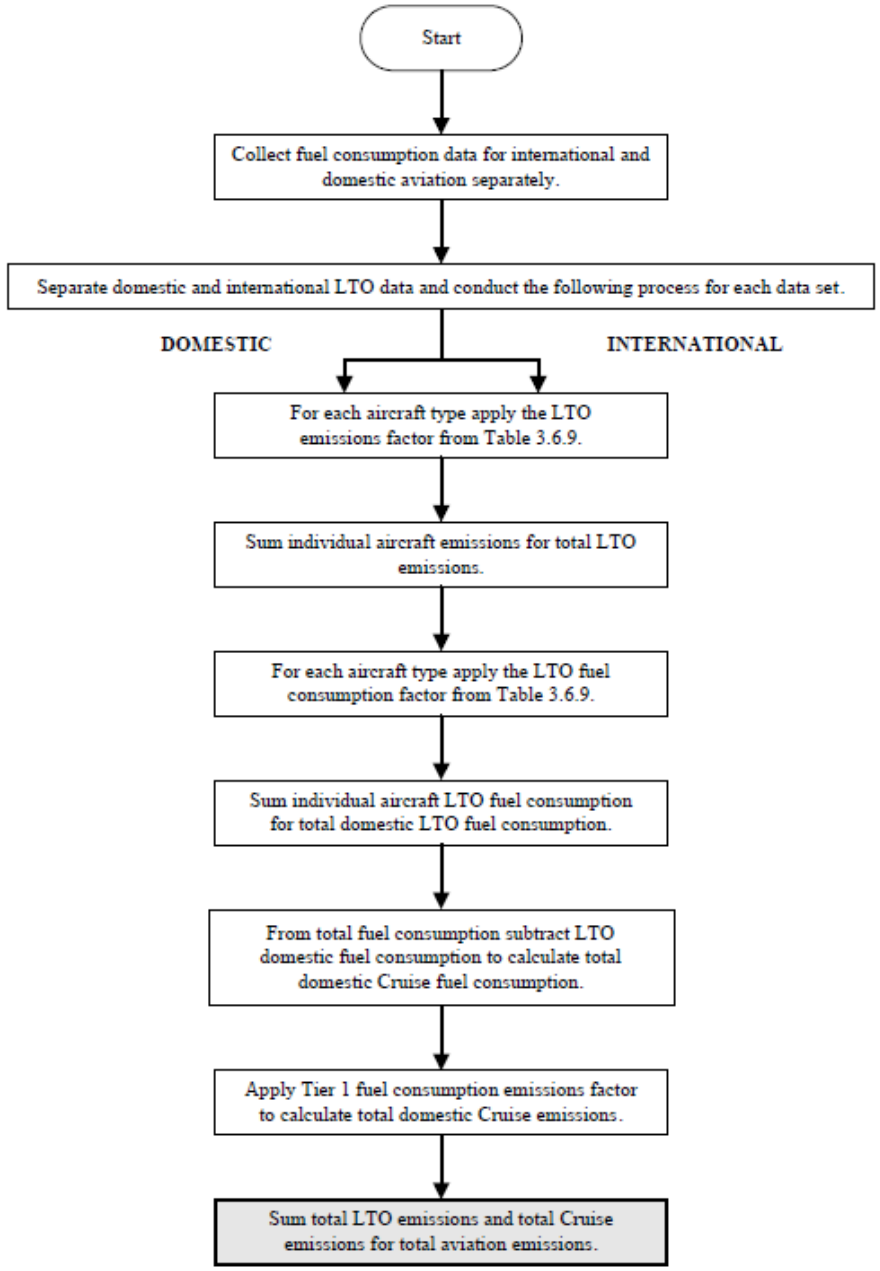
Civil Aviation – CO2

Tier applied	
Key category	Yes, CO2 level only

Data Needs – red requires country-specific data entry	
IPCC Default Method	**Tier 2**
Worksheet :	**Worksheet :**
• Fuel consumption for domestic and international • Emission factor	• Total domestic and international fuel consumption • Number of LTOs for both domestic and international, preferably by aircraft type • EF for LTO (defaults available for specific aircraft type) • Fuel consumption / LTO (defaults available for specific aircraft type) • Cruise fuel EF

Default method should only be used for small aircraft using aviation gasoline; jet-fuelled only in cases where no other data are available

