The IPCC Inventory Software

Practical Training on IPCC Inventory Software & Interoperability with ETF GHG Inventory Tool

IPCC TFI TSU

Let's get Prepared

Please Open on your computer

- ✓ **IPCC Inventory Software**
- ✓ **Energy Sector Users' Guidebook**

https://www.ipcc-nggip.iges.or.jp/software/index.html

Agenda

10:45 – 12:00

- General introduction to the IPCC Inventory Software (the *Software)*
- The Energy Sector in the *Software*
- Calculate GHG Emissions– Fuel Combustion – Demonstration

LUNCH

13:00 -15:15

- Calculate GHG Emissions– Fuel Combustion - Exercise
- Reference Approach
- Cross-cutting functionalities

COFFEE

15:30 – 16:30

- Interoperability with the UNFCCC ETF Reporting Tool

Cooperation need not end today….if any questions, please reach out.

Approach

Show and Do:

- ✓ **Demonstration, using *Software* and available resources**
- ✓ **Exercises** to build **familiarity** and **confidence** with the IPCC Inventory Software

Increasing Complexity:

- ✓ Start with **basic tasks and Tier 1** and gradually move to more **complex exercises accommodating higher tiers and different functionalities**.

A note on the pace of work:

- ✓ Strive that **all have the necessary skill-set** to prepare inventory using the *Software*
- ✓ Are you more advanced? Consider how you may **use this material to support colleagues**
- ✓ Have country-specific data and questions? **Please ask!!**

Objectives

I. Become familiar with the IPCC Inventory Software for Energy and the available resources to guide you in its use

- ✓ Navigate the **interface** and **worksheets** and **input activity data and emission factors**
- ✓ Understand **interaction with other sectors**
- ✓ Use the **Fuel-Manager**
- ✓ Use the **Reference Approach tool**

II. Be able to estimate emissions using the IPCC Inventory Software

- ✓ Apply **default IPCC** and **country-specific** factors to estimate Tier 1/2/3 GHG emissions from stationary combustion
- ✓ Calculate the **Reference Approach**

III. Learn inventory compilation tasks:

- ✓ Create inventory years, time series data entry, and if time , XML import/export
- ✓ Preparing your inventory for upload to the UNFCCC ETF Reporting Tool

IV. Produce IPCC JSON for upload to the UNFCCC ETF Reporting Tool

- General introduction to the *Software*

The IPCC Inventory Software in Institutional Arrangements

A **freely available *Software*** to **calculate** GHG emissions/removals in accordance with the IPCC Guidelines, and upload to the UNFCCC ETF Reporting Tool for GHG Inventory **reporting** under the Paris Agreement

This workshop explored the IPCC Guidelines and data collection for the **Energy Sector**

What are the methods to estimate GHG emissions?

Which method should be used based on national circumstances?

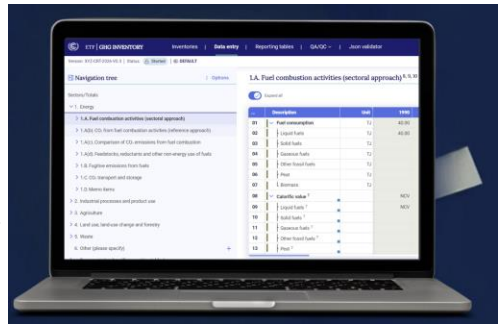
What data are needed and where can I find it?

IPCC Inventory Software

App

Estimate GHG emissions and removals consistent with IPCC Guidelines and prepare IPCC JSON for upload to UNFCCC ETF Reporting Tool

ETF| GHG Inventory Reporting Tool (UNFCCC)



Credit: UNFCCC

Recipe for Using the IPCC Software

You're cooking a dish for the first time — and want to get it right. What's your approach?

Preparing an inventory with the Software follows the same logic

Read the recipe

1. **Read the IPCC Guidelines and Software guides**

Gather ingredients

2. **Assess data availability and set up Data Managers**

Choose your method

3. **Select method using guidance and decision trees**

Start cooking

4. **Enter activity data in the relevant worksheet**

Adjust seasoning

5. **Enter emission factors and parameters**

Taste and test

6. **Check results and perform QA/QC**

Plate and serve

7. **Generate CRT Tables and JSON submission files**

Note recipe improvements for next time

8. **Archive inventory to build on for next submission**

Benefits to Using the *Software*

Complete

1. All IPCC methods, approaches, and default data from 2006 IPCC Guidelines
2. Cross-cutting elements (e.g. uncertainty/KCA)
3. AR5 values

Easy to Use

1. No methodological/calculation errors
2. Prepare Tier 1 inventory with minimal efforts (IPCC defaults at fingertips)
3. Data Managers to facilitate data entry
4. Have NGHGI ready for Paris Agreement reporting

Pivotal for inventory preparation

1. Adaptable to national circumstances
2. Multiple experts can work simultaneously
3. Establishes a single archive
4. **Confidence that inventory consistent with *2006 IPCC Guidelines* and MPGs**

Software a Tool to Integrate Mitigation Actions in the GHG Inventory

One objective of this workshop:

"*The 7th Greenhouse Gas Inventory System Training Workshop aims to provide an opportunity… to build capacity and engage in policy dialogue on providing a national inventory report of greenhouse gases and* ***utilizing national GHG inventories for the design and implementation of NDCs under the Paris Agreement***"

The IPCC Inventory Software **is the resource to prepare GHG inventories** in accordance with:

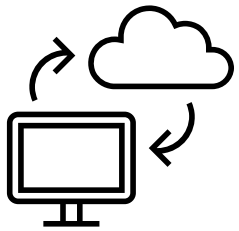
- ✓ **IPCC good practice and principles** *(Transparency, Completeness, Consistency, Accuracy, Comparability)*

- ✓ **UNFCCC reporting requirements for:**
  - **National GHG Inventories**
  - **NDCs**
  - **Art 6,2 ITMOs**
  - **A6.4ERs**

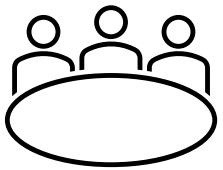
The *Software* thus ensures **consistency among GHG inventories, NDCs, Art6.2 & Art6.4 counting**; and so addressing integrity in reporting of mitigation actions

Basics of Working with the *Software*

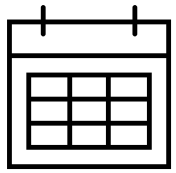
- ✓ All users **download the IPCC Software** application on their computer.
  - MSAccess (ACE OLEDB 12) for WindowsOS , ACCDB file (backup function), Microsoft .NET Framework 4.6.2



- ✓ Conduct **"First Run"** of Software; identify "Superuser" and other users
- ✓ Users either work from a common, shared, inventory database on **internet/intranet (recommended)** or experts **exchange XML files** containing category/sector data.
- ✓ Software can read multiple databases – each database is password protected – do not forget!



- ✓ **Sector/category experts input data**, QA/QC, prepare information for CRT, and generate JSON



- ✓ **Upload IPCC JSON into UNFCCC ETF Reporting Tool**
- ✓ **Create a new inventory year in IPCC Software** based on previous year and prepare next inventory

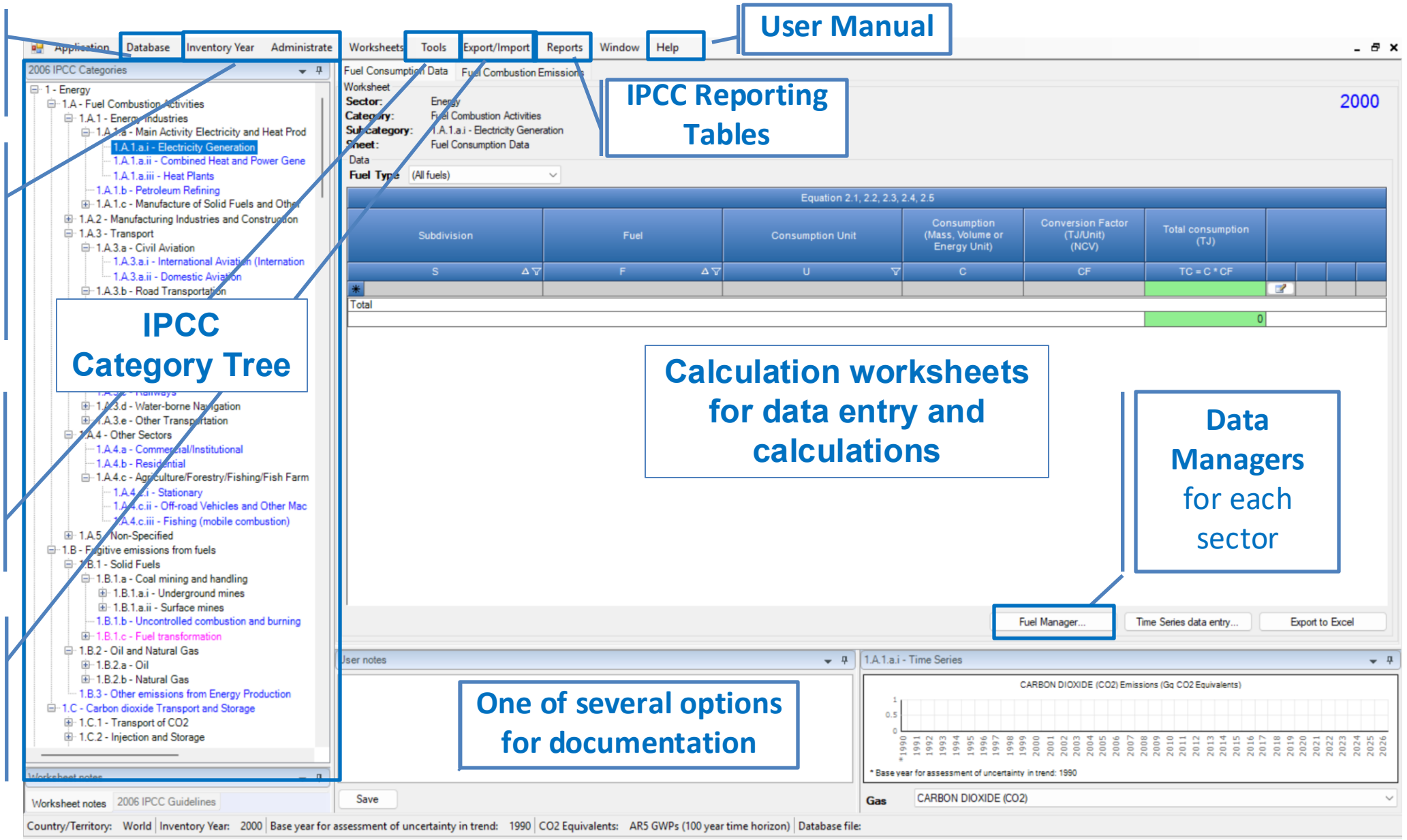
Layout of the Software

Open/Close Databases

Administrate functions: Country, Users, Year
Inventory Year

Tools: Reference Approach, KCA, Uncertainty

Export/Import: Worksheet data UNFCCC CRT



What does “Interoperable” Look Like: Example, Fuel Combustion

Using national data or readily available international data sets (e.g. UN, IEA)

Terajoules

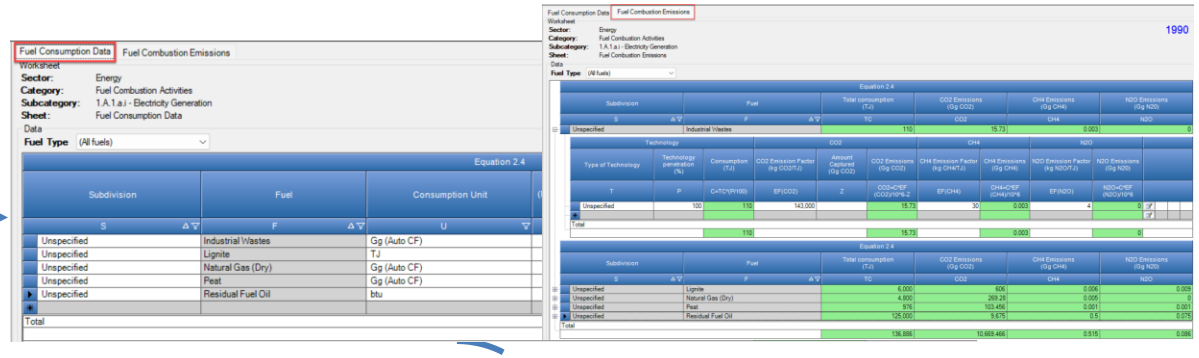
	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables
2021											
Primary production	..	..	336779	..	102398	174939	..	27515	..	641631	202454
Imports	..	..	3105	183656	17765	..	..	157	..	204684	..
Exports	..	..	-334870	-3999	..	-50	..	-6242	..	-345162	-50
International marine bunkers	..	..	..	-296	..	..	..	..	..	-296	..
International aviation bunkers	..	..	..	-8429	..	..	..	..	..	-8429	..
Stock changes	..	..	1198	8587	..	..	..	..	..	9785	..
Total energy supply	..	..	6213	179518	120163	174889	..	21430	..	502212	202404
Statistical difference	..	..	-12330	-638	10969	0	..	0	..	-2000	27515
Transfers	..	..	..	..	..	..	..	..	..	..	..
Transformation	..	..	-16321	13075	-103422	-47580	..	51868	..	-102381	-47580
Electricity plants	..	..	-2172	-3288	-103422	..	..	51868	..	-57014	..
CHP plants	..	..	..	..	..	..	..	..	..	..	..
Heat plants	..	..	..	..	..	..	..	..	..	..	..
Coke ovens	..	..	..	..	..	..	..	..	..	..	..
Briquetting plants	..	..	..	..	..	..	..	..	..	..	..
Liquefaction plants	..	..	..	..	..	..	..	..	..	..	..
Gas works	..	..	..	..	..	..	..	..	..	..	..
Blast furnaces	..	..	..	..	..	..	..	..	..	..	..
NGL plants & gas blending	..	..	-4118	4406	..	..	..	..	..	289	..
Oil refineries	..	..	-10031	10054	..	..	..	..	..	1024	..
Other transformation	..	..	..	..	..	..	..	..	..	..	..
Energy industries own use	..	..	-997	..	..	..	..	..	..	..	..
Losses	..	..	-1225	..	..	..	..	..	..	..	..
Final consumption	..	..	..	15	..	..	..	..	..	15	..
Final energy consumption	..	..	..	16	..	..	..	..	..	16	..
Manufacturing, const., mining	..	..	..	1	..	..	..	..	..	1	..
Iron and steel	..	..	..	..	..	..	..	..	..	..	..
Chemical and petrochemical	..	..	..	..	..	..	..	..	..	..	..
Non-ferrous metals	..	..	..	..	..	..	..	..	..	..	..
Non-metallic minerals	..	..	..	..	..	..	..	..	..	..	..
Transport equipment	..	..	..	..	..	..	..	..	..	..	..
Machinery	..	..	..	..	..	..	..	..	..	..	..
Mining and quarrying	..	..	..	..	..	..	..	..	..	..	..
Food and tobacco	..	..	..	..	..	..	..	..	..	..	..
Paper, pulp and printing	..	..	..	..	..	..	..	..	..	..	..
Wood and wood products	..	..	..	..	..	..	..	..	..	..	..
Textile and leather	..	..	..	..	..	..	..	..	..	..	..
Construction	..	..	..	..	..	..	..	..	..	..	..
Industries n.e.s	..	..	..	..	..	..	..	..	..	..	..
Transport	..	..	..	15	..	..	..	..	..	15	..
Road	..	..	..	..	..	..	..	..	..	..	..
Rail	..	..	..	..	..	..	..	..	..	..	..
Domestic aviation	..	..	..	..	..	..	..	..	..	..	..
Domestic navigation	..	..	..	..	..	..	..	..	..	..	..
Pipeline transport	..	..	..	..	..	..	..	..	..	..	..
Transport, n.e.s	..	..	..	..	..	..	..	..	..	..	..
Other	..	..	..	1	..	..	..	..	..	1	..
Agriculture, forestry, fishing	..	..	..	..	..	..	..	..	..	..	..
Commerce, public services	..	..	..	..	..	..	..	..	..	..	..
Households	..	..	..	..	..	..	..	..	..	..	..
Other consumers	..	..	..	..	..	..	..	..	..	..	..
Non-energy use	..	..	..	..	..	..	..	..	..	..	..

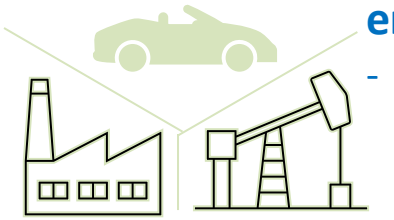
Terajoules

	All Coal	All Oil	Natural Gas	Primary biofuels / Waste	Charcoal	Electricity	Total energy	of which: renewables
2021								
Primary production	..	..	..	*7153	..	23	*7175	*7175
Imports	..	*10915	..	0	50	..	*10965	50
Exports	..	*-87	..	0	-29	..	*-116	-29
International marine bunkers	..	..	..	..	..	..	..	..
International aviation bunkers	..	*-838	..	..	..	..	*-838	..
Stock changes	..	..	..	..	..	..	..	..
Total energy supply	..	*9990	..	*7153	21	23	*17186	*7196
Statistical Difference	..	*-40	..	0	0	0	*-40	*23
Transfers	..	..	..	..	..	..	..	..
Transformation	..	*-5586	..	*-4014	2161	1837	*-5603	*-1854
Electricity plants	..	*-5586	..	..	..	1837	*-3749	..
Charcoal plants	..	..	..	*-4014	2161	..	*-1854	*-1854
Other transformation	..	0	..	0	..	..	0	0
Energy industries own use	..	..	..	..	..	-275	-275	..
Losses	..	..	..	..	..	*-367	*-367	..
Final consumption	..	*4445	..	*3138	*2181	*1217	*10982	*5320
Final energy consumption	..	*4445	..	*3138	*2181	*1217	*10982	*5320
Manufacturing, const., mining	..	*1879	..	..	..	*234	*2113	..
Transport	..	*1085	..	..	..	..	*1085	..
Road	..	*1085	..	..	..	..	*1085	..
Domestic aviation	..	..	..	..	..	..	..	..
Domestic navigation	..	..	..	..	..	..	..	..
Other transport	..	..	..	..	..	..	..	..
Other	..	*1481	..	*3138	*2181	*983	*7784	*5320
Agriculture, forestry, fishing	..	..	..	..	..	..	..	..
Commerce and public services	..	..	..	..	..	..	..	..
Households	..	..	..	*3138	*2181	..	*5320	*5320
Other consumers	..	*1481	..	..	..	*983	*2464	..
Non-energy use	..	..	..	..	..	..	..	..

Source: 2021 Energy Balances (https://unstats.un.org/unsd/energystats/pubs/balance/)

…and filling in relevant data for each category in the two worksheets below





…for most countries captures majority of energy sector emissions:

- *fuel combustion responsible for ~70% of total emissions, excl. LULUCF ; same worksheets used for Tier 2/3 methods for stationary combustion (~55% of total)*

Create CRT Data Set and Generate IPCC JSON in *Software*; upload file in UNFCCC tool

Would populate CRT with AD/emissions for same categories

Resources

IPCC TFI has produced several guides and tools to support use of the Software:

- ✓ **User Manual**
- ✓ **Manual for Inventory Compilers**
- ✓ **Series of Sector User Guidebooks**
- ✓ **UNFCCC CRT Export Guide**

For access to these guidebooks, refer to the IPCC Software website.

IPCC Software Community of Users

Envisions inclusion of:

- ✓General information
- ✓Announcements
- ✓Newcomer's Guide
- ✓FAQs
- ✓Support Materials
- ✓Methodological Support
- ✓Technical Support
- ✓Troubleshooting and Errors Reports

Find the form to register here.

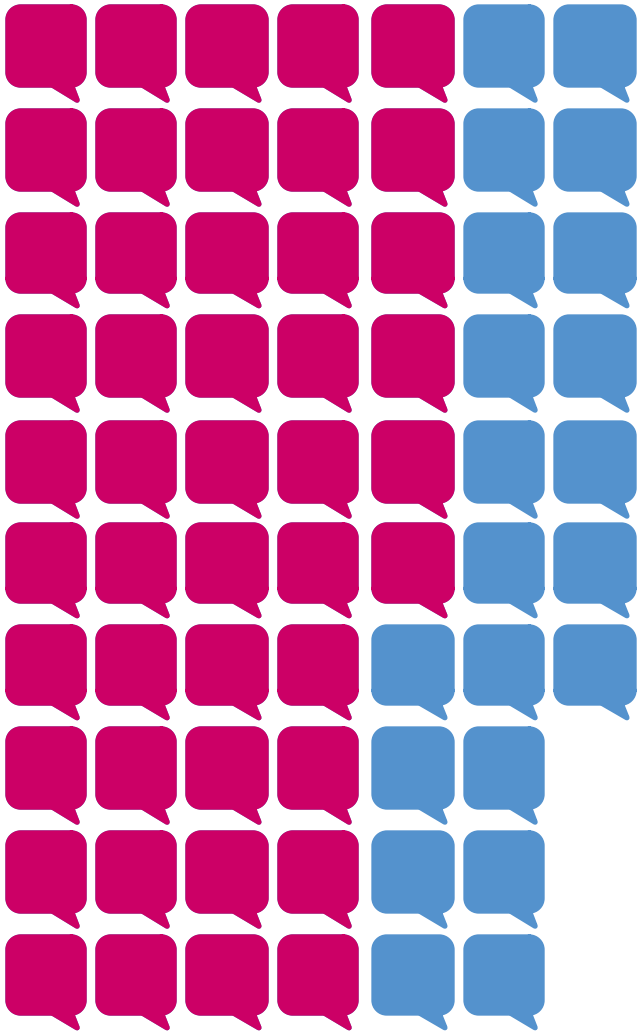
You Will be in Good Company Using the *IPCC Software*

- ✓ Software has been **widely adopted** by developing countries in reporting of biennial update reports and national communications, and more recently the Paris Agreement

- ✓ **Over 2/3 of developing countries** that have submitted their first inventory under the Paris Agreement, used *Software* in some capacity
  - ~ **half of those used the interoperability function** to submit CRTs

- ✓ **At least one developed country** reported their CRT using the interoperability function of the IPCC Inventory Software

Of 67 developing countries that submitted an inventory, 46 used the *Software*



Data as of 5 June 2025

Key Takeaways

The IPCC Inventory Software is the **preeminent tool for calculating a GHG inventory** consistent with the IPCC Guidelines

Software **automatically populates UNFCCC common reporting tables**

Users can be confident GHG Inventory consistent with the UNFCCC MPGs

Substantial technical support is available to users

A single tool to ensure consistency and coherence in counting of GHG emissions/removals **in all mitigation elements**

Continuous work in improving; fast-fixing on any problems detected by users

Brief Reactions?

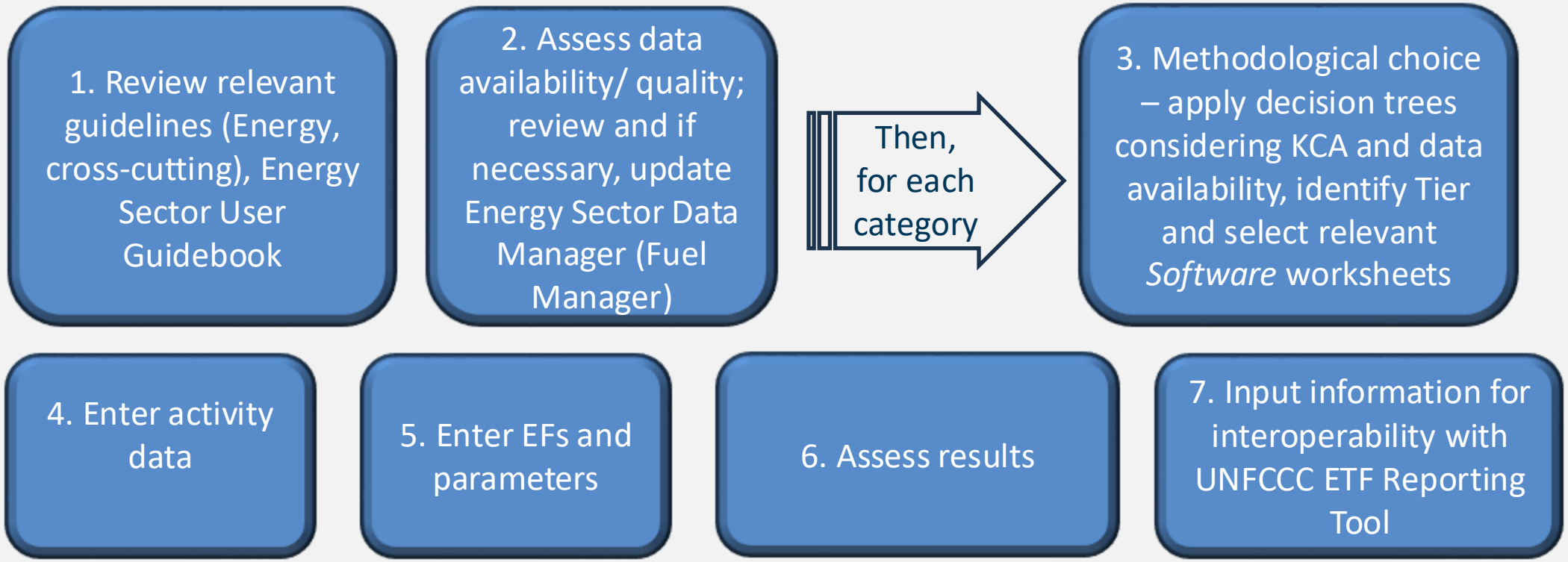
What do you think may be the biggest benefit of use of the *IPCC Inventory Software* in your country?

Have you experienced any challenges in download or use of the *Software*, particularly related to the Energy sector?

Have you accessed or used any of the support resources available?

- Preparing to use the *Software*

Approach to Use the *Software*



Energy Sector Users' Guidebook, available here, guides you through these steps

Energy Sector Guidebook as Tool

IPCC Equations

- ✓ Tier 1: IPCC Tier 1 Equations 2.1 and 2.2
- ✓ Tier 2: IPCC Tier 1 equations, although with user-specific EFs
- ✓ Tier 3: Equations 2.3, 2.4 and 2.5

As explained in section I.2. Use of multiple tiers for reporting, GHG estimates prepared with user-specific Tier 3 methods can be reported in the *Software* worksheets that implement the IPCC Tier 1 equation.