Figure 3.6.2 Estimating aircraft emissions with Tier 2 method



Natural Gas- CH4

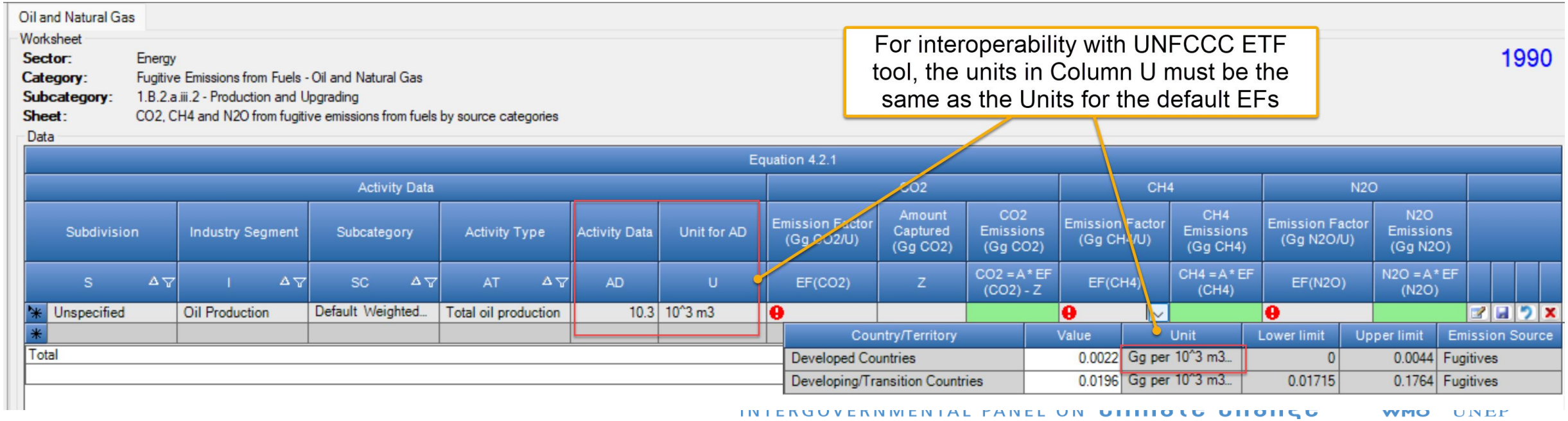
Tier applied	1
Key category	Yes, CH4 trend only

Data Needs – red requires country-specific data entry	
IPCC Default Method	**Tier 2**
Worksheet : Oil and Natural Gas	**Worksheet :** Oil and Natural Gas
*Information on the relevant categories (e.g. industry segment, subcategory (e.g. conventional oil), activity type (e.g. total oil production) *Amount of that activity *Use of default EFs	*Information on the relevant categories (e.g. industry segment, subcategory (e.g. conventional oil), activity type (e.g. total oil production) *Amount of that activity *Use of country-specific EFs

- Cross walk your data availability with the type and units of the default data in Table 4.2.5 in the 2006 IPCC Guidelines? Appears several categories can be calculated with existing data.
- What industry segment in calculation worksheets are “leakage” and “flaring” assigned to?

Natural Gas- CH4

- ✓ After identifying the category: Subdivision/Industry segment / Subcategory you will want to enter the AD associated with that category
- ✓ Column |AD|: AD can be entered in any relevant units in the Software, with the corresponding units reported in Column |U|
  - ✓ However, for Interoperability with the UNFCCC ETF Reporting Tool, the AD and units must be consistent with those in the Tables 4.2.4 and 4.2.5 of the 2006 IPCC Guidelines.
  - ✓ For India, AD in calculation worksheets would need to be converted.



Coal Mining - CH4 (underground and surface)

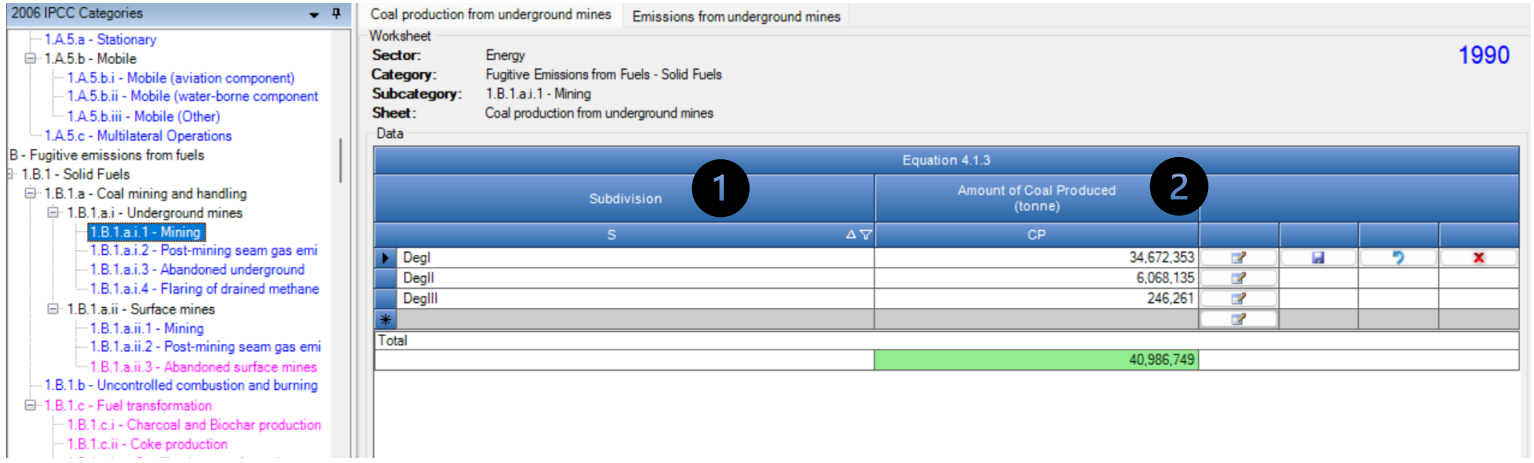
Tier applied	1
Key category	No

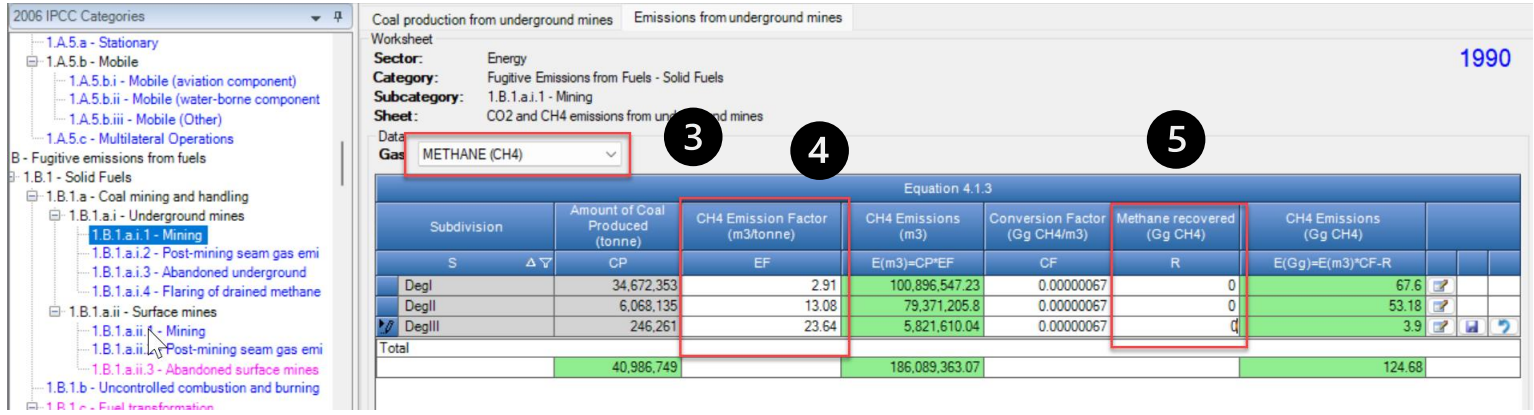
Data Needs – red requires country-specific data entry	
IPCC Default Method	**Tier 2**
Worksheets : Coal production from underground mines ; Emissions from underground mines	
*Among of coal produced from underground mines *Use of default EFs *Amount captured / recovered (if applicable)	*Among of coal produced from underground mines *Use of country-specific or basin-specific Efs *Amount captured / recovered (if applicable)

- Questions to consider:
  - Great that IPCC defaults and country-specific EFs considered side by side in spreadsheet
  - There is a relatively large difference between country specific and default – this does not mean the country-specific value is incorrect, you may just want to explain why the country specific value is appropriate for national conditions.
  - With country specific EFs, appears you can report in three subdivisions?
  - Recovery?

Coal Mining - CH4 (underground and surface)

- ✓ Column |S|: You have three sets of mines with very different EFs, consider three separate subdivisions?
- ✓ In **Emissions from underground mines** Select “Methane (CH4)” from **Gas**
- ✓ In Column |EF| select default EF from dropdown or enter country specific EF
- ✓ Enter CH4 recovered





Questions?