Reference Equations from IPCC Guidelines

Software Worksheets

The *Software* calculates emissions of the three GHGs using worksheets:

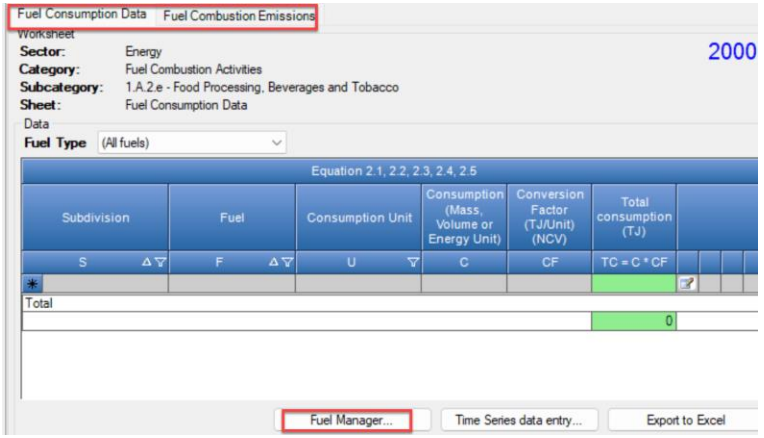
- ✓ **Fuel Manager**: contains data on *carbon content* and *calorific value* of each fuel used in the NGHGI.
- ✓ **Fuel Consumption Data**: contains for each subdivision the amount of fuel consumed, in the source category, for each fuel.

  *Note that in worksheet **Fuel Combustion Emissions** where data on technology types are available, fuel consumption data are apportioned to the various technology-types, considering the penetration rate of each technology type.*
- ✓ **Fuel Combustion Emissions**: contains for each subdivision, the relevant CO_2, CH_4 and N_2O EFs for each fuel, the penetration rate of specific technologies (if known), the CO_2 captured, if any, and calculates associated GHG emissions.

In the upper part of each worksheet, users select the *Fuel type* for which to enter data. The *All Fuels* option is selected to visualize all fuels entered, with no *Fuel type* limitation.

Data compilation of each of 1.A.1, 1.A.2, 1.A.4, and 1.A.5 categories is operated independently, following for each category the entire set of instructions below.

Explains worksheets, and expected data entry



Energy Sector Guidebook as a Tool

Activity data input

The *2006 IPCC Guidelines*, Sections 1.4.1.2 and 1.4.1.3, contain information on how to collect and use energy statistics data. Further information on the choice of AD for stationary combustion can be found in Section 2.3.3.

Fuel consumption data in mass or volume units shall first be converted into the energy content of these fuels in Terajoule units (TJ). The GCV/NCV are used to convert Gg of fuels into TJ (IPCC default values for NCV are in Table 1.2). Other units may be entered into the **Fuel Consumption Data** worksheet, e.g. British Thermal Units (BTUs). However, when alternative units are used, the column for GCV/NCV becomes blank and the user shall enter a user-defined conversion factor (TJ/unit).

Thus, for the relevant source-category:

As a **Starting step**, users enter in the **Fuel Manager** all user-specific fuels to be reported in the NGHGI; and for each fuel listed in the **Fuel Manager** the *calorific value* and the *carbon content* are entered or, for IPCC default fuels, are selected from the dropdown menu.

How to input AD in *Software* for each column in each category

Emission factor input

IPCC default EFs for CO_2 are calculated assuming 100% oxidation to CO_2 of fuel C content, where the fuel C content is expressed in C units of mass per unit of energy (IPCC default values in Table 1.3 are in kg C/GJ).

IPCC default values for EFs are provided in Tables 2.2, 2.3, 2.4, 2.4, in kg/TJ.

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:

i. 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.

   Note that the 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.

ii. Compile each row as follows:

   1. Column |T|: enter technology type. Where the IPCC default method[19] is applied, the notation "unspecified" is selected.
   2. Column |P|: enter technology penetration rate (%) associated with each technology type. The technology penetration rate[20] apportions the total fuel consumed in the subdivision among technology types. Where the IPCC default method is applied[21], 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%.

How to input EF and parameter information for each column in each category

Energy Sector Guidebook as a Tool

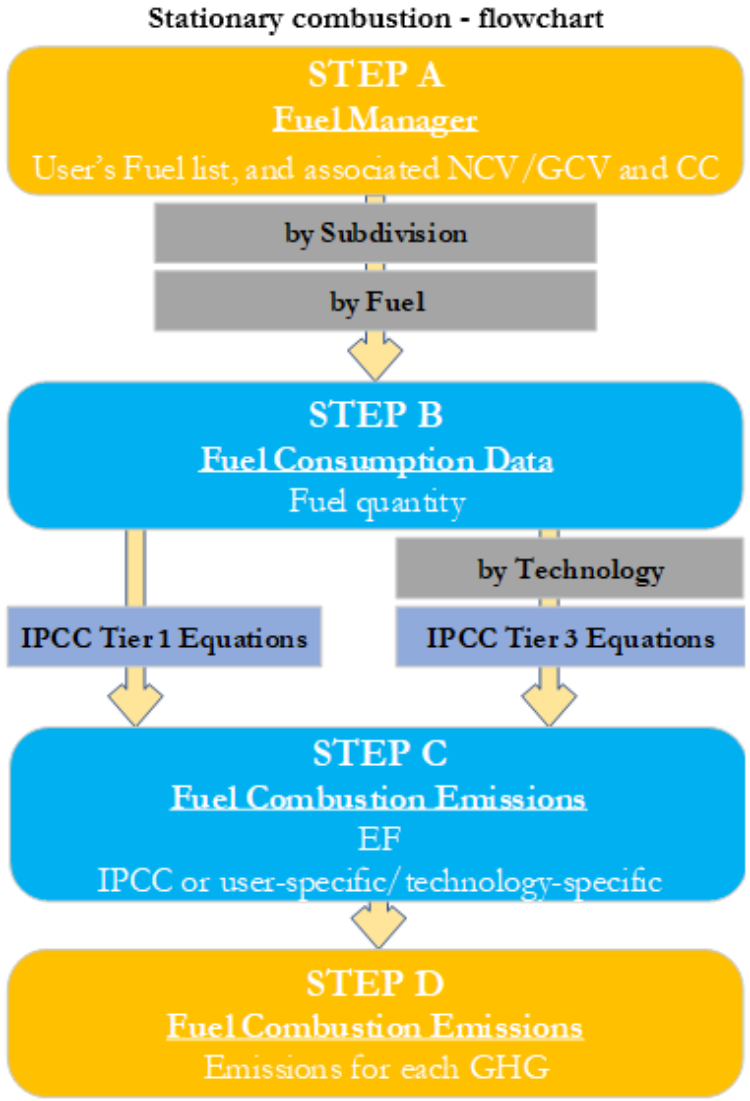
✓ This flowchart, from the Energy Sector Users' Guidebook illustrates how to use the *Software* for all categories of stationary combustion

✓ Shows the main steps, **with worksheet names from *Software* underlined**
- **Step A**: complete **Fuel Manager** (data manager for the energy sector)
- **Step B:** input AD in worksheet **Fuel Consumption Data**
- **Step C:** input EF information in worksheet **Fuel Combustion Emissions**
- **Step D**: assess results in worksheet **Fuel Combustion Emissions**

✓ Input of AD and EF information done by subdivision and by fuel

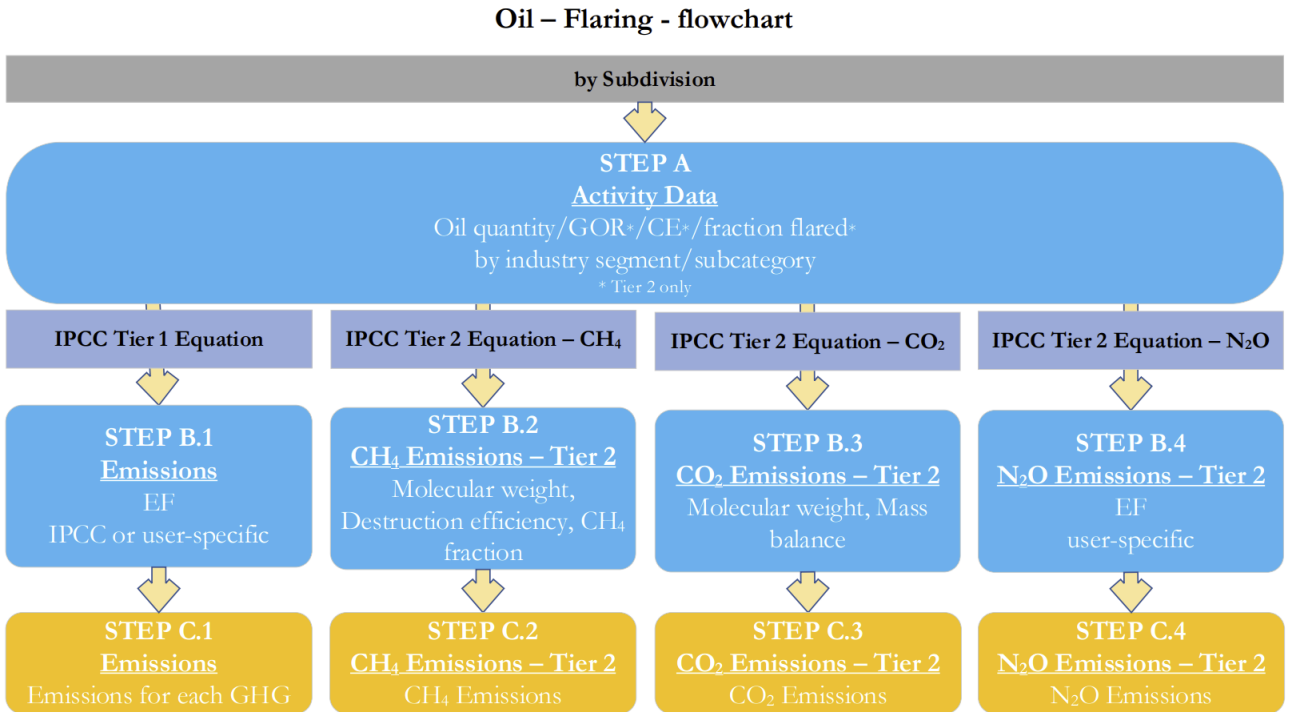
✓ Note that same worksheets are used for all three tiers, tier 3 requires specific information on technology used

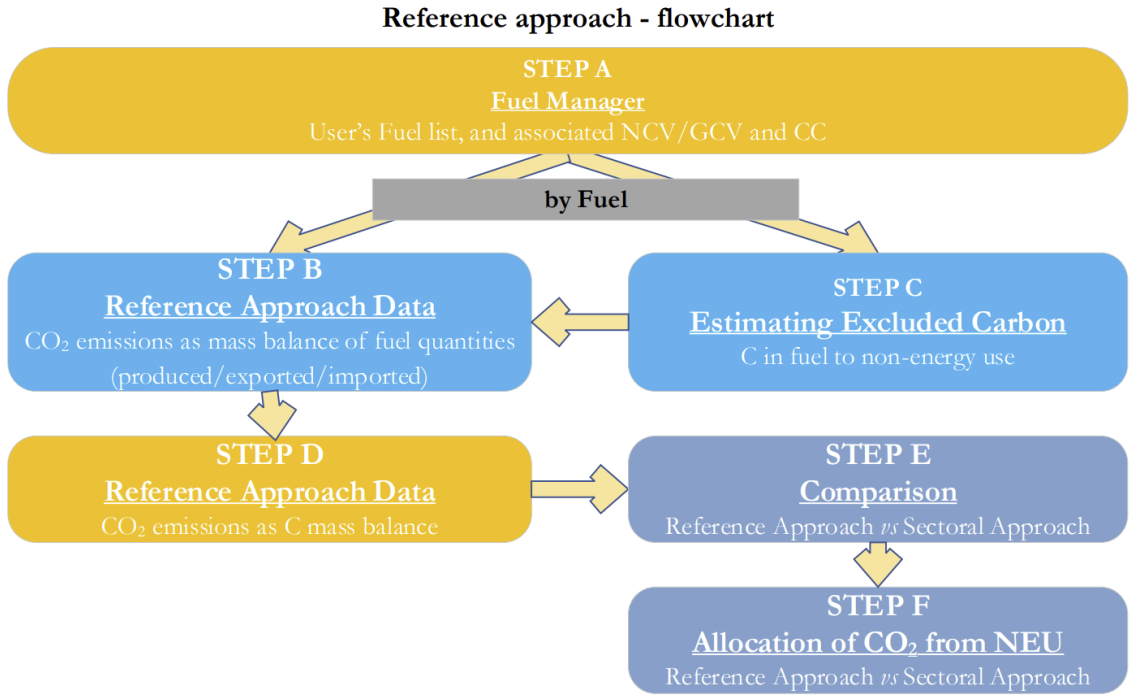
✓Flowcharts can be read in similar fashion for all categories in all sectors



Energy Sector Guidebook as a Tool

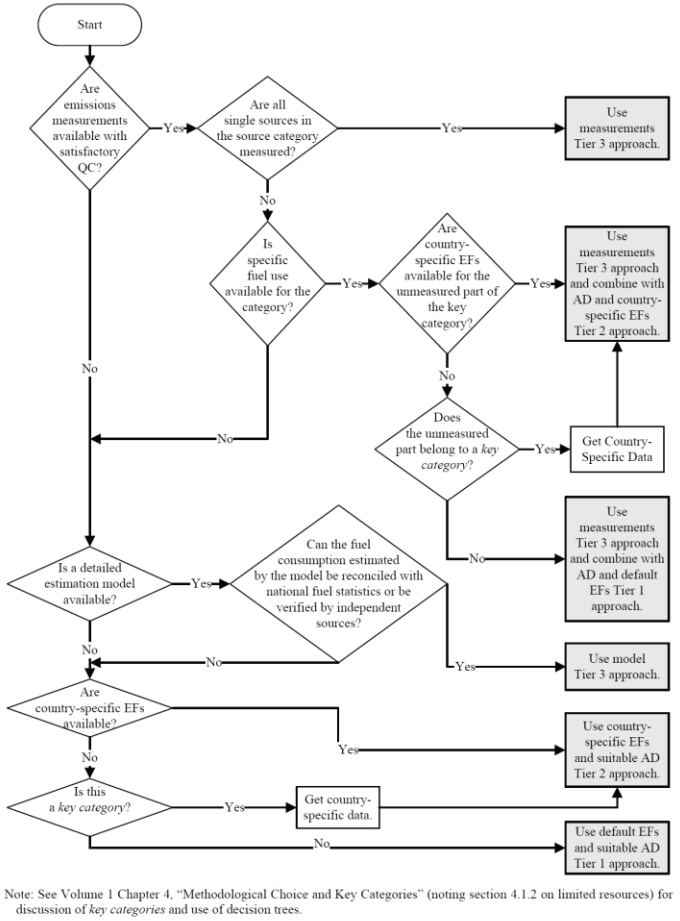
Guidebook contains similar sections, and flowcharts for all categories





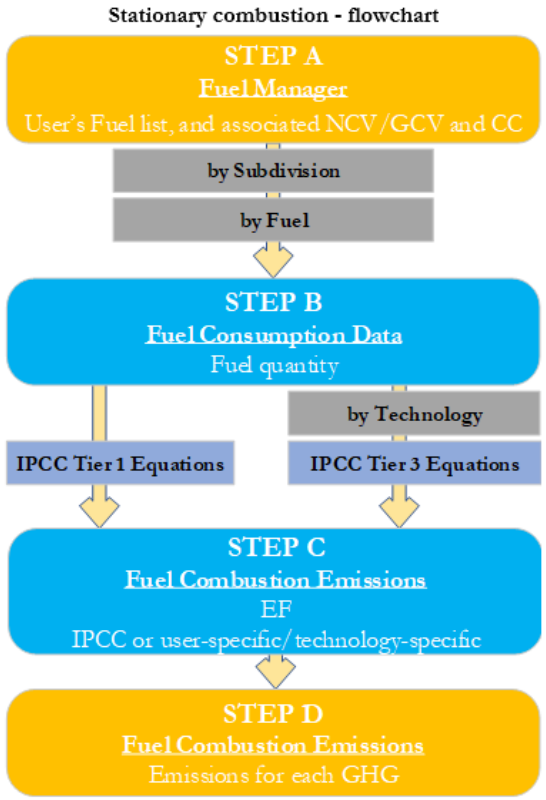
Summary

Identify Tier for each category based on data availability and national circumstances from *2006 IPCC Guidelines; C*ollect data

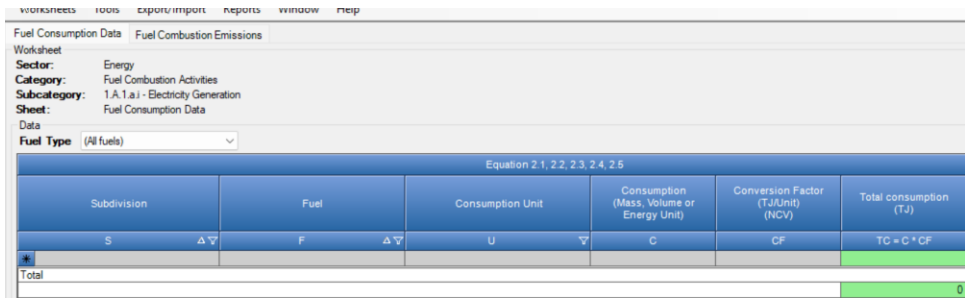


Note: See Volume 1 Chapter 4, "Methodological Choice and Key Categories" (noting section 4.1.2 on limited resources) for discussion of *key categories* and use of decision trees.

Understand which worksheets to use for the selected Tier – Easy for Energy!!



Input data in the *Software* using Guidebook as necessary

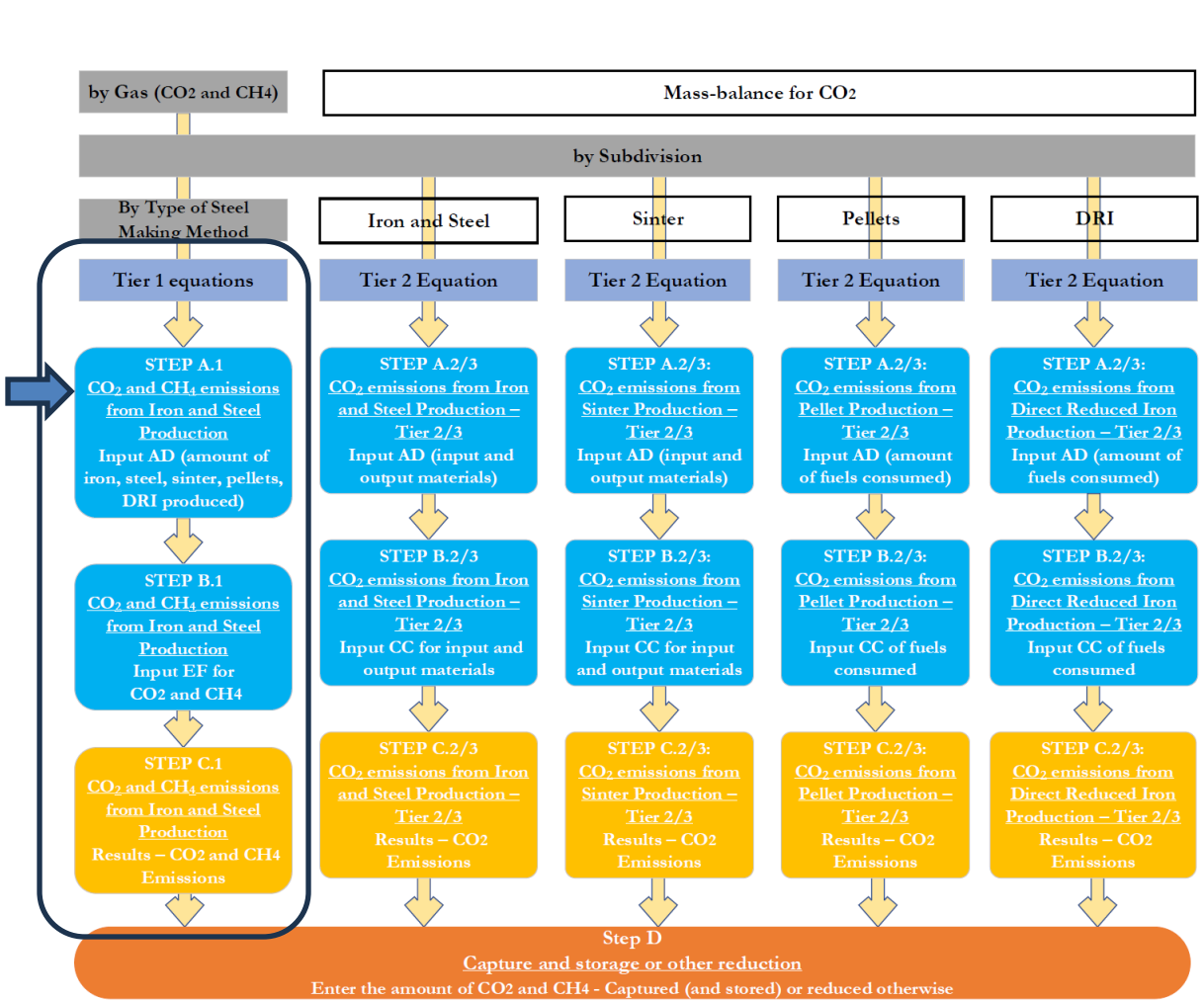


Quick Knowledge Check

Name some of the resources that you may wish to have open while using the *Software*

You want to estimate CO_2 and CH_4 from **iron and steel production**. Based on the decision tree in the 2006 IPCC Guidelines, you want to use a **Tier 1 method.** You notice there are a lot of worksheets and decide to review the IPPU Guidebook to get help.

What is the name of the worksheet where you estimate CO_2 and CH_4 following the Tier 1 method.



- Reviewing the Fuel Manager
- Calculate GHG Emissions– Fuel Combustion

Fuels Combustion in IPCC Software

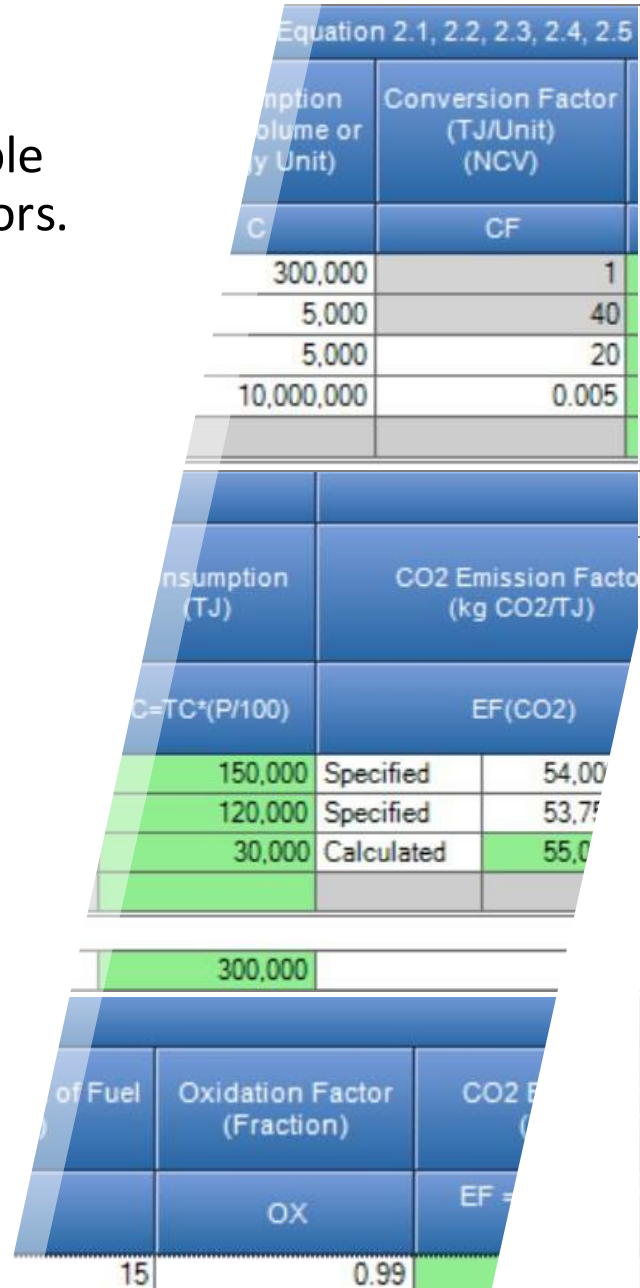
Step A. Fuel Manager

- ✓ Data managers designed to store common AD and/or parameters applicable across multiple categories in a sector to facilitate data input and avoid errors.
- ✓ The Fuel Manager, contains **IPCC default fuels, net calorific values and carbon contents**
- ✓ User may modify values and/or add country-specific fuels
- ✓ Some categories in the IPPU sector also reference data in the Fuel Manager

Steps B and C: Fuel and EF input in *Software* Worksheets

- ✓ Allows the application of different Tiers to estimate CO_2 emissions
  - **Fuel Consumption**
  - **Calorific Value**
  - **Emission Factor**
  - **Carbon Content**
  - **Oxidation Factor**

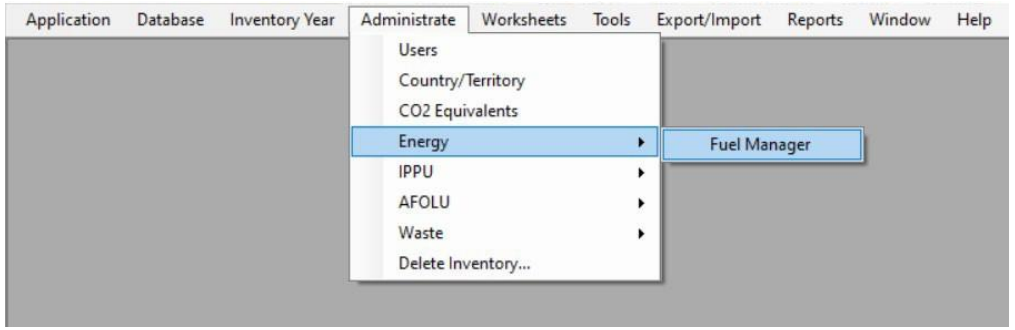
May pull from Fuel Manager



Accessing the Fuel Manager

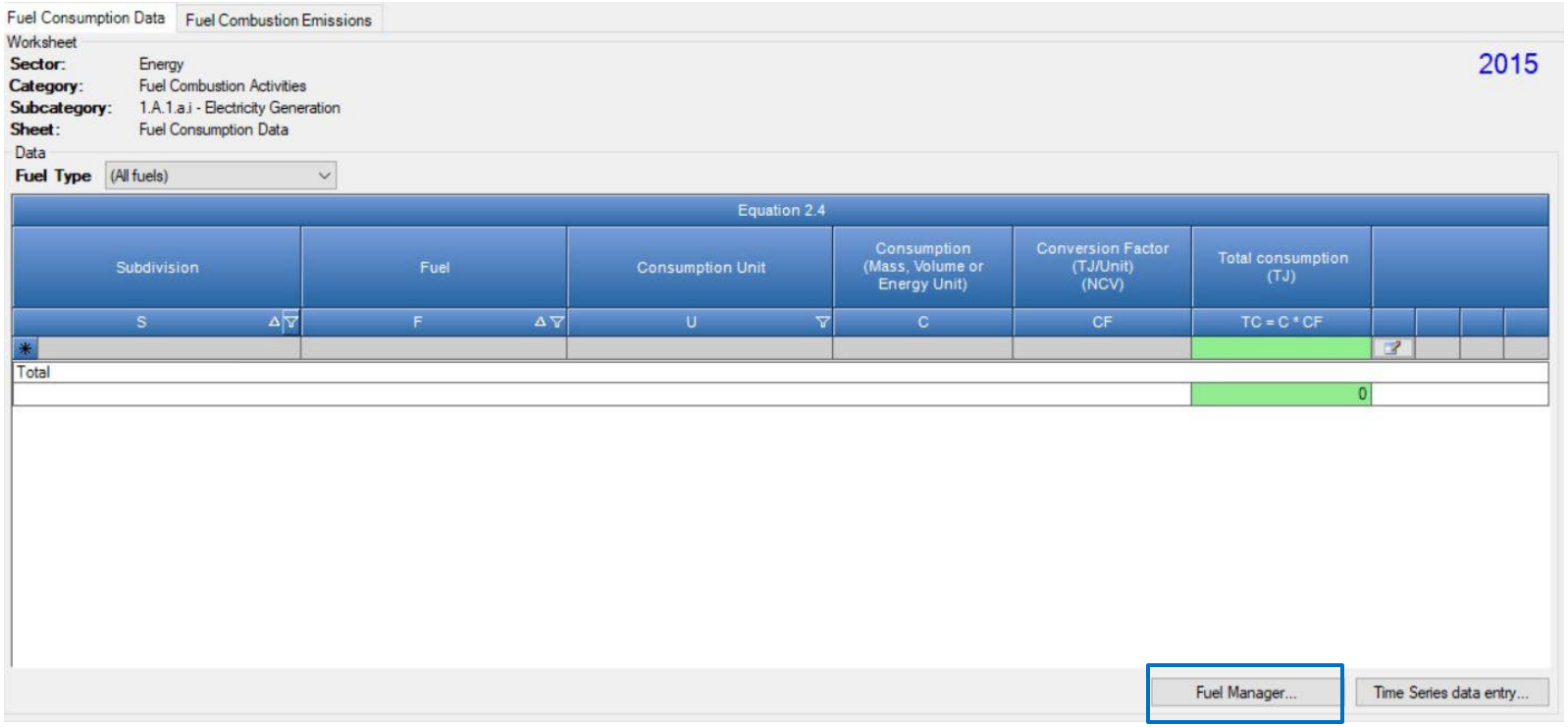
1 – Under Administrate menu

(Superuser access required)

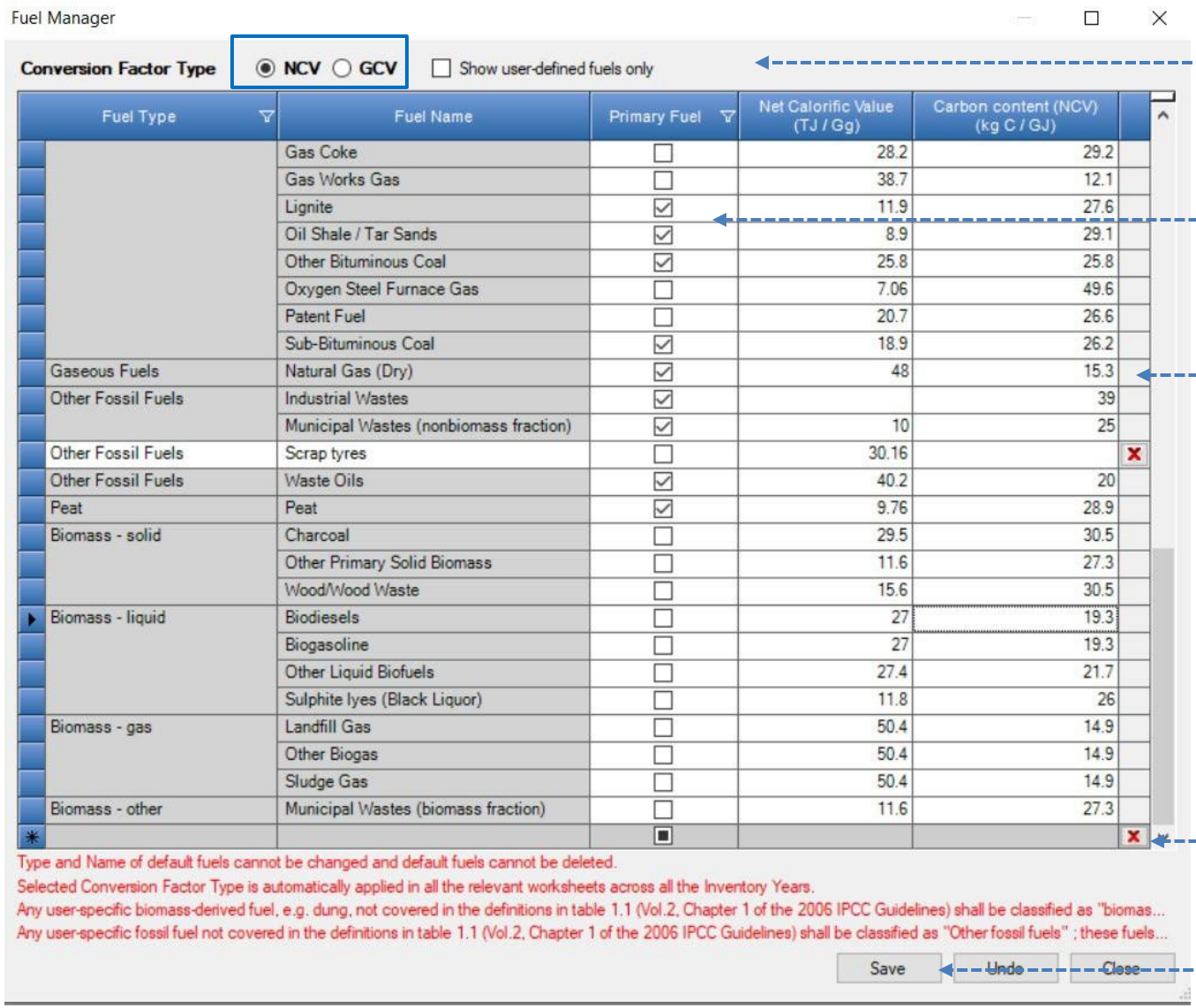


2 – Via energy sector worksheets

(All experts)



Updating the Fuel Manager



Fuel Type	Fuel Name	Primary Fuel	Net Calorific Value (TJ / Gg)	Carbon content (NCV) (kg C / GJ)
	Gas Coke	☐	28.2	29.2
	Gas Works Gas	☐	38.7	12.1
	Lignite	☑	11.9	27.6
	Oil Shale / Tar Sands	☑	8.9	29.1
	Other Bituminous Coal	☑	25.8	25.8
	Oxygen Steel Furnace Gas	☐	7.06	49.6
	Patent Fuel	☐	20.7	26.6
	Sub-Bituminous Coal	☑	18.9	26.2
Gaseous Fuels	Natural Gas (Dry)	☑	48	15.3
Other Fossil Fuels	Industrial Wastes	☑		39
	Municipal Wastes (nonbiomass fraction)	☑	10	25
Other Fossil Fuels	Scrap tyres	☐	30.16	
Other Fossil Fuels	Waste Oils	☑	40.2	20
Peat	Peat	☑	9.76	28.9
Biomass - solid	Charcoal	☐	29.5	30.5
	Other Primary Solid Biomass	☐	11.6	27.3
	Wood/Wood Waste	☐	15.6	30.5
Biomass - liquid	Biodiesels	☐	27	19.3
	Biogasoline	☐	27	19.3
	Other Liquid Biofuels	☐	27.4	21.7
	Sulphite lyes (Black Liquor)	☐	11.8	26
Biomass - gas	Landfill Gas	☐	50.4	14.9
	Other Biogas	☐	50.4	14.9
	Sludge Gas	☐	50.4	14.9
Biomass - other	Municipal Wastes (biomass fraction)	☐	11.6	27.3
		■		

Select NCV/GCV

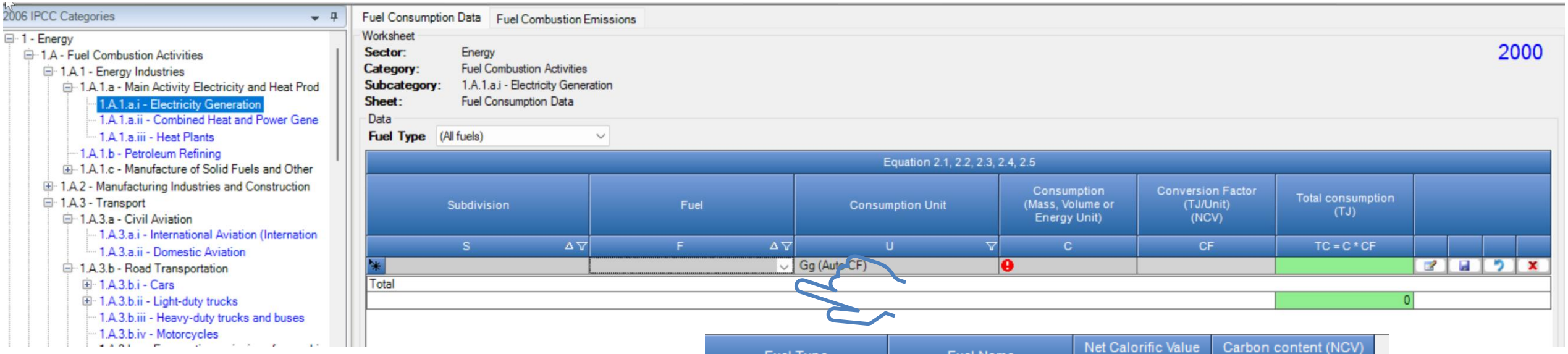
Review identifiers for **primary fuels**

Update data for default fuels (if applicable)
Type updated values directly in cells

Add country-specific fuels

Always **Save**

How Fuel Manager used in Worksheets



Fuel Type	Fuel Name	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

- ✓ When you update NCV/CC in Fuel Manager, carries over to worksheets automatically
- ✓ Only fuels in Manager can be selected
- ✓ May overwrite the NCV/carbon content for a specific category

Exercise 1 – Fuel Manager

Enter a custom fuel in Fuel Manager

Scenario: In 2000, the electric utilities in your country consumed the following fuels for electricity generation (IPCC category 1.A.1.a.i):

- ✓ Residual Fuel Oil
- ✓ Gas/Diesel Oil
- ✓ Old Tires

Your Task:

1. Add your custom fuel to the Fuel Manager
2. Use the following plant-specific factors for old tires

- NCV = 31.16 TJ/Gg
- Carbon content = 15.1 Kg C/GJ

Results 1 – Fuel Manager

1. Old Tires added to Fuel Manager

Fuel Manager

Conversion Factor Type: NCV / GCV — Show user-defined fuels only

Fuel Type	Fuel Name	Primary Fuel	Net Calorific Value (TJ / Gg)	Carbon content (NCV) (kg C / GJ)
	Coke Oven Gas	☐	38.7	12.1
	Coking Coal	☑	28.2	25.8
	Gas Coke	☐	28.2	29.2
	Gas Works Gas	☐	38.7	12.1
	Lignite	☑	11.9	27.6
	Oil Shale / Tar Sands	☑	8.9	29.1
	Other Bituminous Coal	☑	25.8	25.8
	Oxygen Steel Furnace Gas	☐	7.06	49.6
	Patent Fuel	☐	20.7	26.6
	Sub-Bituminous Coal	☑	18.9	26.2
Gaseous Fuels	Natural Gas (Dry)	☑	48	15.3
Other Fossil Fuels	Industrial Wastes	☑		39
	Municipal Wastes (nonbiomass fraction)	☑	10	25
Other Fossil Fuels	Old Tires	☐	31.16	15.1
Other Fossil Fuels	Waste Oils	☑	40.2	20
Peat	Peat	☑	9.76	28.9

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

Data
Fuel Type (All fuels)

Equation 2.1, 2.2, 2.3

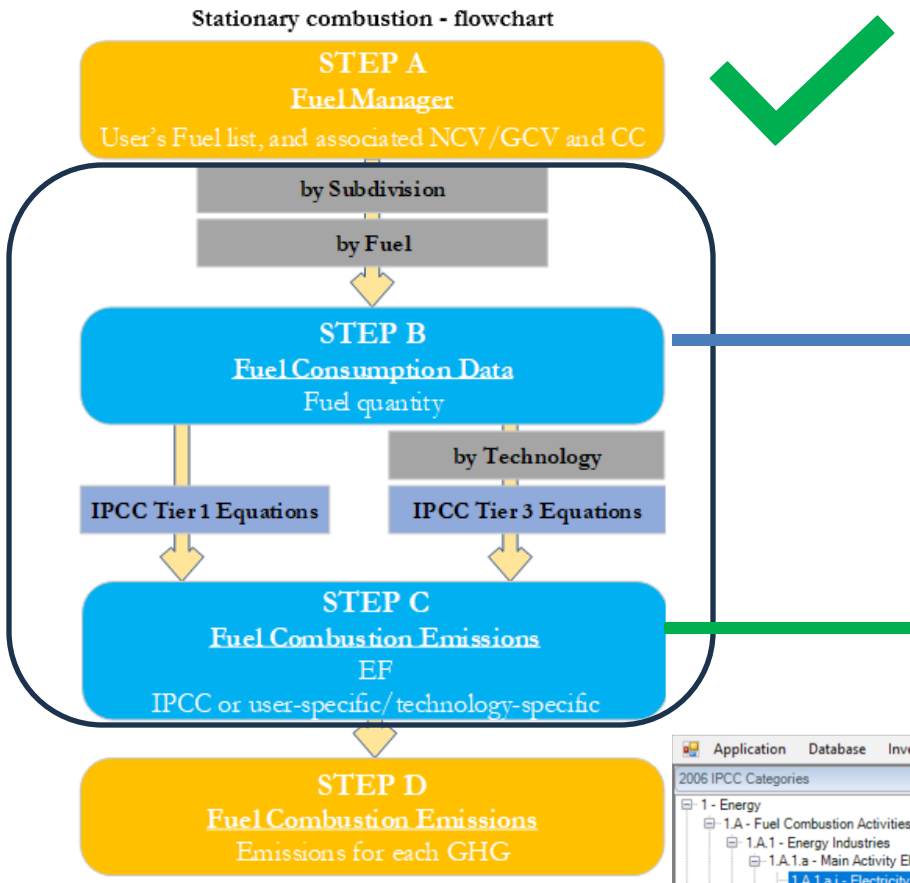
Subdivision	Fuel	Consumption Unit	
S	F	U	C
Unspecified		Gg (Auto CF)	
Total			

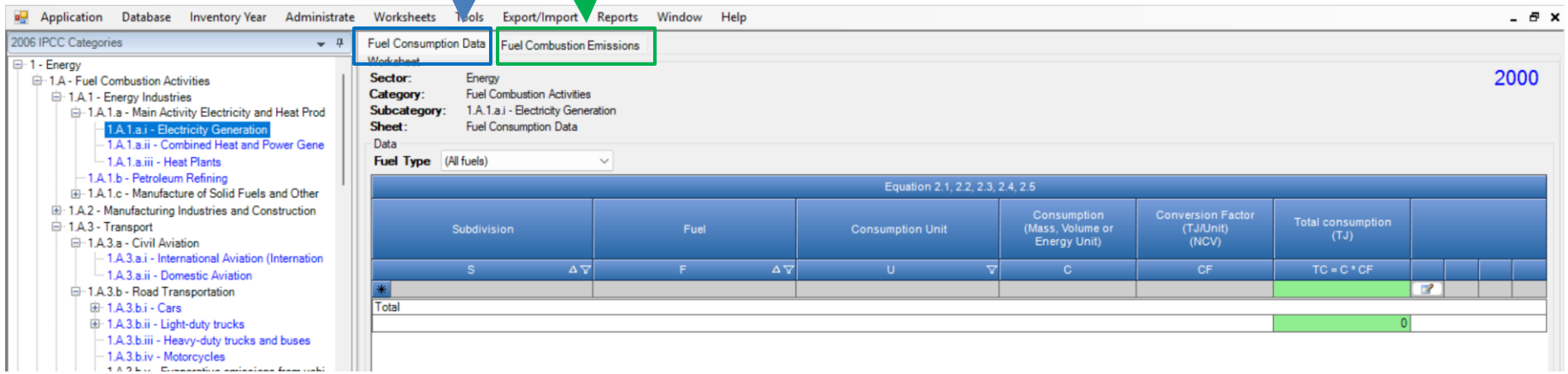
Fuel Type	Fuel Name	Net Calorific Value (TJ / Gg)	Carbon content (NCV) (kg C / GJ)
	Coke Oven Gas	38.7	12.1
	Coking Coal	28.2	25.8
	Gas Coke	28.2	29.2
	Gas Works Gas	38.7	12.1
	Lignite	11.9	27.6
	Oil Shale / Tar Sands	8.9	29.1
	Other Bituminous Coal	25.8	25.8
	Oxygen Steel Furnace Gas	7.06	49.6
	Patent Fuel	20.7	26.6
	Sub-Bituminous Coal	18.9	26.2
Gaseous Fuels	Natural Gas (Dry)	48	15.3
Other Fossil Fuels	Industrial Wastes		39
	Municipal Wastes (nonbio...	10	25
	Old Tires	31.16	15.1
	Waste Oils	40.2	20
Peat	Peat	9.76	28.9
Biomass - solid	Charcoal	29.5	30.5
	Other Primary Solid Bioma...	11.6	27.3
	Wood/Wood Waste	15.6	30.5
Biomass - liquid	Biodiesels	27	19.3

User notes

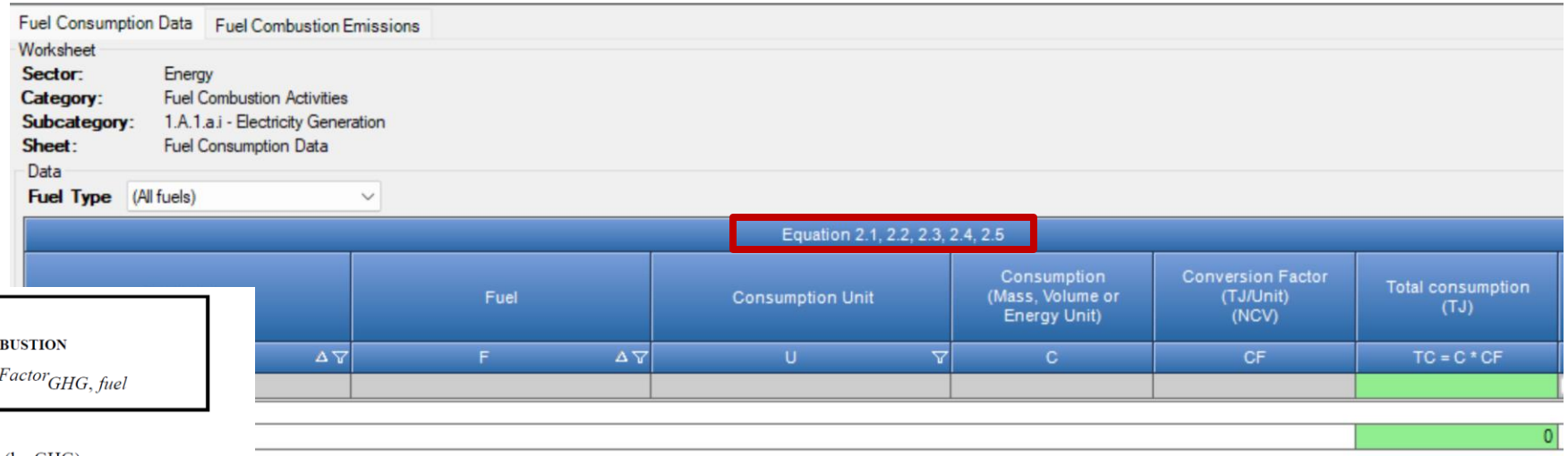
2. Old Tires available for selection in drop-down menu of the calculation worksheets

Recall the workflow





Refresher- Key Equations Stationary Combustion



EQUATION 2.1
GREENHOUSE GAS EMISSIONS FROM STATIONARY COMBUSTION

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

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). For CO_2, it includes the carbon oxidation factor, assumed to be 1.

EQUATION 2.2
TOTAL EMISSIONS BY GREENHOUSE GAS

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

EQUATION 2.3
GREENHOUSE GAS EMISSIONS BY TECHNOLOGY

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

$Emissions_{GHG\ gas,fuel,\ technology}$ = emissions of a given GHG by type of fuel and technology (kg GHG)

$Fuel\ Consumption_{fuel,\ technology}$ = amount[7] of fuel combusted per type of technology (TJ)

$Emission\ Factor_{GHG\ gas,fuel,technology}$ = emission factor of a given GHG by fuel and technology type (kg GHG/TJ)

EQUATION 2.4
FUEL CONSUMPTION ESTIMATES BASED ON TECHNOLOGY PENETRATION

$$Fuel\,Consumption_{\,fuel,technology} = Fuel\,Consumption_{\,fuel} \bullet Penetration_{technology}$$

Where:

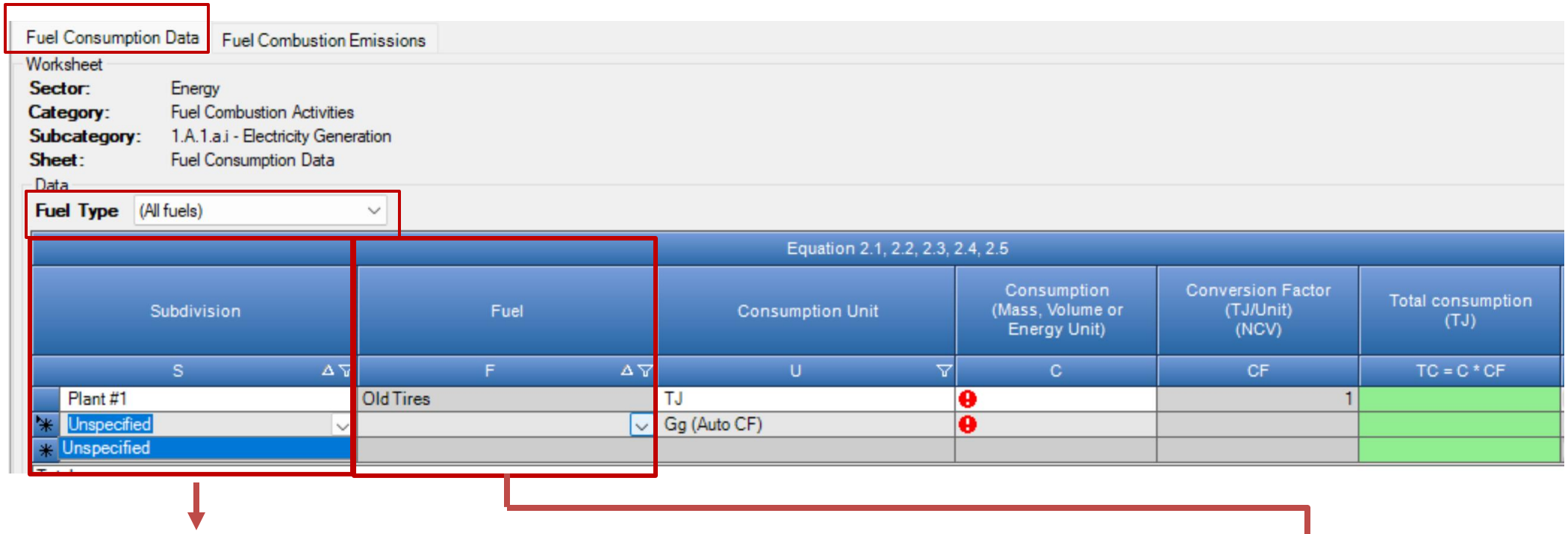
$Penetration_{technology}$ = the fraction of the full source category occupied by a given technology. This fraction can be determined on the basis of output data such as electricity generated which would ensure that appropriate allowance was made for differences in utilisation between technologies.

EQUATION 2.5
TECHNOLOGY-BASED EMISSION ESTIMATION

$$Emissions_{GHG,fuel} = \sum_{technologies} Fuel\,Consumption_{\,fuel,technology} \bullet Emission\ \ Factor_{GHG,fuel,technology}$$

Worksheet – Fuel Consumption Data

Input Activity Data



Subdivision

- ✓ User may input data at the national level (e.g. select “Unspecified” from drop-down menu) or input for specific regions/plants/other
- ✓ Inputting in subdivisions may be helpful for tracking mitigation actions

Fuel

- ✓ Select from drop-down menu; includes all fuels in Fuel Manager
- ✓ Don’t see a fuel? Note that you may filter worksheet view by **fuel type**

Worksheet – Fuel Consumption Data

Equation 2.1, 2.2, 2.3, 2.4, 2.5					
Subdivision	Fuel	Consumption Unit	Consumption (Mass, Volume or Energy Unit)	Conversion Factor (TJ/Unit) (NCV)	Total consumption (TJ)
S	F	U	C	CF	TC = C * CF
Unspecified	Fuel 1	TJ	300,000	1	300,000
Unspecified	Fuel 2	Gg (Auto CF)	5,000	40	200,000
Unspecified	Fuel 3	Gg (Manual CF)	5,000	20	100,000
Unspecified	Fuel 4	* Custom Unit *	10,000,000	0.005	50,000
Total					
					650,000

FUEL CONSUMPTION DATA & CALORIFIC VALUES

- Compile fuel consumption information to estimate **Total Energy Consumption** (TJ).

- Users can enter data in **Energy** (TJ) or **Mass** (Gg) by default. ***Other units*** (*e.g., m³, BTUs, liters*) can also be used, but require a **user-defined conversion factor** (TJ/unit).

Consumption Unit	Consumption *unit type*	Conversion Factor	Conversion Factor Unit (NCV)	*Source of Conversion Factor*
TJ	Energy	Automatic	TJ/TJ	CF = 1
Gg (Auto CF)	Mass	Automatic	TJ/Gg	Fuel Manager *(Default/User defined)*
Gg (Manual CF)	Mass	Manual	TJ/Gg	*User-defined*
**** Custom Unit ****	*Other (e.g. volume)*	Manual	TJ/*Custom Unit*	*User-defined*

Worksheet – Fuel Combustion Emissions

Input Emission Factor and Parameter Information

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

2000

Total consumption, by **subdivision** and **fuel**, carry over from worksheet **Fuel Consumption Data**

Data

Fuel Type (All fuels)

Equation 2.1, 2.2, 2.3, 2.4, 2.5

Subdivision	Fuel	Total consumption (TJ)	CO2 Emissions (Gg CO2)	CH4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
S	F	TC	CO2	CH4	N2O
Plant #1	Old Tires	1,000	0	0	0
Plant#2	Gas/Diesel Oil	2,000	0	0	0
Plant#3	Residual Fuel Oil	2,000	0	0	0
Unspecified	Natural Gas (Dry)	1,500	0	0	0

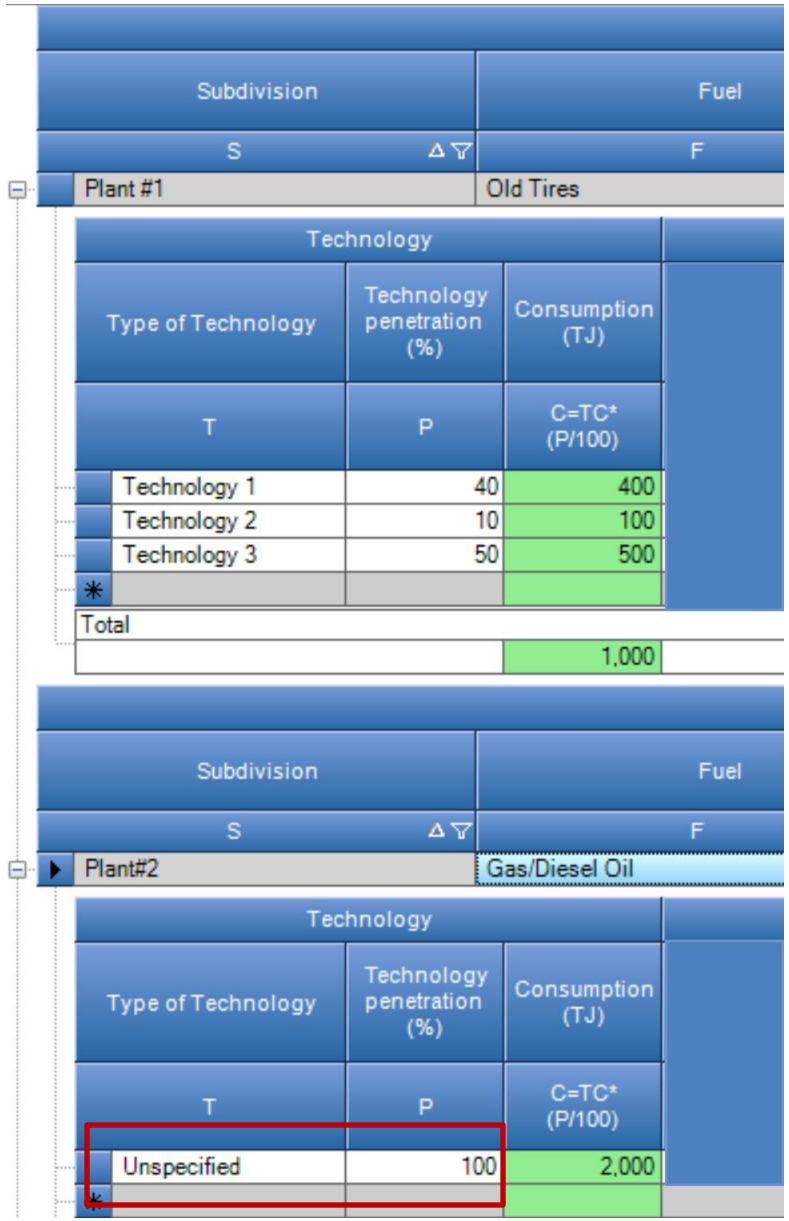
Technology			CO2			CH4		N2O	
Type of Technology	Technology penetration (%)	Consumption (TJ)	CO2 Emission Factor (kg CO2/TJ)	Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)	CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)
T	P	C=TC*(P/100)	EF(CO2)	Z	CO2=C*EF (CO2)/10^6-Z	EF(CH4)	CH4=C*EF (CH4)/10^6	EF(N2O)	N2O=C*EF (N2O)/10^6
Total		0			0		0		0
Total			6,500		0		0		0

Select [+] to open drop-down table and estimate GHG emissions for each subdivision/fuel

Worksheets – Fuel Combustion Emissions

Tier 3

Default method (Tier 1 or Tier 2)



Subdivision	Fuel
S	F
Plant #1	Old Tires

Technology

Type of Technology	Technology penetration (%)	Consumption (TJ)
T	P	C=TC* (P/100)
Technology 1	40	400
Technology 2	10	100
Technology 3	50	500
*		
Total		1,000

Subdivision	Fuel
S	F
Plant#2	Gas/Diesel Oil

Technology

Type of Technology	Technology penetration (%)	Consumption (TJ)
T	P	C=TC* (P/100)
Unspecified	100	2,000
*		

TECHNOLOGY

- For higher tiers, fuel consumption is apportioned by the penetration rate of different technologies
  - You will receive an alert if the sum of technology penetration rates is greater than 100%
- Where the IPCC default method is applied (Tier 1 or Tier 2), "Unspecified" may be selected for **Type of Technology** and the value 100 is automatically entered by the *Software.*
- You can use different Tiers for different fuels, even within a single subdivision

Worksheets – Fuel Combustion Emissions

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

2000

Data

Fuel Type (All fuels)

Equation 2.1, 2.2, 2.3, 2.4, 2.5

Subdivision	Fuel	Total consumption (TJ)	CO2 Emissions (Gg CO2)	CH4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
S	F	TC	CO2	CH4	N2O
Plant #1	Old Tires	1,000	55.37	0	0

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)/1	EF(CH4)	CH4=C*EF(CH4)/1	EF(N2O)	N2O=C*EF(N2O)/10	
Technology 2	10	100	Specified	55,366.66...		5.54					
Technology 3	50	500	Specified	55,366.66...		27.68					
Technology 1	40	400	Calculat...	55,366.67		22.15					
Total											

E.g. **Specified:** default value from Fuel Manager available in drop-down menu

Default Value	Unit	Description
55,366.66666...	kg/TJ	Calculated from current Carbon Content of Fuel defined in Fuel Manager

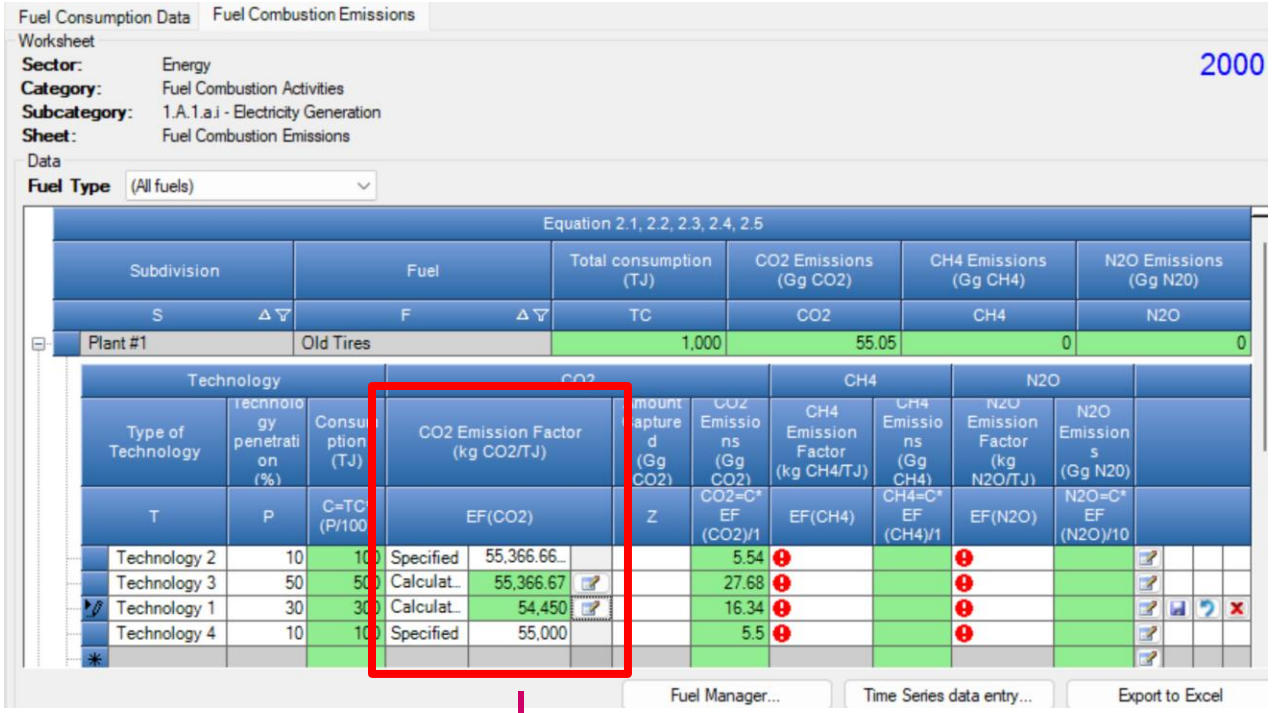
CO_2 EMISSION FACTOR

- Estimate CO_2 emissions using default and/or user-specified *carbon content* and *oxidation factor* or *CO_2 EFs*
- CO_2 EF may be **Specified** or **Calculated**
- Supports disaggregated estimates by ***technology***, enabling different emission factors for the same type of fuel.
- Enables use of different Tiers for different fuels, even within a single subdivision

CO2 Emission Factor

Fuel	Carbon Content of Fuel (kg / GJ)	Oxidation Factor (Fraction)	CO2 Emission Factor (kg CO2/TJ)
F	CC	OX	EF = CC * OX * 44/12 * 1000
Old Tires	15.1	1	55,366.67

Worksheets – Fuel Combustion Emissions



CO_2 EMISSION FACTOR SUMMARY

Estimate Parameters Approach	*CO_2 Emission Factor Option*	*Carbon Content*	*Oxidation Factor*	*CO_2 Emission Factor*
Automatic CO_2 EF selection	**Specified**			IPCC default
	Calculated	IPCC default	IPCC default	**Calculated**
Manual input of $C_{Content}$ and $Oxi._{Factor}$	**Calculated**	User-defined	User-defined	**Calculated**
Manual input of CO_2 EF value	**Specified**	-	-	**User-defined**

Worksheets – Fuel Combustion Emissions

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

2000

Data

Fuel Type (All fuels)

Equation 2.1, 2.2, 2.3, 2.4, 2.5

Subdivision	Fuel	Total consumption (TJ)	CO2 Emissions (Gg CO2)	CH4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
S	F	TC	CO2	CH4	N2O
Plant #1	Old Tires	1,000	22.14667	0	0
Plant#2	Gas/Diesel Oil	2,000	0	0	0
Plant#3	Residual Fuel Oil	2,000	153.39667	0.006	0.00096

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	40	800	Specified	77,400		61.92	3	0.0024	0.6	0.00048
Technology 2	10	200	Calculated	77,366.66667		15.47333	3	0.0006	0.6	0.00012
Technology 3	30	600	Specified	77,050		46.23	3	0.0018	0.6	0.00036
Technology 4	20	400	Calculated	74,433.33333		29.77333	3	0.0012		
Total										

Default Value	Lower limit	Upper limit	Unit	Parameter	Description
0.6	0.2	2	kg/TJ		

CH_4 and N_2O EF

- ✓ After Calculating or Specifying CO_2 EF, user shall complete CH_4 and N_2O columns for completeness
- ✓ CH_4 and N_2O EF may be input directly, or IPCC defaults selected from drop-down menus
- ✓ For some categories, you may see different IPCC defaults developed under different conditions; choose the one most appropriate for national circumstances.

Default Value	Lower limit	Upper limit	Unit	Parameter	Description
33	9.6	110	kg/TJ	Uncontrolled	Motor gasoline uncontrolled default value is based on USEPA (2004b) value for a USA light duty gasoline vehicle (car) - uncontrolled, converted using values and assumptions described in table note (a). If motorcycles account for a significant share of the national vehicle population, inventory compilers should adjust the given default emission factor downwards.
25	7.5	86	kg/TJ	Oxidation Catalyst	Motor gasoline - light duty vehicle oxidation catalyst default value is based on the USEPA (2004b) value for a USA Light Duty Gasoline Vehicle (Car) - Oxidation Catalyst, converted using values and assumptions described in table note (a). If motorcycles account for a significant share of the national vehicle population, inventory compilers should adjust the given default emission factor downwards.
3.8	1.1	13	kg/TJ	Low Mileage Light Duty Vehicle Vintage 1995 or Later	Motor gasoline - light duty vehicle vintage 1995 or later default value is based on the USEPA (2004b) value for a USA Light Duty Gasoline Vehicle (Car) - Tier 1, converted using values and assumptions described in table note (a). If motorcycles account for a significant share of the national vehicle population, inventory compilers should adjust the given default emission factor downwards.

E.g. IPCC default CH_4 EFs for motor gasoline in road transport

EXERCISE 2

CO_2 Emissions from Combustion

Objective

Apply what you have learned to estimate combustion-related GHG emissions from cement production *(hint- IPCC category 1.A.2.f Non-metallic minerals).* You have two cement production facilities in your country.

Use the **IPCC Software** to estimate **CO_2, CH_4 and N_2O emissions** from **1.A.2.f** for the year **2000**
(to open 2000, go to Main Menu→ Inventory→ Create new → select 2000 and Create Empty Inventory Year)

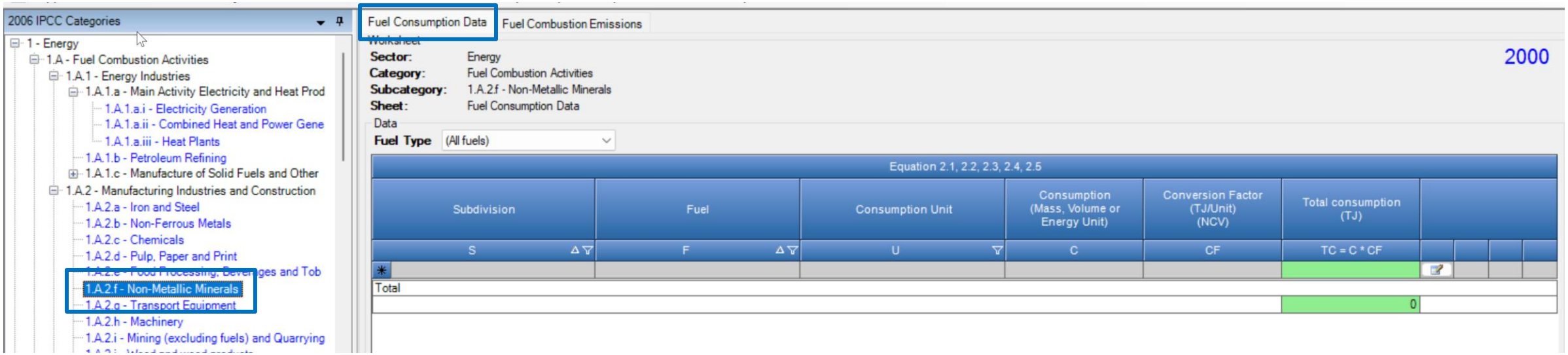
Key Steps

1. **Enter fuel data**: Natural Gas, Old Tires, and Sub-Bituminous Coal
2. **Convert Fuel to Energy**: Use different consumption units
3. **Select Emission Factors**: Use different methods for selection of EF
4. **Estimate CO_2 , CH_4 and N_2O emissions**

Locate Worksheet

1. FUEL CONSUMPTION DATA

- Select Category - 1.A.2.f – Non-Metallic Minerals
- Select Worksheet - Fuel Consumption Data



EXERCISE 2

GHG Emissions from Combustion in 1.A.2.f

Year: 2000

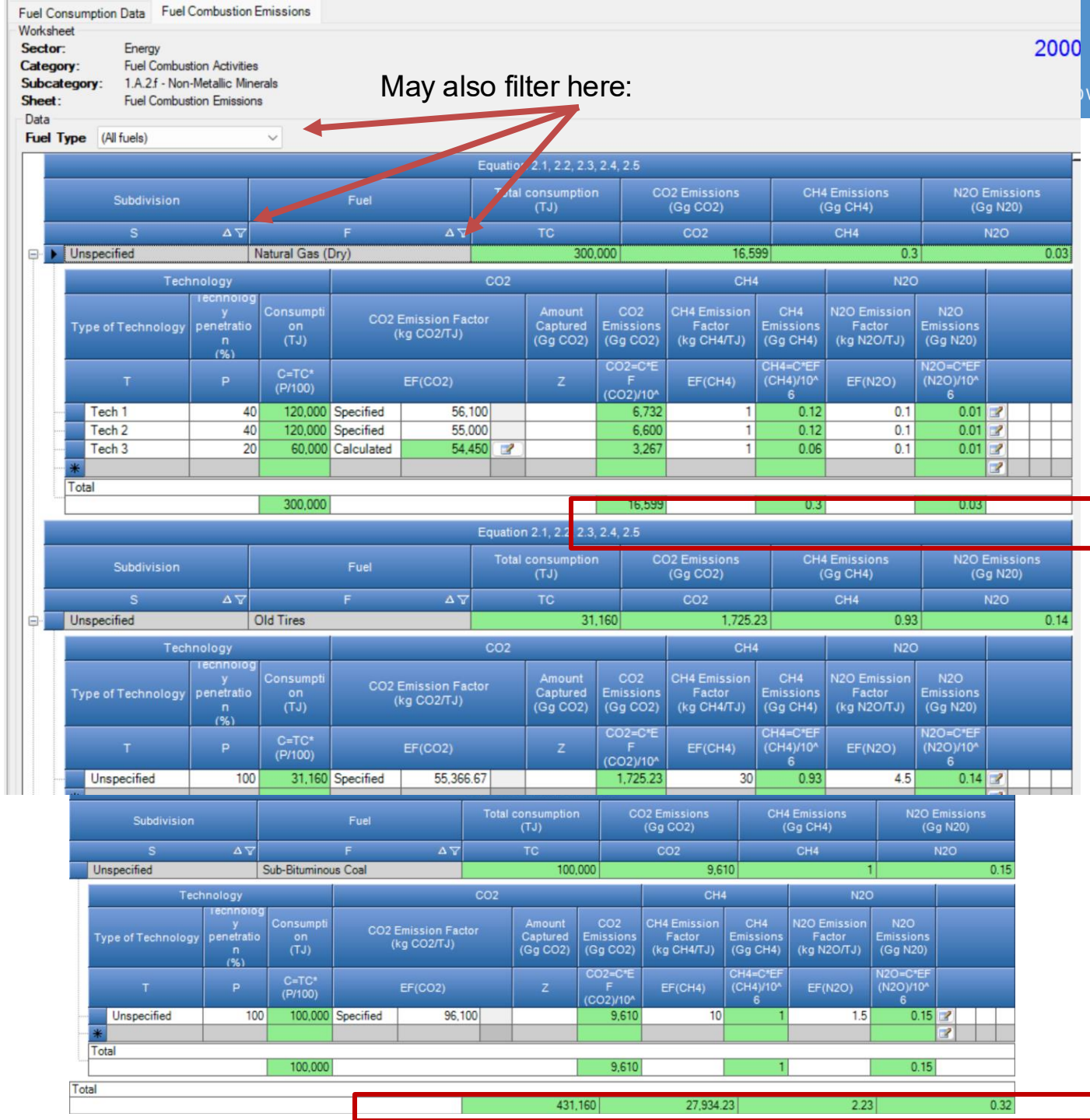
Fuel	Consumption Unit	Fuel Consumption	Conversion Factor	Type of Technology	Tech. Penetration	CO_2 EF *Approach*	CO_2 Emission Factor	Carbon Content	Oxidation Factor
Natural Gas (Dry)	**TJ**	300,000	Automatic	Tech 1	40%	**Specified**	Automatic	-	-
				Tech 2	40%	**Specified**	55 000	-	-
				Tech 3	20%	**Calculated**	Calculated	15.0	0.99
Old Tires	**Gg (Auto CF)**	1,000	Automatic	Unspecified	100%	**Specified**	Automatic	-	-
Sub-Bituminous Coal	**Gg (Manual CF)**	5,000	20.0	Unspecified	100%	**Specified**	Automatic	-	-

WORKSHEET: Fuel Consumption Data

WORKSHEET: Fuel Combustion Emissions

- ✓ For completeness, select **IPCC default CH_4 and N_2O EFs from Natural gas and Sub-bituminous coal**
- ✓ **CH_4 and N_2O EFs for the country-specific fuel, Old Tires**, input directly: CH_4 (30 kg CH_4/TJ), N_2O (4.5 kg N_2O/TJ)

Results 2



Notice how totals can be assessed by fuel, subdivision, and total emissions.

Total GHG emissions from 1.A.2.f:

CO_2 = 27,934.23 Gg CO_2

CH_4 = 2.23 Gg CH_4

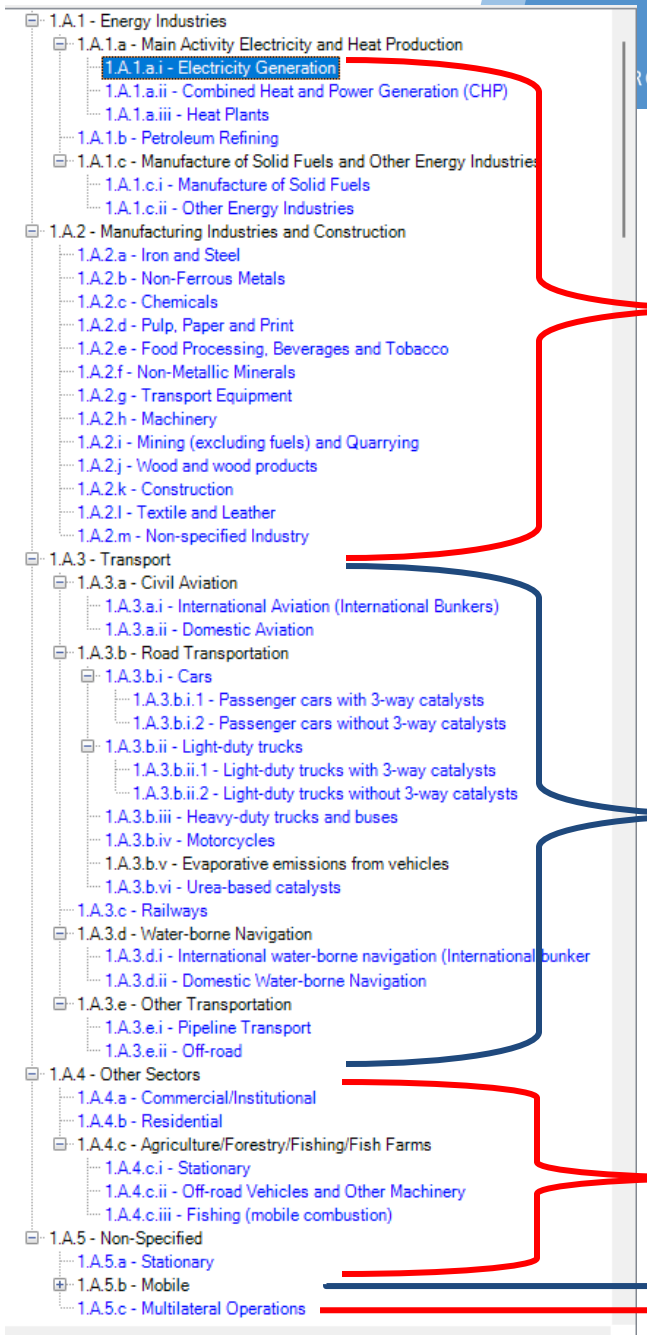
N_2O = 0.32 Gg N_2O

Applicability of Exercise

Try yourself:

- Navigate to IPCC category 1.A.4.b. What do you notice?
- How about category 1.A.3.b.i?
- How about category 1.A.3.a.ii?

- ✓ Same steps undertaken in the previous slides apply in exact same way to many other categories (indicated in red).
- ✓ For some categories, the same worksheets are applicable to the lower tier method (indicated in blue).



Same two worksheets apply

For mobile applications, the same two worksheets are applicable for Tier 1 and/or Tier 2 (depending on category)

Same two worksheets apply

Considerations for Data Input

Important to collect the best quality data possible for use in estimation of GHG emissions

Some key considerations when estimating GHG emissions for the energy sector in the *Software*

Source: https://www.globalmethane.org/

✓ **Avoid double counting of fuel consumption-** double counting of AD results in inadvertent counting of the same emissions/ reductions more than once.

- If fuel is used as a reductant/feedstock in IPPU, it should be subtracted from energy statistics
- Use of fuel combustion **fuel combustion statistics** rather than **fuel delivery statistics** key to avoiding double counting

✓ **Waste fuels combusted for energy recovery are to be included in the appropriate fuel type in the energy sector**

- Where **waste incinerators also produce heat or power**, emissions from this waste combustion is calculated in the energy sector; the corresponding amount of waste considered as a fuel is subtracted from the waste sector
- Combustion of other forms of energy captured elsewhere for use also reported in the energy sector (e.g. landfill gas, manure, biogas) as a biomass fuel
- When **biofuels** are combusted with fossil fuels, determine split between fossil and non-fossil fractions and input relative fractions in the *Software*, with corresponding EFs

Considerations for Data Input

IPCC Software automatically maps information items to the proper reporting category in the IPCC Reporting Tables and the UNFCCC CRT:

- ✓ CO_2 emissions from **biomass combustion** are included as an information item in the energy sector; CH_4 and N_2O emissions from its combustion included in totals.
- ✓ CO_2 CH_4 and N_2O emissions from fuels used for international aviation and international waterborne navigation **(International Bunkers)** are excluded from national totals and reported separately as memo items.
- ✓ *Software* allows input for CO_2 **capture** for each category /fuels. CO_2 capture of fossil and biogenic fuels also mapped to reporting tables.

Table1 | Table1.A(a)s1 | Table1.A(a)s2 | Table1.A(a)s3 | Table1.A(a)s4 | Table1.A(b)

TABLE 1 SECTORAL REPORT FOR ENERGY

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2
	(kt)
1.D. Memo items: (3)	
1.D.1. International bunkers	7,380.8797
1.D.1.a. Aviation	1,116.3731
1.D.1.b.Navigation	6,264.5066
1.D.2. Multilateral operations	21,161.10069
1.D.3. CO2 emissions from biomass	99,037.84582
1.D.4. CO2 captured	-300
1.D.4.a. For domestic storage	-100
1.D.4.b. For storage in other countries	-200

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS			AMOUNT CAPTURED (4)
	Consumption	NCV/GCV (5)	CO2 (1)	CH4	N2O	CO2 (2,3)	CH4	N2O	CO2
	(TJ)		(t/TJ)	(kg/TJ)	(kg/TJ)	(kt)	(kt)	(kt)	(kt)
1.A. Fuel combustion	1,149,143.2	NCV				61,240.677	2.9079832	0.387898...	-100
Liquid fuels	48,300	NCV	3.17591442	0.1242236	0.01987578	153.39666667	0.006	0.00096	NA, NE, NO
Solid fuels	100,000	NCV	96.1	10	1.5	9,510	1	0.15	-100
Gaseous fuels (6)	901,500	NCV	55.23793677	0.99833611	0.09983361	49,797	0.9	0.09	NA, NE, NO
Other fossil fuels (7)	32,160	NCV	55.35697554	29.06716418	4.36007463	1,780.280333...	0.9348	0.14022	NA, NE, NO
Peat (8)	NA, NE, NO	NCV	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE,...	NA, NE, NO
Biomass (3)	67,183.2	NCV	54.6	1	0.1	3,668.20272	0.0671832	0.006718...	NA, NE, NO

Images preparing data in Software for UNFCCC CRT.

Summary

Used the IPCC Inventory Software for Energy sector to

- ✓ Review and update the Fuel-Manager- added a country-specific fuel
- ✓ Navigate the user interface and worksheets for stationary combustion
- ✓ Input AD and EF information at various levels, applicable to Tier 1, Tier 2 and Tier 3 methods and estimate GHG emissions
- ✓ Review applicability of exercise to other energy-related categories
- ✓ Understand interaction with other sectors

Reference Approach

Refresher - Reference Approach

- ✓ The Reference Approach is a **top-down method** that uses a country's energy supply data to calculate CO_2 emissions from combustion, primarily of fossil fuels.

- ✓ Recommended to use both the sectoral approach and the reference approach to estimate CO_2 emissions and compare the results for **validation**.

THE ALGORITHM

1: Estimate Apparent Fuel Consumption in Original Units

2: Convert to a Common Energy Unit

3: Multiply by Carbon Content to Compute Total Carbon

4: Compute the Excluded Carbon

5: Correct for Carbon Unoxidised and Convert to CO_2 Emissions

THE EQUATION

EQUATION 6.1
CO_2 EMISSIONS FROM FUEL COMBUSTION USING THE REFERENCE APPROACH

$$CO_2\ Emissions = \sum_{all\ fuels} \left[\begin{array}{l} ((Apparent\ Consumption_{fuel} \bullet Conv\ Factor_{fuel} \bullet CC_{fuel}) \bullet 10^{-3} \\ - Excluded\ Carbon_{fuel}) \bullet COF_{fuel} \bullet 44/12 \end{array} \right]$$

Refresher- Key Equation

$$CO_2\ EMISSIONS_{fuel} = (Apparent\ Consumption_{fuel} \bullet Carbon\ Content_{fuel}) - Excluded\ Carbon_{fuel} \bullet Oxidation\ Factor \bullet 44/12$$

Represents total estimated consumption of a fuel, considering **production**, **imports**, **exports**, **bunkers** and **stock changes**

Represents carbon emissions **not directly** attributed to **burning fuel for energy purposes**.

Represents fraction of that fuel oxidized to CO_2

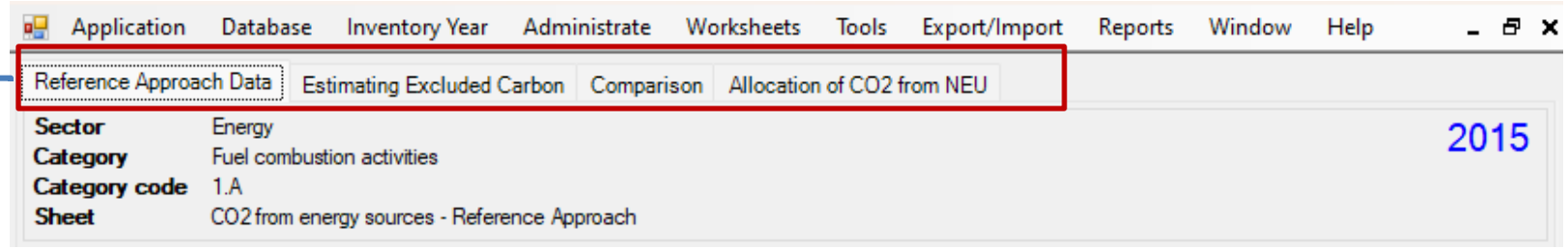
$$APPARENT\ CONSUMPTION_{fuel} = Production_{fuel} + Imports_{fuel} - Exports_{fuel} - International\ Bunkers_{fuel} - Stock\ Change_{fuel}$$

Primary fuels

Secondary fuels

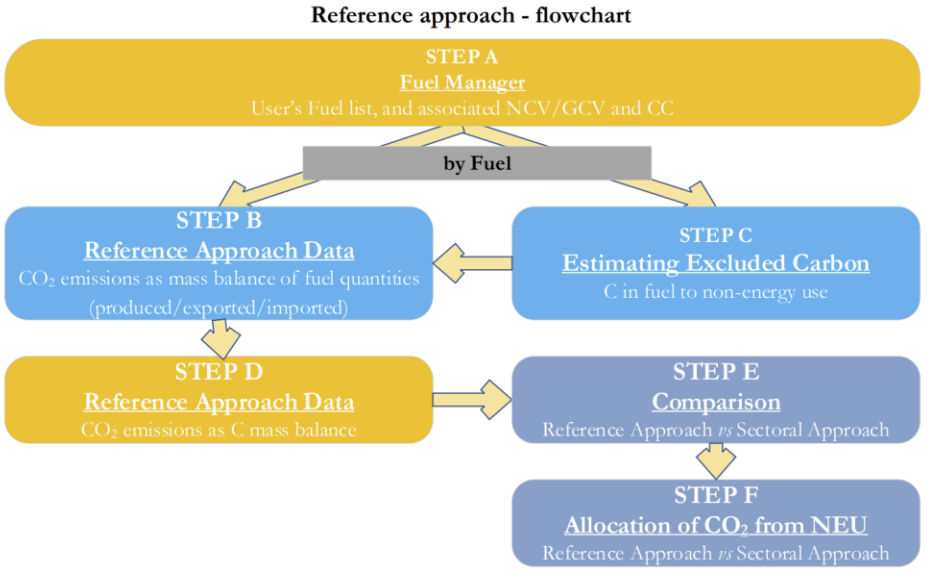
Production	= Domestic production of fossil fuels
Imports	= Fuels imported into the country
Exports	= Fuels exported out of the country
Stock Changes	= Refers to the variation in the amount of fuels stored over a specific period
International Bunkers	= Fuels used for international aviation and marine transport; *excluded from national totals*

Recall- Use of Energy Sector Users' Guidebook



Reference Approach Data	Inputs **fuel supply data, calorific value, carbon content**, and **calculates CO_2 emissions.**
Estimating Excluded Carbon	Calculates the **amount of carbon to exclude** from non-combustion fuels uses.
Comparison	**Compares CO_2 emissions estimates** from the **Reference** and **Sectoral** approaches.
Allocation of CO2 from NEU	Records **CO_2 excluded** that is later released in **another Inventory category**.

The Energy Sector Users' Guidebook will explain how to use these worksheets and populate the necessary information.



Input data in Worksheet Reference Approach Data

Select or enter manually the measurement unit used (e.g. Gg, TJ, m^3). When Gg or TJ is selected, Column G is automatically populated based on data in the Fuel Manager. When another unit is input, the user must populate the conversion factor (cell turns white, see sub-bituminous coal)

From Fuel Manager

Automatically populated from worksheet Estimating Excluded Carbon (if applicable)

Select [+] to expand fuel list

Reference Approach Data | Estimating Excluded Carbon | Compa

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

1990

			Step 1						Step 2		Step 3		Step 4		Step 5	
Fuel Types		Unit	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	Apparent Consumption (TJ) H=F*G	Carbon content (t C/TJ) I	Total Carbon (Gg C) J=H*I/1000	Excluded Carbon (Gg C) K	Net Carbon Emissions (Gg C) L=J-K	Fraction of Carbon Oxidised M	Actual CO2 Emissions (Gg CO2) N=L*M*44/12
Liquid Fuels: 22 item(s)										0		0		0		0
Solid Fuels: 15 item(s)										0		0		0		0
Primary Fu...	Anthracite	Gg						0	26.7	0	26.8	0		0	1	0
	Coking Coal	Gg						0	28.2	0	25.8	0		0	1	0
	Lignite	TJ						0	1	0	27.6	0		0	1	0
	Oil Shale / Tar Sands	TJ						0	1	0	29.1	0		0	1	0
	Other Bituminous Coal	Gg						0	25.8	0	25.8	0		0	1	0
	Sub-Bituminous Coal	ktoe						0		0	26.2	0		0	1	0
Secondary...	Blast Furnace Gas	Gg						0	2.47	0	70.8	0		0	1	0
	Brown Coal Briquettes	Gg						0	20.7	0	26.6	0		0	1	0
	Coal Tar	Gg						0	28	0	22	0		0	1	0
	Coke Oven Coke / Lignite...	Gg						0	28.2	0	29.2	0		0	1	0
	Coke Oven Gas	Gg						0	38.7	0	12.1	0		0	1	0
	Gas Coke	Gg						0	28.2	0	29.2	0		0	1	0
	Gas Works Gas	Gg						0		0	12.1	0		0	1	0
	Oxygen Steel Furnace Gas	Gg						0		0	49.6	0		0	1	0
	Patent Fuel	Gg						0		0						
Gaseous Fuels: 1 item(s)																0
Other Fossil Fuels: 3 item(s)																0
Peat: 1 item(s)																
Biomass - solid: 3 item(s)																

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

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

Input the amount of production, imports, exports, bunkers (if applicable) and stock change

When stock change is +, this withdraws supply from consumption and decreases apparent consumption. A negative stock change, when subtracted, causes an increase in apparent consumption

Green cells in the *Software* always represent results of calculations

Pre-populated with IPCC default of 1; user may change

Did you forget a fuel in the Fuel Manager? You can access Fuel Manager here to make changes.

Can export to, and import from, Excel

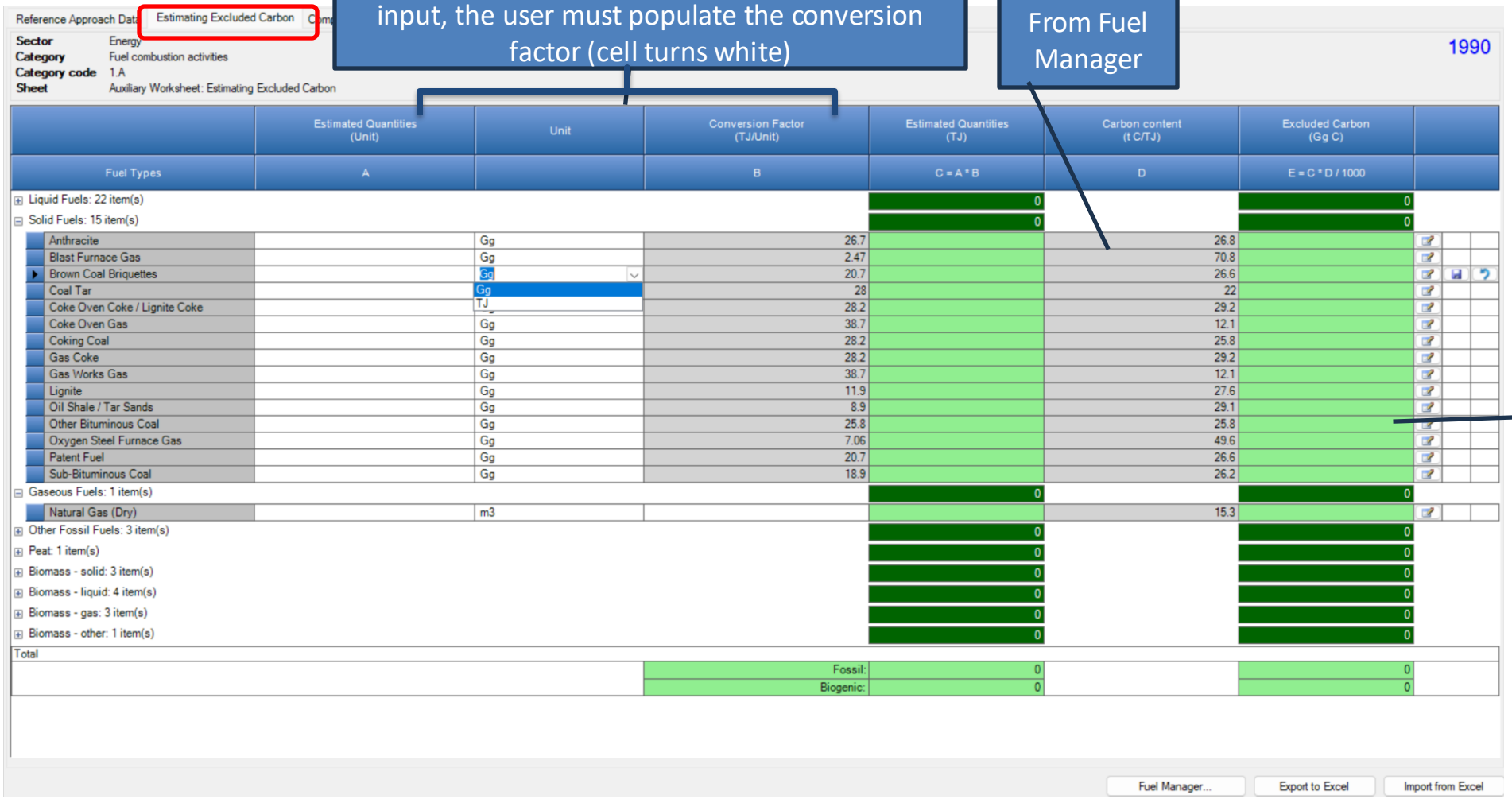
Input data in Worksheet Estimating Excluded Carbon

Select the type of fuel-use resulting in excluded carbon, and input the quantity and the unit (e.g. Gg, TJ, m^3). When Gg or TJ is selected as the Unit, Column B is automatically populated based on data in the Fuel Manager. When another unit is input, the user must populate the conversion factor (cell turns white)

From Fuel Manager

Select [+] to expand fuel list

Excluded carbon is calculated and input into Column K of Reference Approach Data worksheet



Reference Approach Data | Estimating Excluded Carbon | Comp

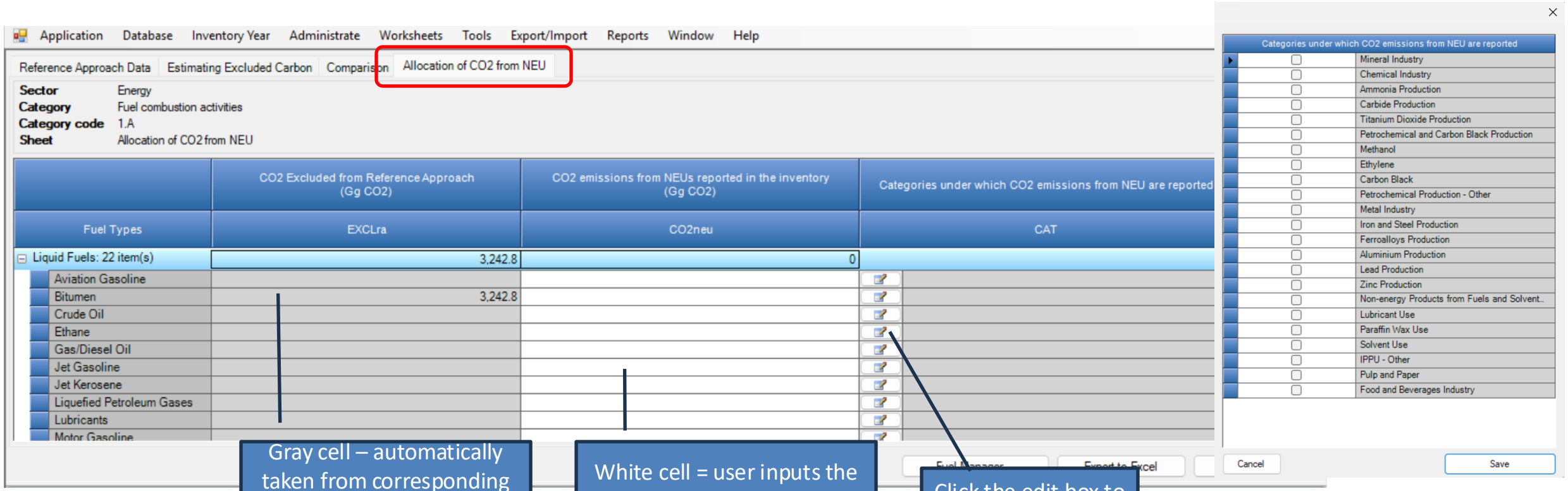
Sector Energy
Category Fuel combustion activities
Category code 1.A
Sheet Auxiliary Worksheet: Estimating Excluded Carbon

1990

Fuel Types	Estimated Quantities (Unit) A	Unit	Conversion Factor (TJ/Unit) B	Estimated Quantities (TJ) C = A * B	Carbon content (t C/TJ) D	Excluded Carbon (Gg C) E = C * D / 1000
Liquid Fuels: 22 item(s)				0		0
Solid Fuels: 15 item(s)				0		0
Anthracite		Gg	26.7		26.8	
Blast Furnace Gas		Gg	2.47		70.8	
Brown Coal Briquettes		Gg	20.7		26.6	
Coal Tar		Gg	28		22	
Coke Oven Coke / Lignite Coke		TJ	28.2		29.2	
Coke Oven Gas		Gg	38.7		12.1	
Coking Coal		Gg	28.2		25.8	
Gas Coke		Gg	28.2		29.2	
Gas Works Gas		Gg	38.7		12.1	
Lignite		Gg	11.9		27.6	
Oil Shale / Tar Sands		Gg	8.9		29.1	
Other Bituminous Coal		Gg	25.8		25.8	
Oxygen Steel Furnace Gas		Gg	7.06		49.6	
Patent Fuel		Gg	20.7		26.6	
Sub-Bituminous Coal		Gg	18.9		26.2	
Gaseous Fuels: 1 item(s)				0		0
Natural Gas (Dry)		m3			15.3	
Other Fossil Fuels: 3 item(s)				0		0
Peat: 1 item(s)				0		0
Biomass - solid: 3 item(s)				0		0
Biomass - liquid: 4 item(s)				0		0
Biomass - gas: 3 item(s)				0		0
Biomass - other: 1 item(s)				0		0
Total						
			Fossil:	0		0
			Biogenic:	0		0

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

Input data in Worksheet Allocation of CO_2 from NEU



Gray cell – automatically taken from corresponding value in worksheet Estimating Excluded Carbon

White cell = user inputs the CO_2 emissions reported elsewhere in the GHG Inventory that are to be excluded

Click the edit box to indicate where in the inventory it is reported

Exercise 3 – Reference Approach

CASE STUDY: ESTIMATING THE REFERENCE APPROACH

Using energy supply statistics

Scenario:

Consider emissions estimated in **Exercise 2** as your Sectoral approach.

Goal:

Use the **energy supply statistics** to estimate the Reference approach

Your Task:

1. Enter energy supply data and determine **Apparent Consumption**
2. Enter non-energy data and determine **Excluded Carbon**
3. Estimate **CO_2 Emissions**
4. **Compare** Reference and Sectoral Approach

Exercise 3a – Reference Approach Data

Exercise 3a: Input the energy supply data into worksheet **"Reference Approach Data" for 2000**

Note units ↓

Fuel	Type of Fuel	Unit	Production	Imports	Exports	International Bunkers	Stock Change
Crude	Liquid	Gg	0.0	6,500.0	0.0	0.0	+170.0
Residual Fuel Oil	Liquid	Gg	-	0.0	86.3	41.1	0.0
Sub-Bituminous Coal	Solid	TJ	10,000	83,000	0.0	0.0	-3,030.0
Natural Gas	Gaseous	TJ	150,000	100,000	0.0	0.0	0
Old Tires	Other fossil fuels	TJ	-	31,200	0.0	0.0	0.0

Questions: What is apparent consumption of Natural Gas, in TJ? What are CO_2 emissions from this apparent consumption?

Note: at this stage you have not yet considered any excluded carbon.

Exercise 3b – Excluded Carbon

Exercise 3b: Enter non-energy use of fuel data in worksheet: **Estimating Excluded Carbon**. You know that in 2000, an ammonia producing plant consumed 11.3 Gg of Natural Gas as feedstock in its process.

> **Question:** Note how the *Software* automatically populates the Conversion factor and carbon content from the Fuel Manager. **What is the estimated amount of Excluded Carbon from Natural Gas Used as a feedstock in Ammonia Production? _____ Gg C.**

Exercise 3c: In worksheet **Allocation of CO2 from NEU**, indicate that all CO_2 emissions from this ammonia production are reported elsewhere in the GHG Inventory, in the category for ammonia production.

Results 3a

Worksheet:
Reference Approach Data

Answers: Apparent consumption of Natural Gas, in TJ? 250,000 TJ

What are CO_2 emissions (*Note: at this stage you have not yet considered any excluded carbon)* 14,025 $GgCO_2$

Note that after Exercise 3b, the total here becomes 13,994.57 $GgCO_2$

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

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

			Step 1						Step 2		Step 3		Step 4		Step 5	
			Production (Unit)	Imports (Unit)	Exports (Unit)	International Bunkers (Unit)	Stock change (Unit)	Apparent Consumption (Unit)	Conversion Factor (TJ/Unit)	Apparent Consumption (TJ)	Carbon content (t C/TJ)	Total Carbon (Gg C)	Excluded Carbon (Gg C)	Net Carbon Emissions (Gg C)	Fraction of Carbon Oxidised	Actual CO2 Emissions (Gg CO2)
Fuel Types		Unit	A	B	C	D	E	F=A+B-C-D-E	G	H=F*G	I	J=H*I/1000	K	L=J-K	M	N=L*M*44/12
Liquid Fuels: 22 item(s)										262,612.04		5,246.58		5,246.58		19,237.46
Primary Fuels	Crude Oil	Gg		6,500			170	6,330	42.3	267,759	20	5,355.18		5,355.18	1	19,635.66
	Natural Gas Liquids	Gg						0	44.2	0	17.5	0		0	1	0
	Orimulsion	Gg						0	27.5	0	21	0		0	1	0
Secondary Fuels	Aviation Gasoline	Gg						0	44.3	0	19.1	0		0	1	0
	Bitumen	Gg						0	40.2	0	22	0		0	1	0
	Ethane	Gg						0	46.4	0	16.8	0		0	1	0
	Gas/Diesel Oil	Gg						0	43	0	20.2	0		0	1	0
	Jet Gasoline	Gg						0	44.3	0	19.1	0		0	1	0
	Jet Kerosene	Gg						0	44.1	0	19.5	0		0	1	0
	Liquefied Petroleum Gases	Gg						0	47.3	0	17.2	0		0	1	0
	Lubricants	Gg						0	40.2	0	20	0		0	1	0
	Motor Gasoline	Gg						0	44.3	0	18.9	0		0	1	0
	Naphtha	Gg						0	44.5	0	20	0		0	1	0
	Other Kerosene	Gg						0	43.8	0	19.6	0		0	1	0
	Other Petroleum Products	Gg						0	40.2	0	20	0		0	1	0
	Paraffin Waxes	Gg						0	40.2	0	20	0		0	1	0
	Petroleum Coke	Gg						0	32.5	0	26.6	0		0	1	0
	Refinery Feedstocks	Gg						0	43	0	20	0		0	1	0
	Refinery Gas	Gg						0	49.5	0	15.7	0		0	1	0
	Residual Fuel Oil	Gg			86.3	41.1		-127.4	40.4	-5,146.96	21.1	-108.6		-108.6	1	-398.2
	Shale Oil	Gg						0	38.1	0	20	0		0	1	0
	White Spirit and SBP	Gg						0	40.2	0	20	0		0	1	0
Solid Fuels: 15 item(s)										96,030		2,515.99		2,515.99		9,225.28
Primary Fuels	Anthracite	Gg						0	26.7	0	26.8	0		0	1	0
	Coking Coal	Gg						0	28.2	0	25.8	0		0	1	0
	Lignite	Gg						0	11.9	0	27.6	0		0	1	0
	Oil Shale / Tar Sands	Gg						0	8.9	0	29.1	0		0	1	0
	Other Bituminous Coal	Gg						0	25.8	0	25.8	0		0	1	0
	Sub-Bituminous Coal	TJ	10,000	83,000			-3,030	96,030	1	96,030	26.2	2,515.99		2,515.99	1	9,225.28
Secondary Fuels	Blast Furnace Gas	Gg						0	2.47	0	70.8	0		0	1	0
	Brown Coal Briquettes	Gg						0	20.7	0	26.6	0		0	1	0
	Coal Tar	Gg						0	28	0	22	0		0	1	0
	Coke Oven Coke / Lignite...	Gg						0	28.2	0	29.2	0		0	1	0
	Coke Oven Gas	Gg						0	38.7	0	12.1	0		0	1	0
	Gas Coke	Gg						0	28.2	0	29.2	0		0	1	0
	Gas Works Gas	Gg						0	38.7	0	12.1	0		0	1	0
	Oxygen Steel Furnace Gas	Gg						0	7.06	0	49.6	0		0	1	0
	Patent Fuel	Gg						0	20.7	0	26.6	0		0	1	0
Gaseous Fuels: 1 item(s)										250,000		3,825		3,825		14,025
Primary Fuels	Natural Gas (Dry)	TJ	150,000	100,000			0	250,000	1	250,000	15.3	3,825	0	3,825	1	14,025
Other Fossil Fuels: 4 item(s)										31,200		471.12		471.12		1,727.44
Primary Fuels	Industrial Wastes	Gg						0		0	39	0		0	1	0
	Municipal Wastes (nonbio...	Gg						0	10	0	25	0		0	1	0
	Waste Oils	Gg						0	40.2	0	20	0		0	1	0
Secondary Fuels	Old Tires	TJ		31,200				31,200	1	31,200	15.1	471.12		471.12	1	1,727.44
Peat: 1 item(s)										0		0		0		0
Biomass - solid: 3 item(s)										0		0		0		0
Biomass - liquid: 4 item(s)										0		0		0		0
Biomass - gas: 3 item(s)										0		0		0		0

Results 3b and 3c

Worksheet: Excluded Carbon

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

2000

Fuel Types	Estimated Quantities (Unit) A	Unit	Conversion Factor (TJ/Unit) B	Estimated Quantities (TJ) C = A * B	Carbon content (t C/TJ) D	Excluded Carbon (Gg C) E = C * D / 1000
Liquid Fuels: 22 item(s)				0		0
Solid Fuels: 15 item(s)				0		0
Gaseous Fuels: 1 item(s)				542.4		8.3
Natural Gas (Dry)	11.3	Gg	48	542.4	15.3	8.3
Other Fossil Fuels: 4 item(s)				0		0
Peat: 1 item(s)				0		0
Biomass - solid: 3 item(s)				0		0
Biomass - liquid: 4 item(s)				0		0
Biomass - gas: 3 item(s)				0		0
Biomass - other: 1 item(s)				0		0
Total						
			Fossil:	542.4		8.3
			Biogenic:	0		0

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

2000

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)	0	0	
Solid Fuels: 15 item(s)	0	0	
Gaseous Fuels: 1 item(s)	30.43	30.43	
Natural Gas (Dry)	30.43	30.43	Ammonia Production
Other Fossil Fuels: 4 item(s)	0	0	
Peat: 1 item(s)	0	0	
Biomass - solid: 3 item(s)	0	0	
Biomass - liquid: 4 item(s)	0	0	
Biomass - gas: 3 item(s)	0	0	
Biomass - other: 1 item(s)	0	0	
Total			
Fossil:	30.43	30.43	
Biogenic:	0	0	

Estimated amount of Excluded Carbon from Natural Gas Used as a feedstock in Ammonia Production? **8.3 Gg C.**

Exercise 3d – Reference Approach

The Comparison worksheet compares the energy consumption and CO_2 emissions between the Sectoral Approaches and Reference Approaches. Take a look at the results and answer the questions below… Differences greater than 5% should be explained.

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

	Reference Approach				Sectoral Approach		Difference	
Fuel Types	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)	262,612.04	0	262,612.04	19,237.46	0		100	100
⊞ Solid Fuels: 15 item(s)	96,030	0	96,030	9,225.28	100,000	9,61	-3.97	-4
⊞ Gaseous Fuels: 1 item(s)	250,000	542.4	249,457.6	13,994.57	300,000	16,59	-16.85	-15.69
⊞ Other Fossil Fuels: 4 item(s)	31,200	0	31,200	1,727.44	31,160	1,725.2	0.13	0.13
⊞ Peat: 1 item(s)	0	0	0	0	0		0	0
Total								
	639,842.04	542.4	639,299.64	44,184.75	431,160	27,934.2	48.27	58.17

1. Reading the table, why is there a large difference in energy consumption between SA/RA for liquid fuels?
2. Can you think of a possible reason why the reference approach for gaseous fuels could be less than the sectoral approach?

Summary

Used the IPCC Inventory Software for Energy sector to

- ✓ Estimate GHG emissions from the Reference Approach

- ✓ Review comparison between the Reference Approach and Sectoral Approaches, and what this may tell you as part of your QC efforts

Selected Cross-cutting Functionalities:

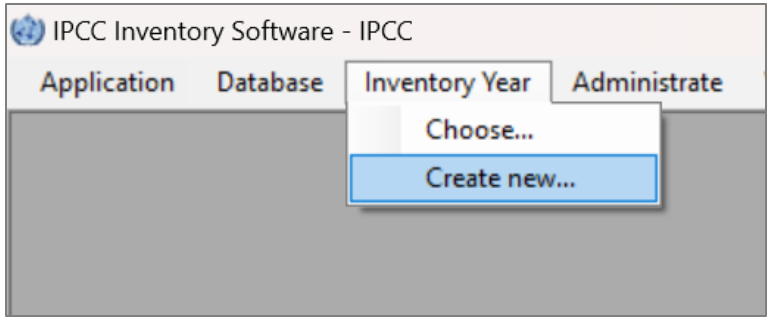
- Create new inventory year
- Time series data entry

Create a New Inventory Year

Create New Inventory Year

I. Select the year

Select **Create New** and choose a year from the "New Inventory Year" list.



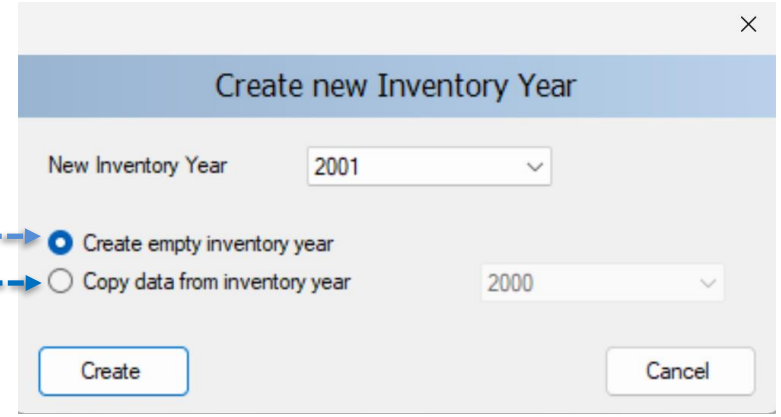
II. Choose a Creation Mode

Create empty Inventory Year:

This option creates a completely new inventory year with no pre-existing data.

Copy data from Inventory Year:

This option creates a new inventory year by copying all data from a selected year.



Exercise 4: Create New Inventory Years

Scenario:
You have already estimated stationary combustion emissions for the year 2000 in Exercises 1-3. Now, you will create the 2000-2004 inventories, updating information as appropriate.

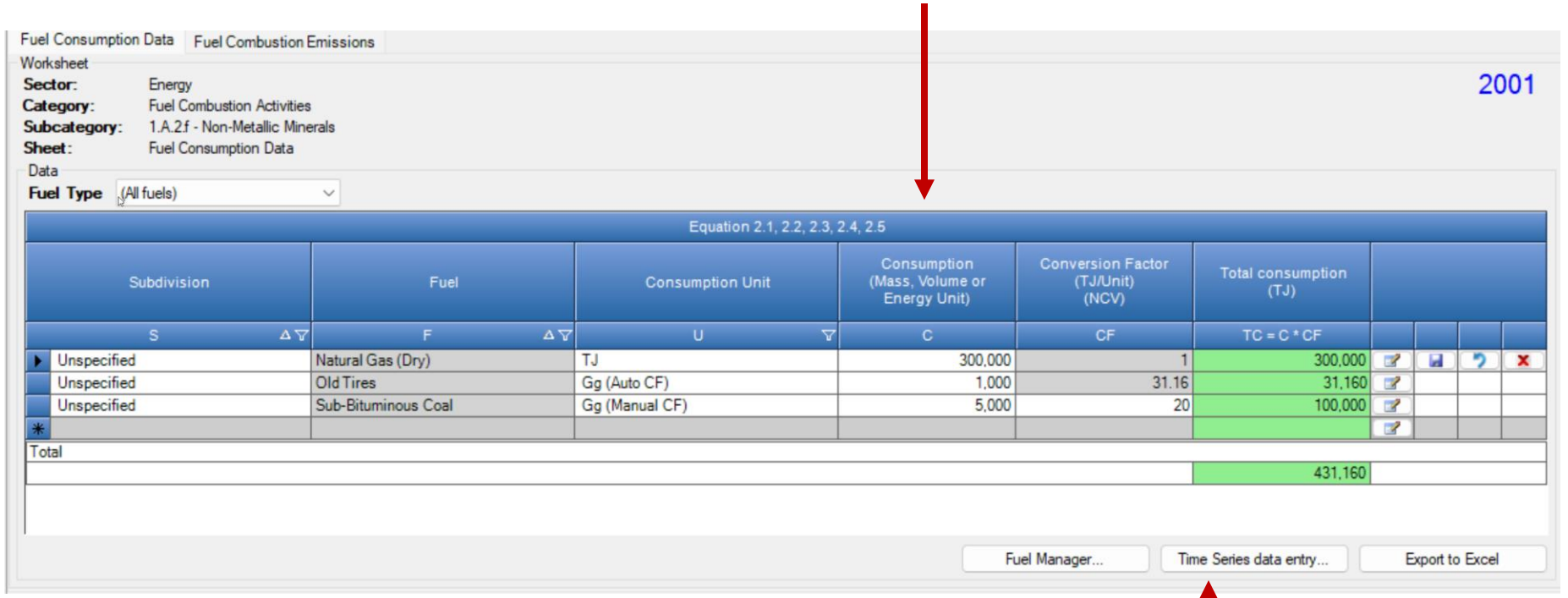
Goal:
Accurately replicate the GHG emission estimates for the years 2000-2004, following the same methodologies used for 2000.

Your Task: Your boss asked you to begin creating the inventories for 2001-2004. Create a new inventory year for each of these years; **copying data** from 2000.

Time Series Data Entry

Updating Subsequent GHG Inventory

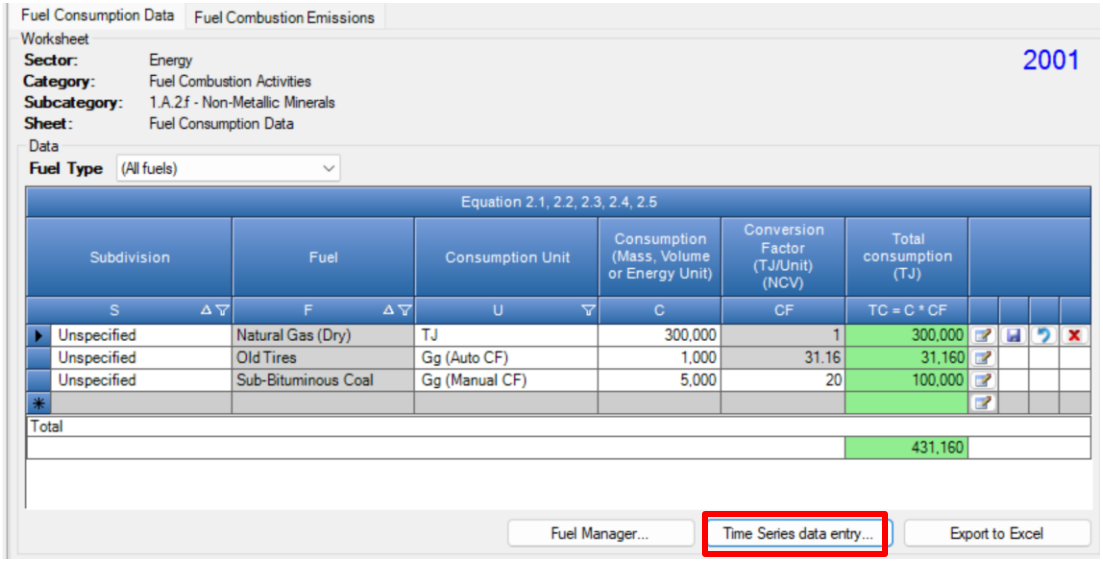
I. The “copied” inventory for 2001 carried over all information input for 2000. You may update the AD, and if applicable EFs (remembering to ensure time series consistency)

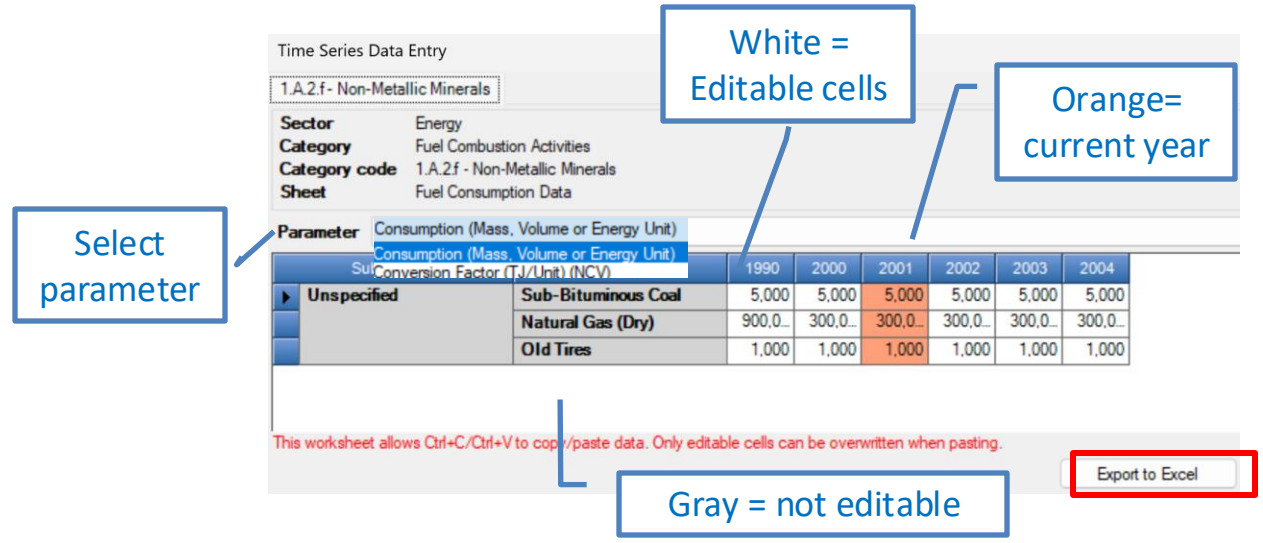


II. For a longer time series, you may use the **Time Series data entry** function

Time Series Data Entry

- ✓ Most worksheets support time series data entry.
- ✓ This functionality allows the user to edit parameters of a worksheet across **existing inventory years**, and for **which the activity has been entered into the *Software*** *(e.g. subdivision and fuel for the energy sector)*.
- ✓ Parameters available for time series data entry reflect the open worksheet





Export Time Series Data

1

✓ After selecting category and parameter for which you wish to export data you may either copy data from Excel and paste directly into this table, or **Export to Excel**

2

Generated:	6/10/2025 10:37:16 AM							
Country:	World							
Sector:	Energy							
Category:	Fuel Combustion Activities							
Subcategory:	1.A.2.f - Non-Metallic Minerals							
Sheet:	Fuel Consumption Data							
Parameter:	Consumption (Mass, Volume or Energy Unit)							
Subdivision	**Fuel**	**Fuel GUID**	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**
Unspecified	Sub-Bituminous Coal	0000001a-0000-0000-0000-000000000000	5000	5000	5000	5000	5000	5000
Unspecified	Natural Gas (Dry)	00000026-0000-0000-0000-000000000000	900000	300000	300000	300000	300000	300000
Unspecified	Old Tires	12c40dc2-66fb-4fea-85ce-3c3b2fca8f8a	1000	1000	1000	1000	1000	1000

✓ Save the file to your computer

3

Generated:	6/10/2025 10:37:16 AM							
Country:	World							
Sector:	Energy							
Category:	Fuel Combustion Activities							
Subcategory:	1.A.2.f - Non-Metallic Minerals							
Sheet:	Fuel Consumption Data							
Parameter:	Consumption (Mass, Volume or Energy Unit)							
Subdivision	**Fuel**	**Fuel GUID**	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**
Unspecified	Sub-Bituminous Coal	0000001a-0000-0000-0000-000000000000	5000	5000	5050	5075	5090	5100
Unspecified	Natural Gas (Dry)	00000026-0000-0000-0000-000000000000	900000	300000	300100	300200	300300	300400
Unspecified	Old Tires	12c40dc2-66fb-4fea-85ce-3c3b2fca8f8a	1000	1000	1050	1060	1070	1080

✓ Update values in white cells.

✓ Do not make any changes to the structure of the table (e.g. adding/deleting columns)

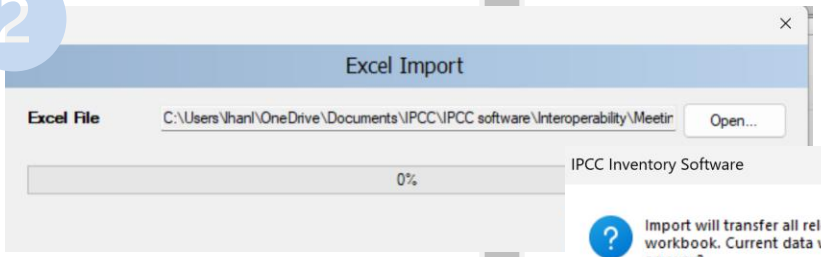
✓ Save file to your computer

Import Time Series Data

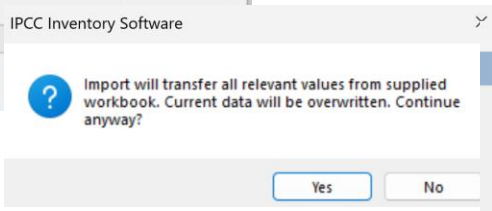
1

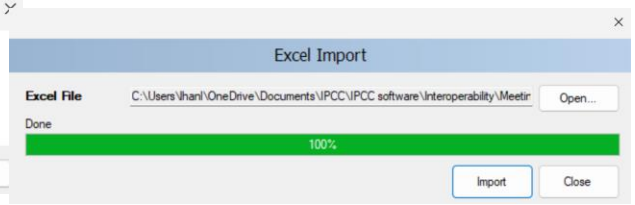
✓ After selecting category and parameter for which you wish to import data, select **Import from Excel.**

2



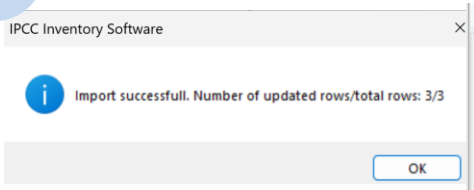
✓ Select **Open** and the relevant Excel file from your computer.

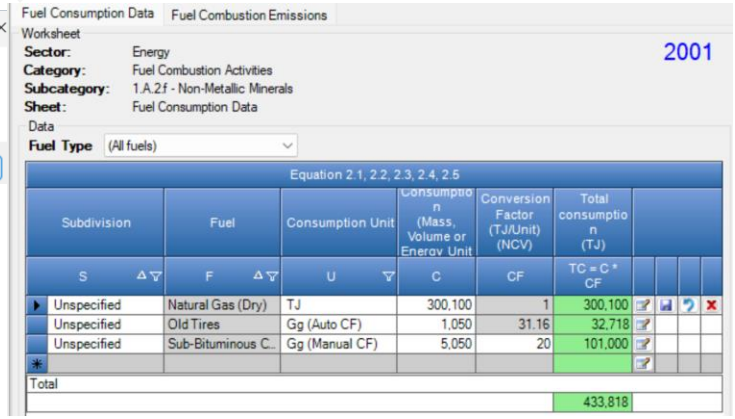


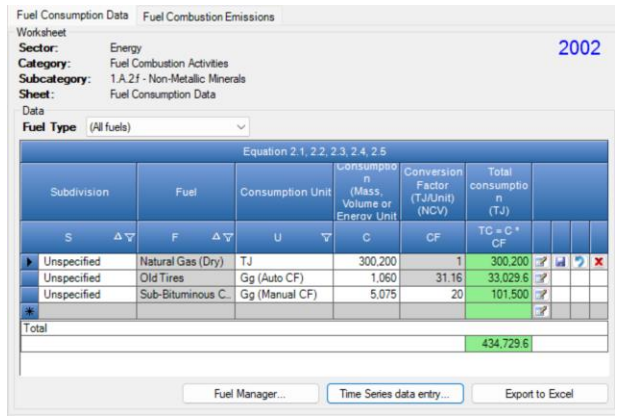


✓Select **Import.** An alert appears that all relevant values from the workbook will be imported and current data overwritten. Selecting **Yes** will continue the process

3







✓ After notification that the import was successful, you may close the time series data entry window. Updated data appear for all years.

Exercise 5: Update AD for 2001-2004

Scenario:
You have already estimated stationary combustion emissions for the year 2000 in Exercises 1-3. You have also created the GHG inventories for 2001-2004 as a copy of the 2000 inventory.

Goal:
Update the AD for the years 2001-2004 using the **Time Series Data Entry** function

Your Task:

1. You are likely in inventory year 2004. Navigate to **category 1.A.2.f** and worksheet **Fuel Consumption Data** *(note: you can do this task from any existing year inventory)*
2. Select **Time Series data entry**
3. Select parameter **Consumption**
4. Select **Export to Excel.** Save the file to your computer and **update the Consumption data** for 2001-2004 using the data in the embedded Excel file

Fuel	2000	2001	2002	2003	2004	2005
Sub-Bituminous Coal	5000	5050	5075	5090	5100	5100
Natural Gas (Dry)	300000	300100	300200	300300	300400	300400
Old Tires	1000	1050	1060	1070	1080	1080

5. Save the Excel file to your computer
6. Select **Import from Excel** to import the updated AD

Knowledge Check

Navigate to worksheet **Fuel Combustion Emissions**. Which parameter(s) can you import/export to Excel from this calculation worksheet?

In worksheet **Fuel Combustion Emissions**, given the updated AD for the year 2005 imported in the last exercise, what are total CO_2 emissions in 2005 from category 1.A.2.f?

Answer: CO_2 = 28,286.58 Gg CO_2

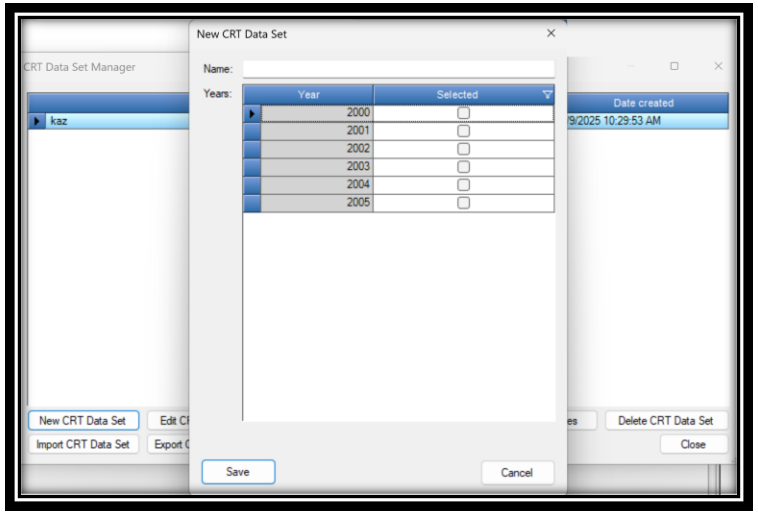
Interoperability between IPCC Inventory Software and UNFCCC ETF Reporting Tool

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO
UN environment programme

Objective of Session

Using a combination of presentation, live demonstration and hands-on exercises, strengthen your skills to use the IPCC Inventory Software to prepare a GHG inventory and populate the common reporting tables (CRT) under the Paris Agreement.

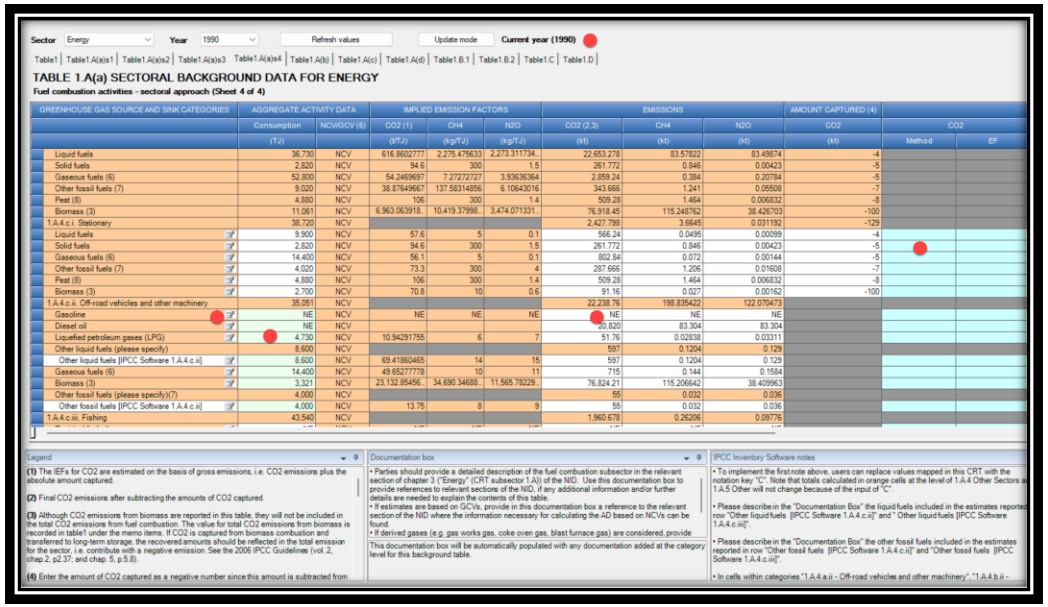
Highlights of Interactive Demonstration



Create CRT Data Set – First step in preparing the CRTs. Will compile information AD and emissions information from the underlying IPCC Inventory Software worksheets for selected year(s). Will allow you to see how data will map to CRT!

Open and review visualized CRT, provide additional information for CRT–

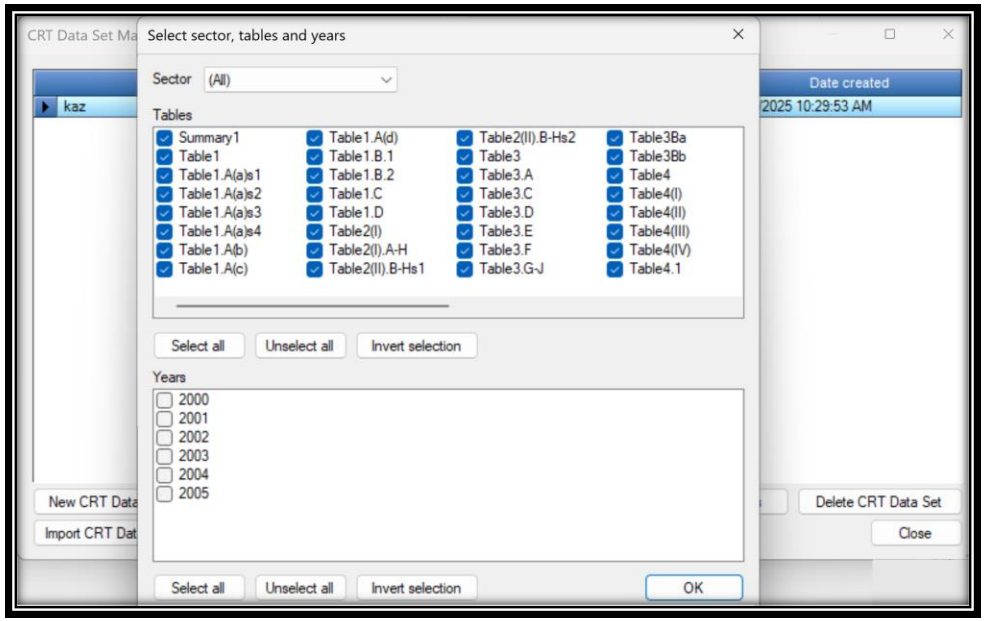
- ✓ Apply changes to single year or multiple years
- ✓ How to change notation keys
- ✓ How to provide notation key explanations for CRT9
- ✓ How to provide method and EF information for Summary 3
- ✓ How do designate information as confidential
- ✓ Learn meaning of green shading in cells
- ✓ How to provide information for documentation boxes
- ✓ Make a change in calculation worksheet and regenerate CRT



Highlights of Interactive Demonstration

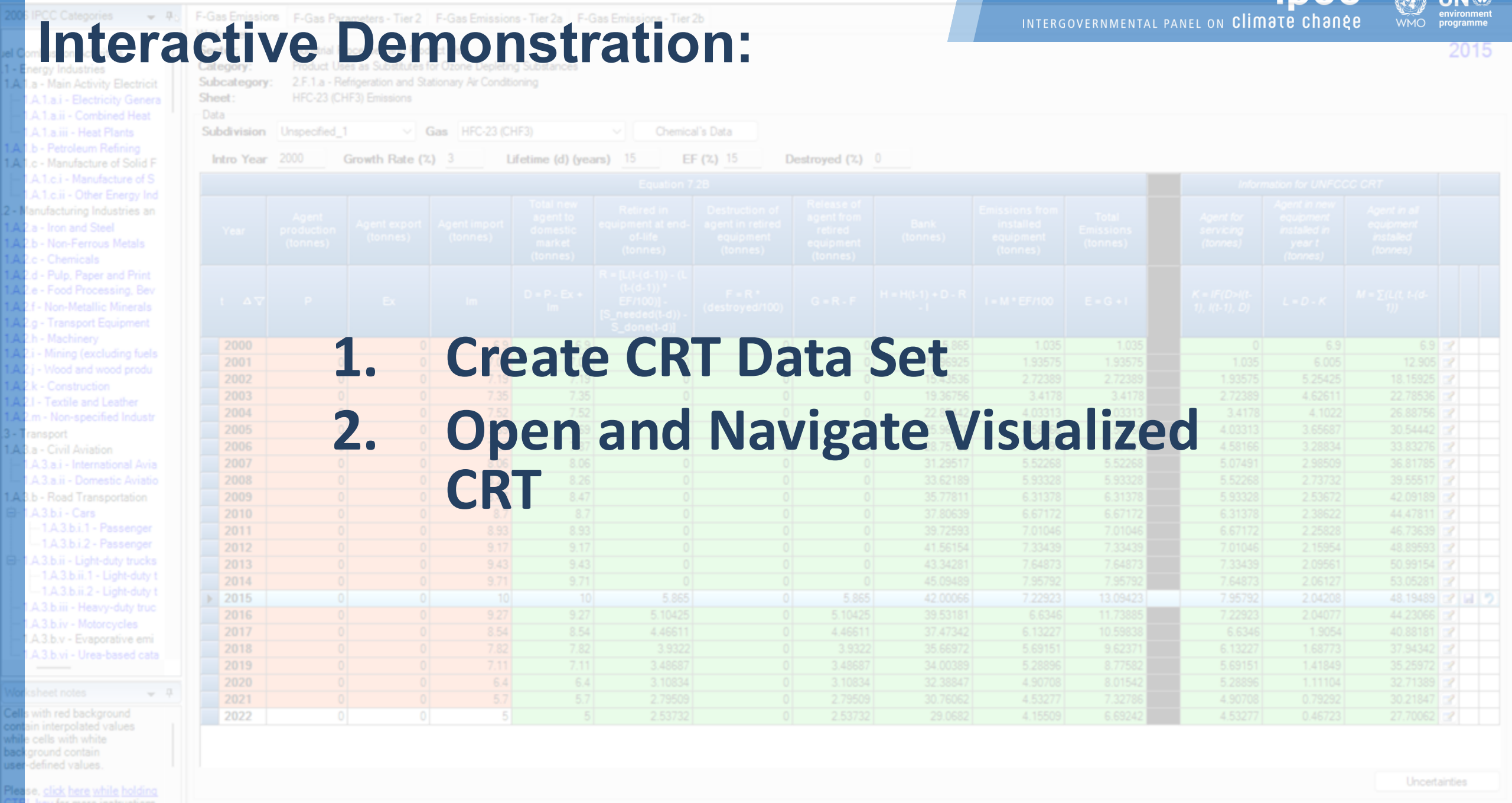
Generate IPCC JSON - generate IPCC JSON file for upload to UNFCCC

IPCC Inventory Software



Interactive Demonstration:

1. Create CRT Data Set
2. Open and Navigate Visualized CRT



CRT Data Set Management

Prepare, review, and edit CRT tables directly in the Software.

What it does

Allows users to create and manage CRT data sets — where you can review and customize the contents of CRT tables before use or submission.

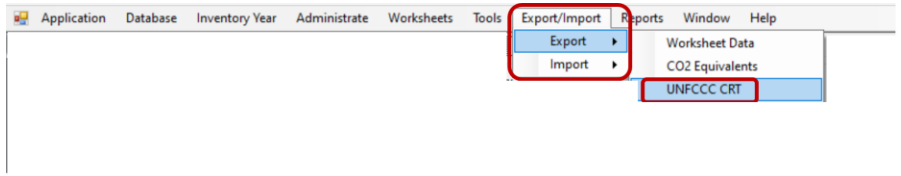
Why it matters

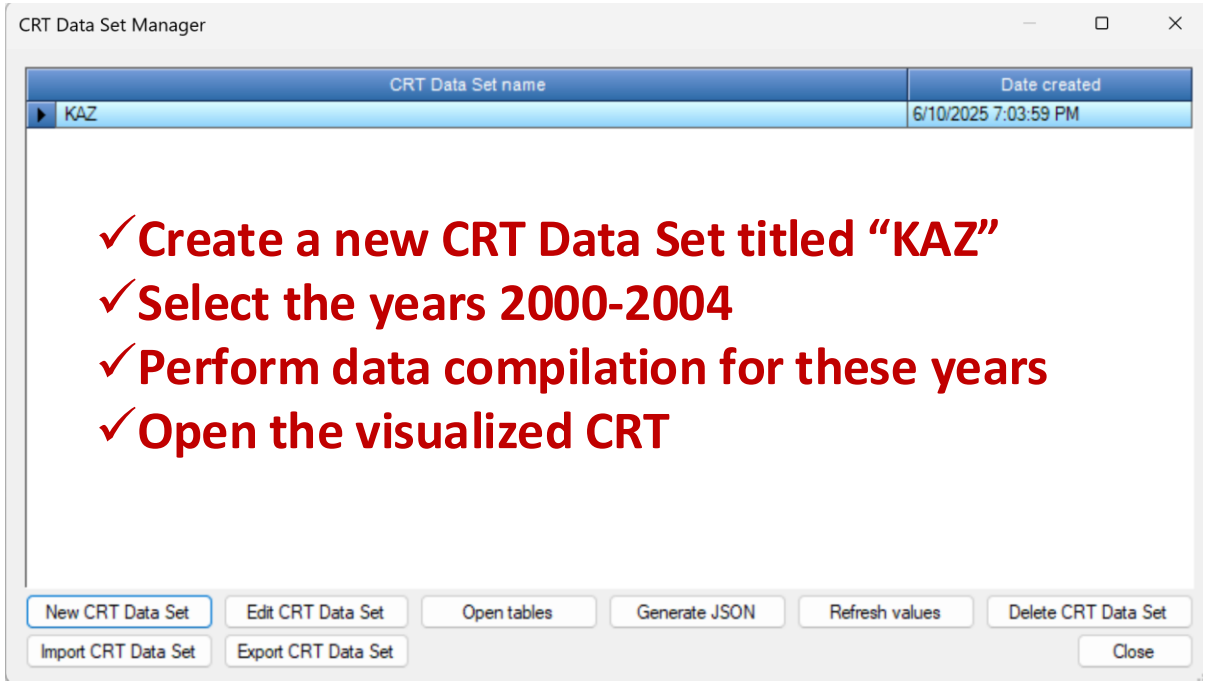
Enhances transparency; view and check how data will appear in the CRT (sectors/categories not all one-to-one mapping)
Enables submission to UNFCCC

Key features

Create, name, manage and delete CRT Data Sets
Import/Export CRT Data Sets in XML format
Refresh (i.e. update) entire CRT Data Set with **latest worksheet data**
Generate JSON for **CRT Data Set**

Exercise 6 Produce CRT Data Set and Open Visualized CRT





- ✓Create a new CRT Data Set titled "KAZ"
- ✓Select the years 2000-2004
- ✓Perform data compilation for these years
- ✓Open the visualized CRT

Want more information?

See Section on CRT Data Set Manager of the Software Manual in PowerPoint

Test your understanding

1. What is the 2000 estimate for CO_2 emissions from category 1.A.2.f?
2. Navigate to table 1.A(b). What is the % difference in energy consumption between the sectoral and reference approaches for gaseous fuels?
3. Select "**Summaries"** from the drop-down menu next to "Sector". Select **Summary 2**. Scroll all the way to the bottom of the table. What are total CO_2 equivalent emissions without LULUCF for your inventory?

Results 6 Produce CRT Data Set and Open Visualized CRT

Test your understanding

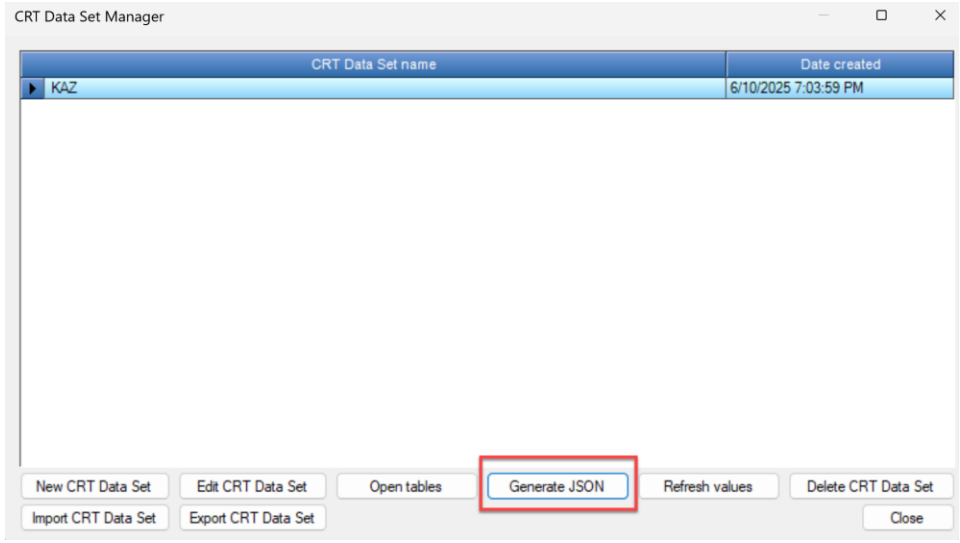
1. What is the 2000 estimate for CO_2 emissions from category 1.A.2.f?
2. Navigate to table 1.A(b). What is the % difference in energy consumption between the reference and sectoral approaches for gaseous fuels?
3. Select "**Summaries"** from the drop-down menu next to "Sector". Select **Summary 2**. Scroll all the way to the bottom of the table. What are total CO_2 equivalent emissions without LULUCF for your inventory?

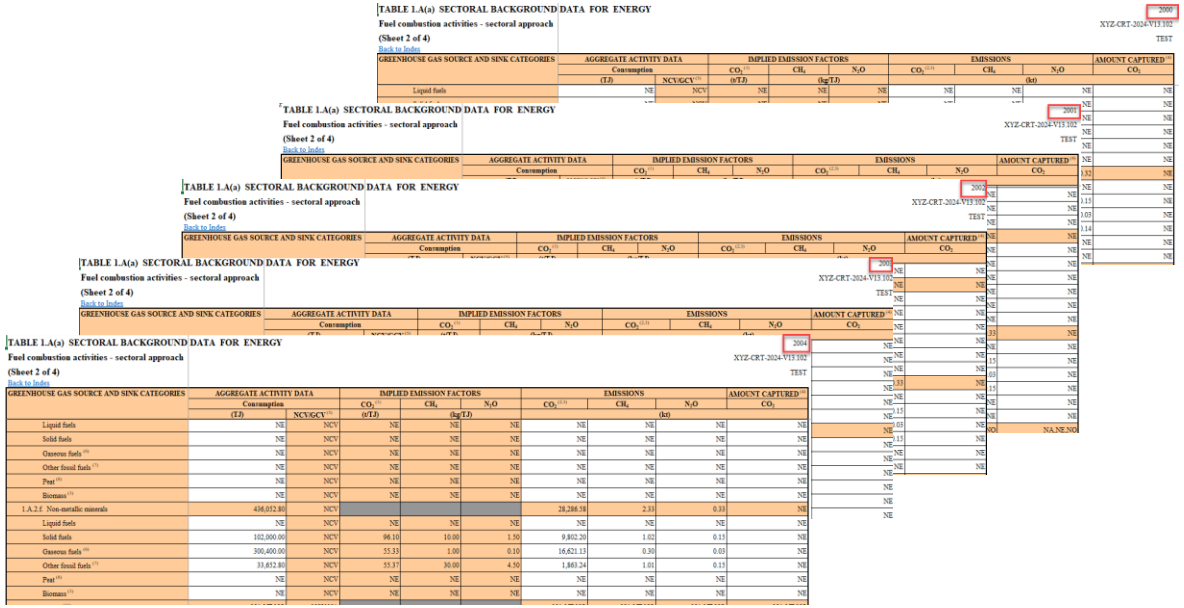
1. 27,934.23
2. -16.85%
3. 28,081.66 $ktCO_2eq$

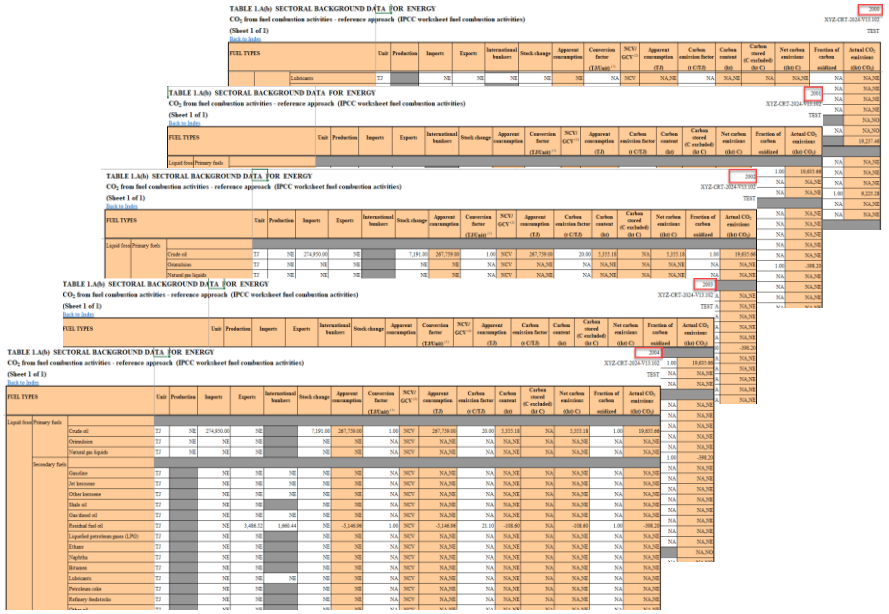
Did you know…

The CRTs require additional information in a GHG Inventory for assessing TACCC (e.g. provide information on notation keys used, methodological tiers and EFs).

However, if you do nothing else at this stage, but generate the IPCC JSON … AD and emissions would already transfer into the proper cells of the CRT.







Demonstration and Exercises:

1. Understand purpose of “Update mode”
2. Change notation key, add explanations and comments
3. Add method/EF information
4. Add comments to documentation box

Provide Additional Information

Paris Agreement CRTs require more than AD and emissions

What it does

The user can provide all additional information required for CRT reporting in the IPCC Software

Why it matters

Allows you to provide **additional information** required for Paris Agreement reporting

Key features

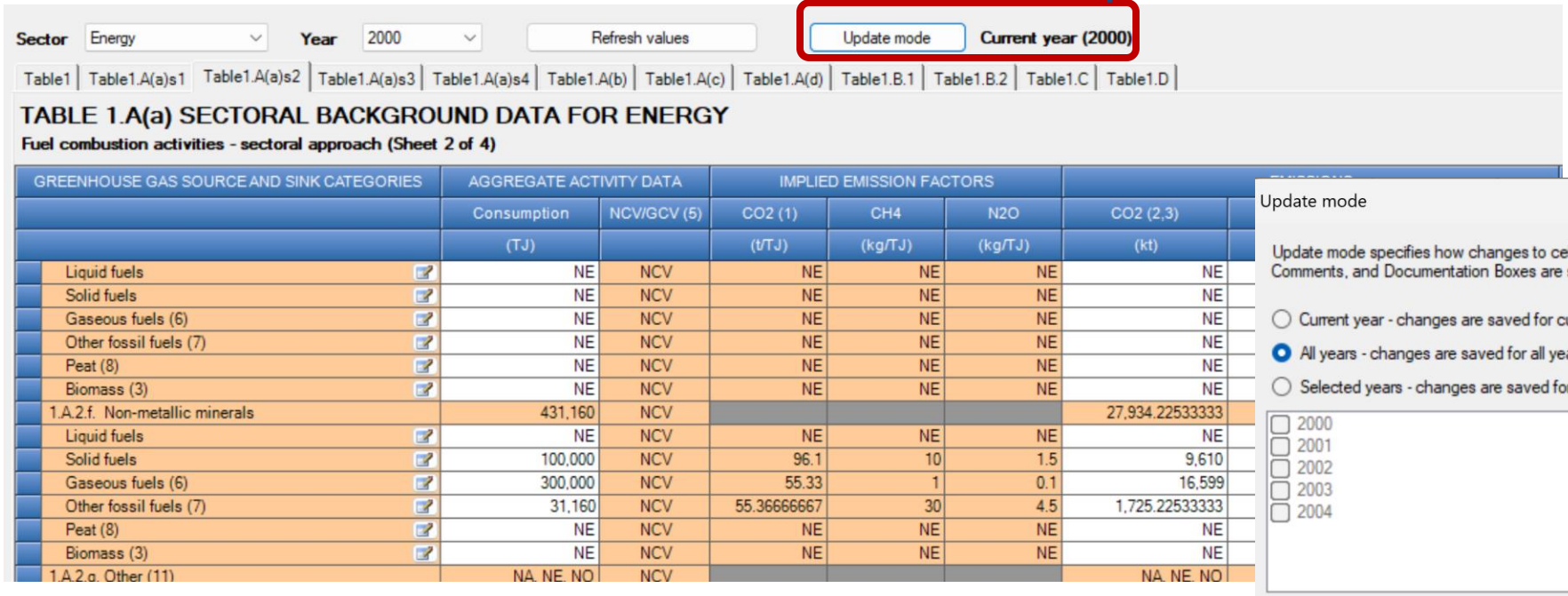
- Review CRT footnotes and IPCC inventory Software notes
- Indicate update mode (year(s) to which subsequent changes apply
- AD notation key explanations (CRT9); change notation keys where applicable
- Add user / official comments
- Add method and EF information for CRT Summary 3
- Review AD where multiple methods used
- Add notes to documentation box
- Refresh values with latest changes to worksheet data
- Review category and sector totals

Update Mode

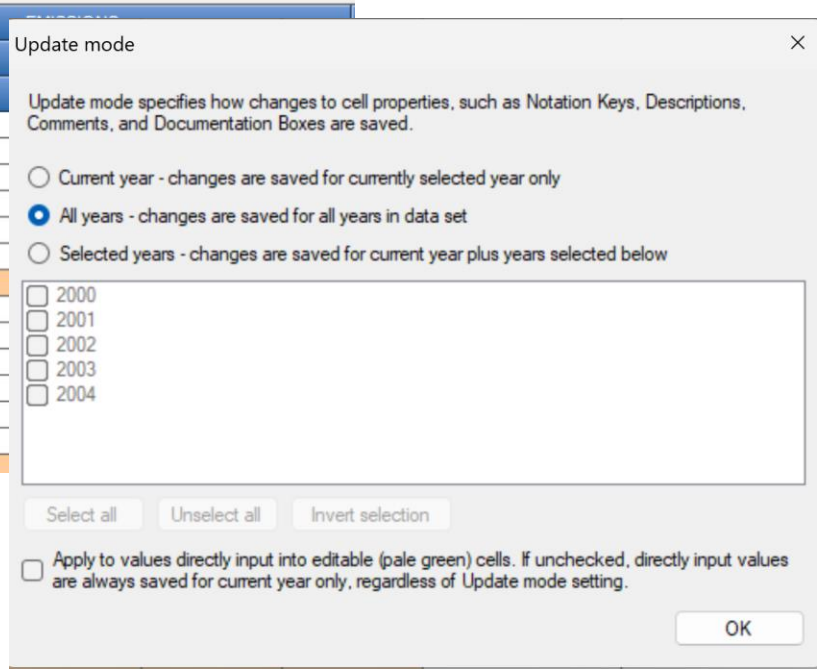
A GHG inventory is a time series. To save time and avoid errors, information (e.g. notation keys, comments, method/EF) entered in visualized CRT can be added for a single year, selected years, or the entire time series.

Select to change update mode

Current mode of update

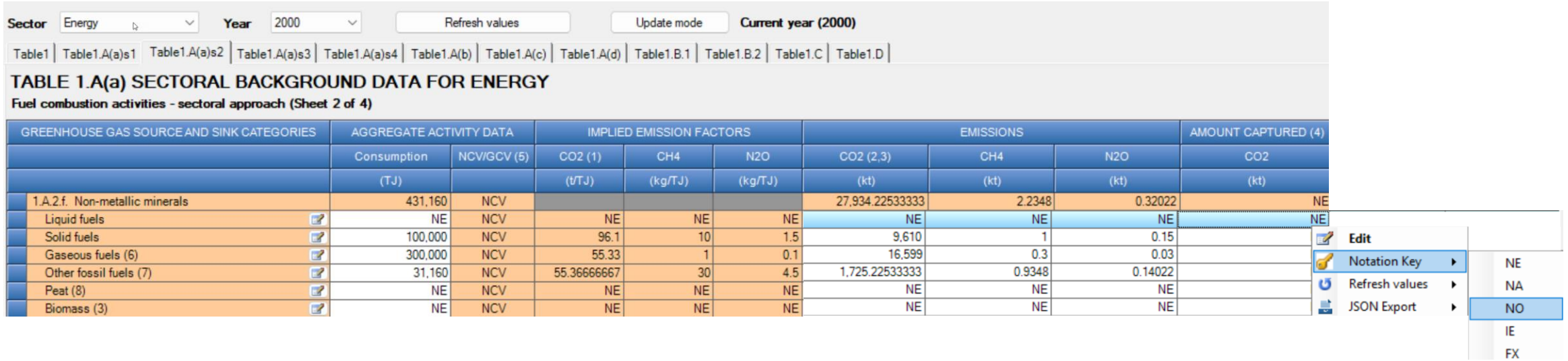


GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS
	Consumption	NCV/GCV (5)	CO2 (1)	CH4	N2O	CO2 (2,3)
	(TJ)		(t/TJ)	(kg/TJ)	(kg/TJ)	(kt)
Liquid fuels	NE	NCV	NE	NE	NE	NE
Solid fuels	NE	NCV	NE	NE	NE	NE
Gaseous fuels (6)	NE	NCV	NE	NE	NE	NE
Other fossil fuels (7)	NE	NCV	NE	NE	NE	NE
Peat (8)	NE	NCV	NE	NE	NE	NE
Biomass (3)	NE	NCV	NE	NE	NE	NE
1.A.2.f. Non-metallic minerals	431,160	NCV				27,934.22533333
Liquid fuels	NE	NCV	NE	NE	NE	NE
Solid fuels	100,000	NCV	96.1	10	1.5	9,610
Gaseous fuels (6)	300,000	NCV	55.33	1	0.1	16,599
Other fossil fuels (7)	31,160	NCV	55.36666667	30	4.5	1,725.22533333
Peat (8)	NE	NCV	NE	NE	NE	NE
Biomass (3)	NE	NCV	NE	NE	NE	NE
1.A.2.g. Other (11)	NA, NE, NO	NCV				NA, NE, NO

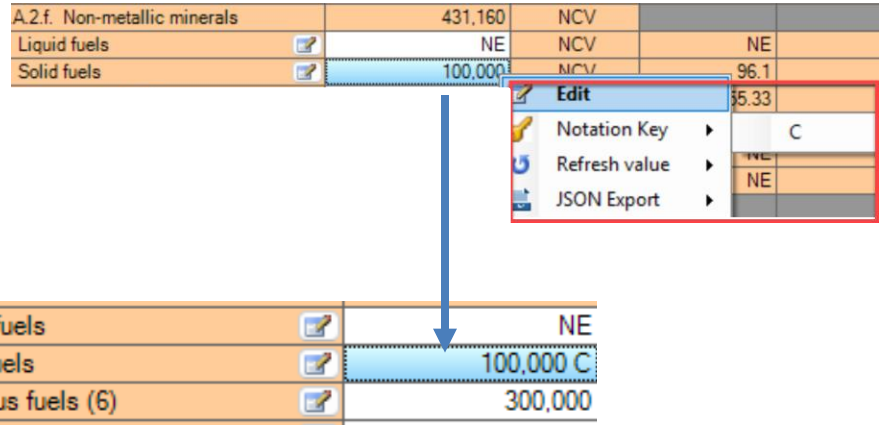


Change Notation Keys

- ✓ In a white cell of visualized CRT a user can **right click or double click on one or multiple cells** to be presented with four options, including **Notation Key**

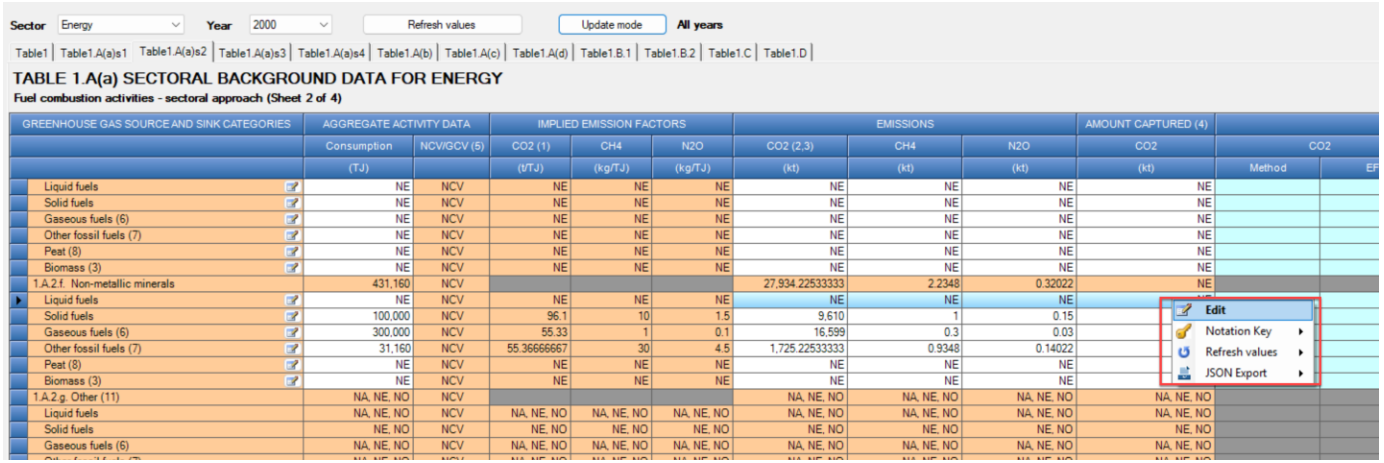


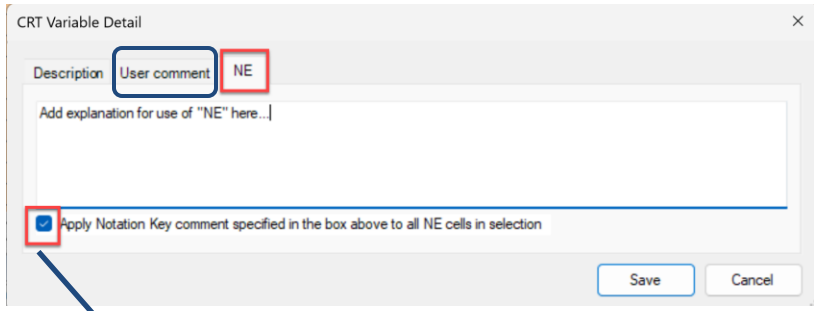
- ✓ Notation keys available depend on if the white cell contains a value or a notation key. If white cell contains value, can only change to “C”



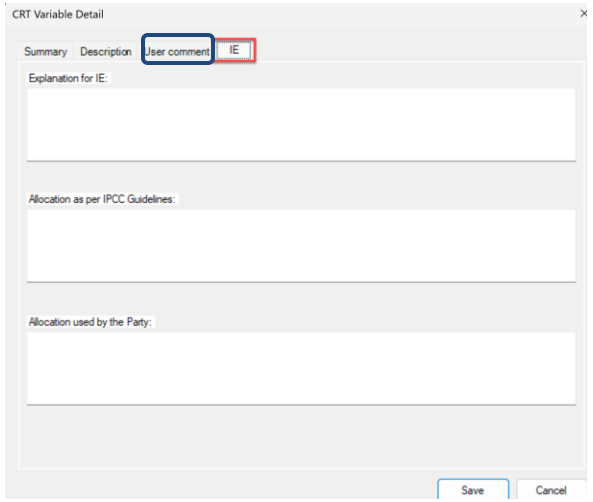
Add Notation Key Explanations

- ✓ For “NE”, “IE”, “FX”, user can add notation key explanations by selecting **Edit** after right clicking on cell(s).
- ✓ Explanations for “NE” and “IE” transfer to CRT 9; FX to a flex summary table downloadable from IPCC Inventory Software.

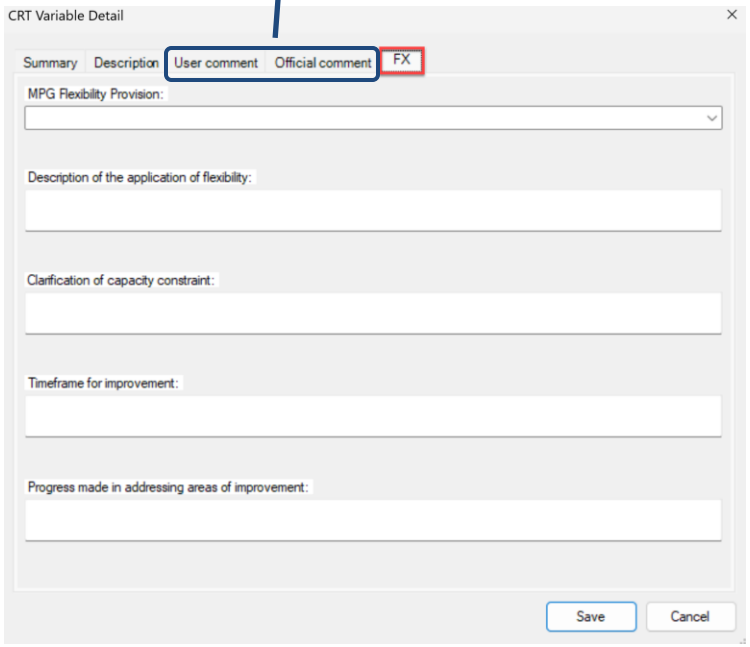




Option available when multiple cells selected



Note also this is how you input **User comments** (not transferred to UNFCCC) and **Official comments** (transferred to UNFCCC)



Method and EF information

- ✓ Input in blue cells
- ✓ Populates Summary 3 in CRT
- ✓ Input in similar manner to notation key explanations

Sector: Energy | Year: 2000 | Refresh values | Update mode | All years

Table1 | Table1.A(a)s1 | Table1.A(a)s2 | Table1.A(a)s3 | Table1.A(a)s4 | Table1.A(b) | Table1.A(c) | Table1.A(d) | Table1.B.1 | Table1.B.2 | Table1.C | Table1.D

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

Fuel combustion activities - sectoral approach (Sheet 2 of 4)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS			AMOUNT CAPTURED (4)	Information to	
	Consumption	NCV/GCV (5)	CO2 (1)	CH4	N2O	CO2 (2,3)	CH4	N2O	CO2	CO2	C
	(TJ)		(t/TJ)	(kg/TJ)	(kg/TJ)	(kt)	(kt)	(kt)	(kt)	Method	EF	Method
Liquid fuels	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
Solid fuels	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
Gaseous fuels (6)	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
Other fossil fuels (7)	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
Peat (8)	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
Biomass (3)	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
A.2.f. Non-metallic minerals	431,160	NCV				27,934.22533333	2.2348	0.32022	NE			
Liquid fuels	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
Solid fuels	100,000	NCV	96.1	10	1.5	9,610	1	0.15	NE			
Gaseous fuels (6)	300,000	NCV	55.33	1	0.1	16,599	0.3	0.03	NE			
Other fossil fuels (7)	31,160	NCV	55.36666667	30	4.5	1,725.22533333	0.9348	0.14022	NE			
Peat (8)	NE	NCV	NE	NE	NE	NE	NE	NE	NE			
					NE	NE	NE	NE	NE			
						NA, NE, NO	NA, NE, NO	NA, NE, NO, FX	NA, NE, NO			
					NO,...	NA, NE, NO	NA, NE, NO	NA, NE, NO, FX	NA, NE, NO			
					E, NO	NE, NO	NE, NO	NE, NO	NE, NO			

Edit
Notation Key
JSON Export

CRT Variable Detail

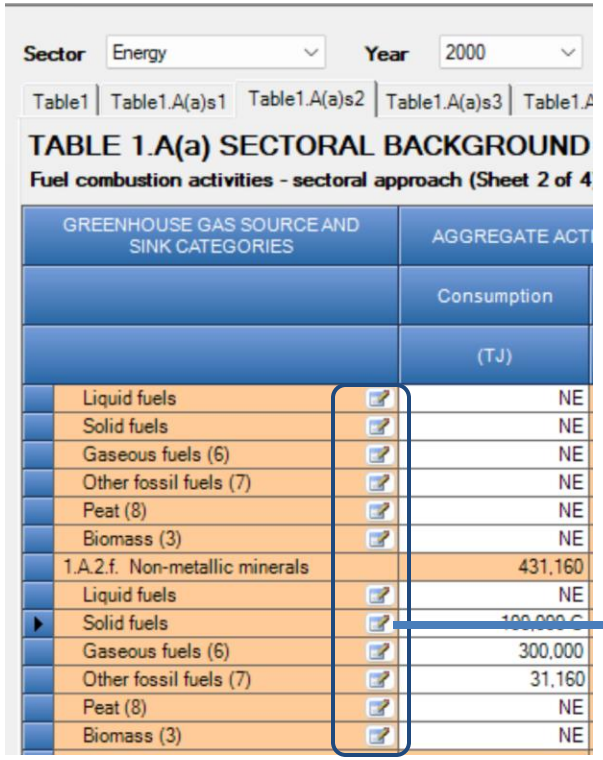
EF | Method | Description

Selected	Notation	Remark
☐	D	IPCC Default
☐	CR	CORINAIR
☐	CS	Country-Specific
☐	M	Model
☐	PS	Plant-Specific
☐	OTH	Other

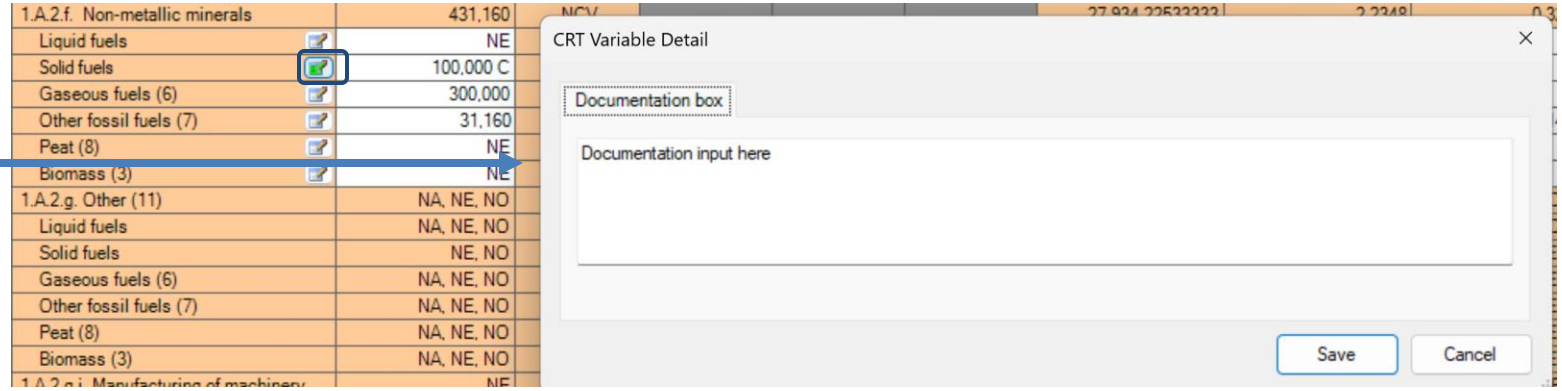
☑ Apply Notation Keys selected in the table above to all EF cells in selection

Save | Cancel

Documentation Box



- ✓ Information added here transfers to the corresponding documentation box in the CRT.
- ✓ Box turns green after information input



Exercise 7. Additional information

Scenario: You have been asked to update and change the notation keys for category 1.A.2.f and add information on the method and EFs used in the visualized CRT.

Your tasks:

1. **Change update mode to all years** so that any changes you make to notation keys, method and EFs, apply to all years in your time series

2. **Provide an explanation** for use of "NE" for liquid fuels in category 1.A.2.f (e.g. data not available), for inclusion in CRT 9

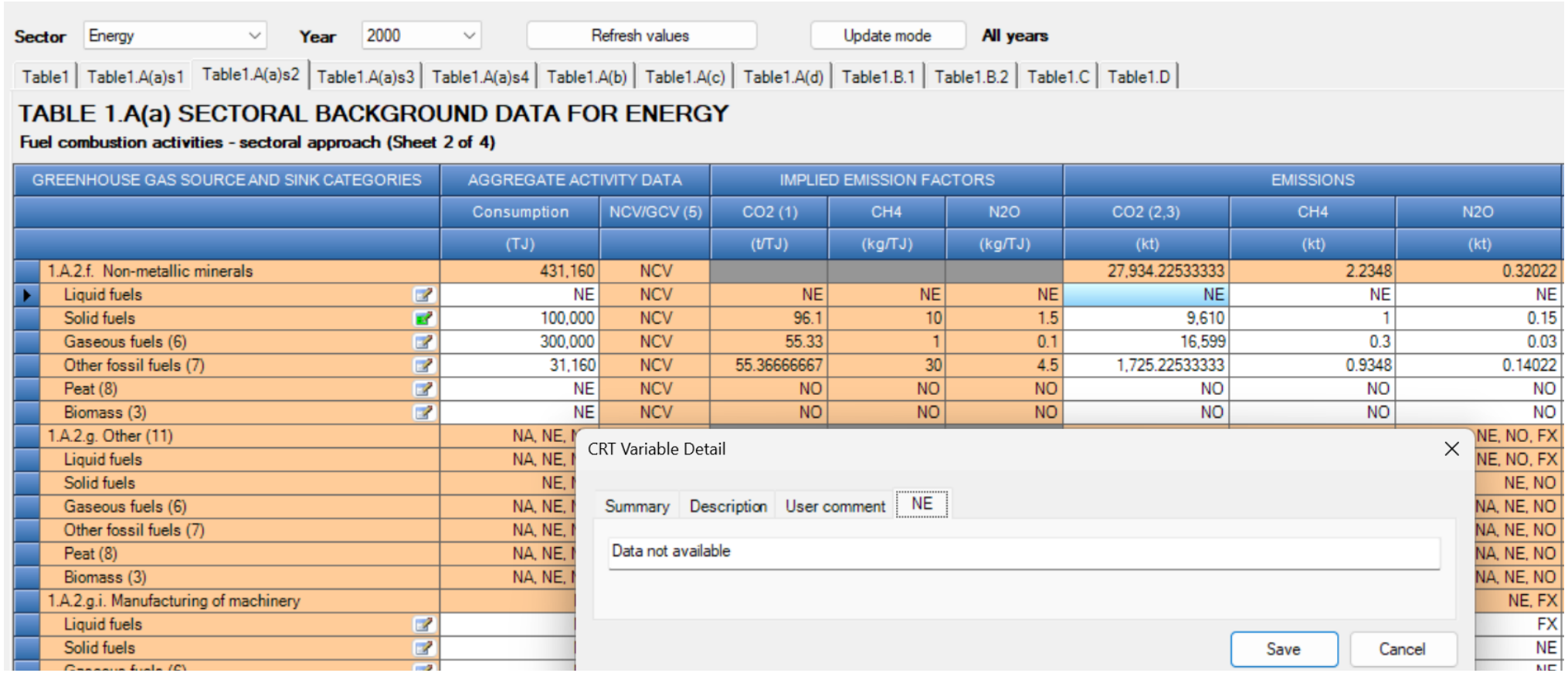
3. **Change the notation key** for all other fuels in category 1.A.2.f to "NO"

4. Indicate the following in the blue cells for CO_2, CH_4 and N_2O emissions, for inclusion in Summary 3 of the CRT
   - ✓ **Method = IPCC Tier 1 method**
   - ✓ **EF = IPCC Default**

5. Add the following text in the **documentation box** for solid fuels from category 1.A.2.f - "There are three plants"

6. Add the following as an **official comment on AD** for solid fuels from category 1.A.2.f – "There are three plants"

Results 7



Sector: Energy | Year: 2000 | Refresh values | Update mode | All years

Table1 | Table1.A(a)s1 | Table1.A(a)s2 | Table1.A(a)s3 | Table1.A(a)s4 | Table1.A(b) | Table1.A(c) | Table1.A(d) | Table1.B.1 | Table1.B.2 | Table1.C | Table1.D

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

Fuel combustion activities - sectoral approach (Sheet 2 of 4)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS		
	Consumption	NCV/GCV (5)	CO2 (1)	CH4	N2O	CO2 (2,3)	CH4	N2O
	(TJ)		(t/TJ)	(kg/TJ)	(kg/TJ)	(kt)	(kt)	(kt)
1.A.2.f. Non-metallic minerals	431,160	NCV				27,934.22533333	2.2348	0.32022
Liquid fuels	NE	NCV	NE	NE	NE	NE	NE	NE
Solid fuels	100,000	NCV	96.1	10	1.5	9,610	1	0.15
Gaseous fuels (6)	300,000	NCV	55.33	1	0.1	16,599	0.3	0.03
Other fossil fuels (7)	31,160	NCV	55.36666667	30	4.5	1,725.22533333	0.9348	0.14022
Peat (8)	NE	NCV	NO	NO	NO	NO	NO	NO
Biomass (3)	NE	NCV	NO	NO	NO	NO	NO	NO
1.A.2.g. Other (11)	NA, NE,							NE, NO, FX
Liquid fuels	NA, NE,							NE, NO, FX
Solid fuels	NE,							NE, NO
Gaseous fuels (6)	NA, NE,							NA, NE, NO
Other fossil fuels (7)	NA, NE,							NA, NE, NO
Peat (8)	NA, NE,							NA, NE, NO
Biomass (3)	NA, NE,							NA, NE, NO
1.A.2.g.i. Manufacturing of machinery								NE, FX
Liquid fuels								FX
Solid fuels								NE

CRT Variable Detail

Summary | Description | User comment | NE

Data not available

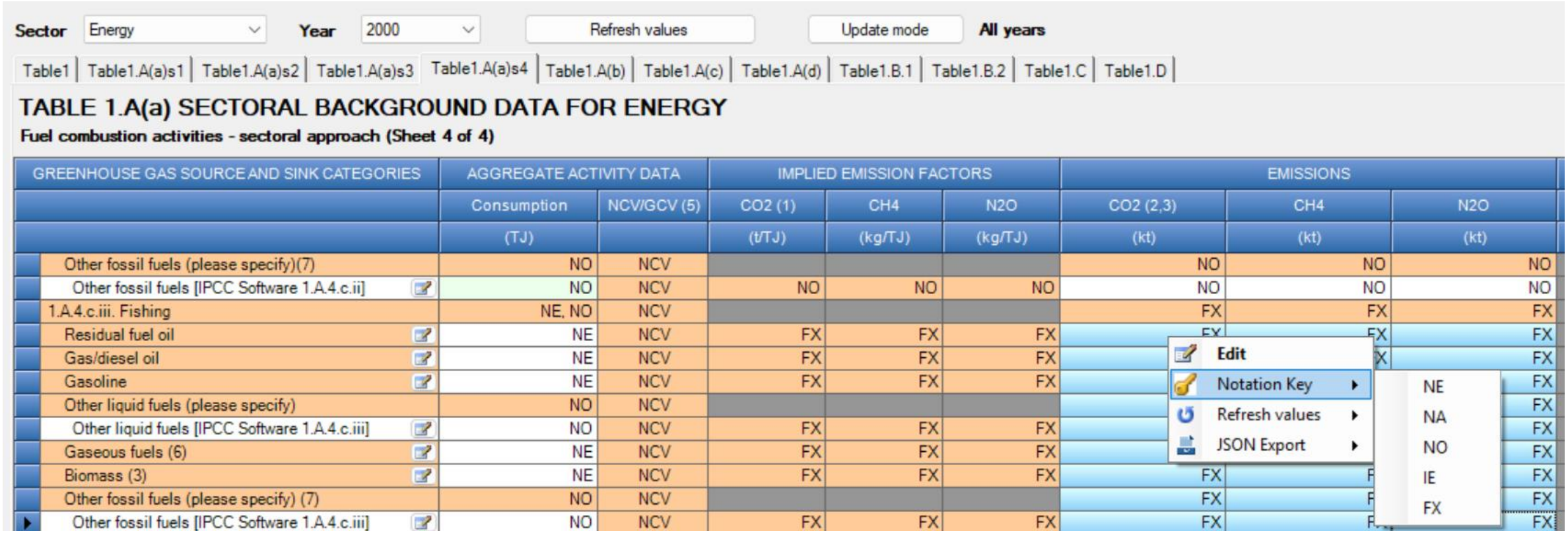
Save | Cancel

Follow along….

1. Reporting on Flexibility

Work along: Change NK to “FX”

User wishes to change the notation key in category 1.A.4.c.iii Fishing from the default of “NE” to “FX” owing to information that this category is insignificant and thus you have used flexibility for this category

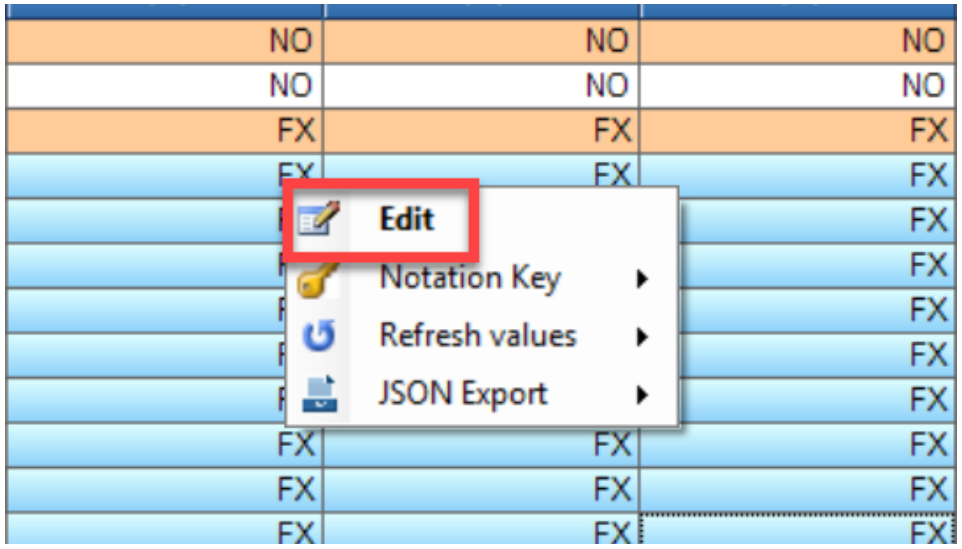


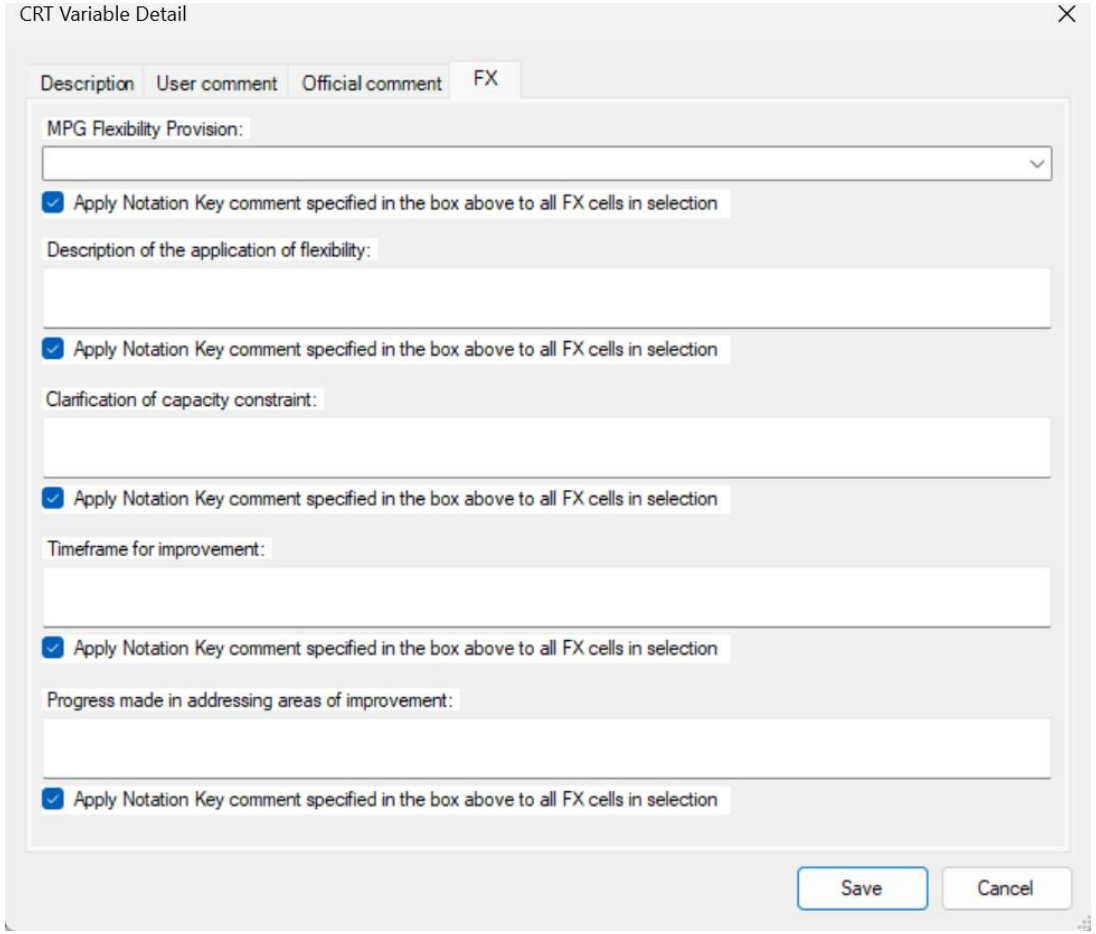
Work along: Explain Use of FX

In accordance with the MPGs, users shall provide explanations for the use of FX. There are multiple ways this could be provided, including in the National Inventory Document or Flex Summary of the CRT.

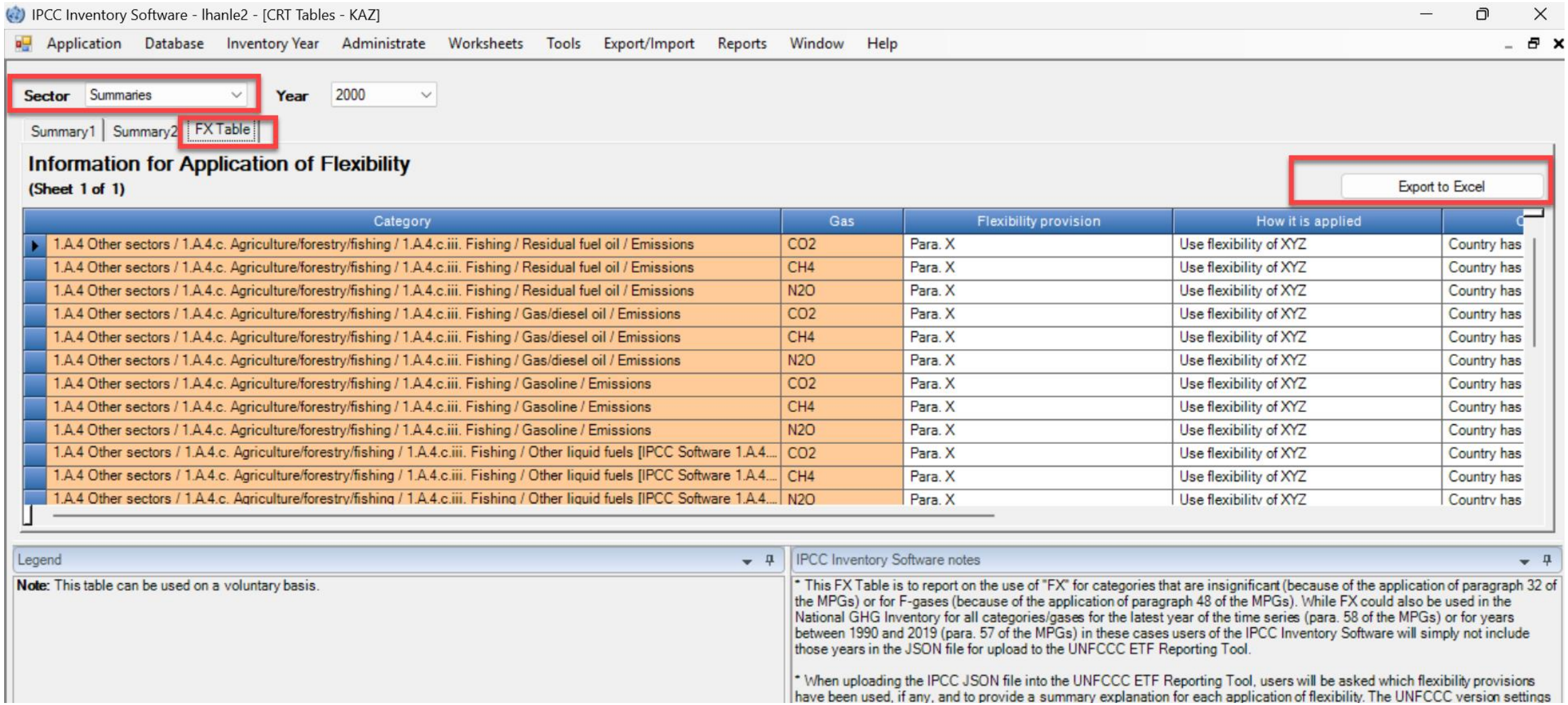
Users of the IPCC Software may choose to provide this information for each occurrence of FX.

- ✓ The FX will transfer to the UNFCCC
- ✓ The explanation will not automatically transfer to the UNFCCC, but the information may be downloaded and included in the NID





Work along: Download FX table



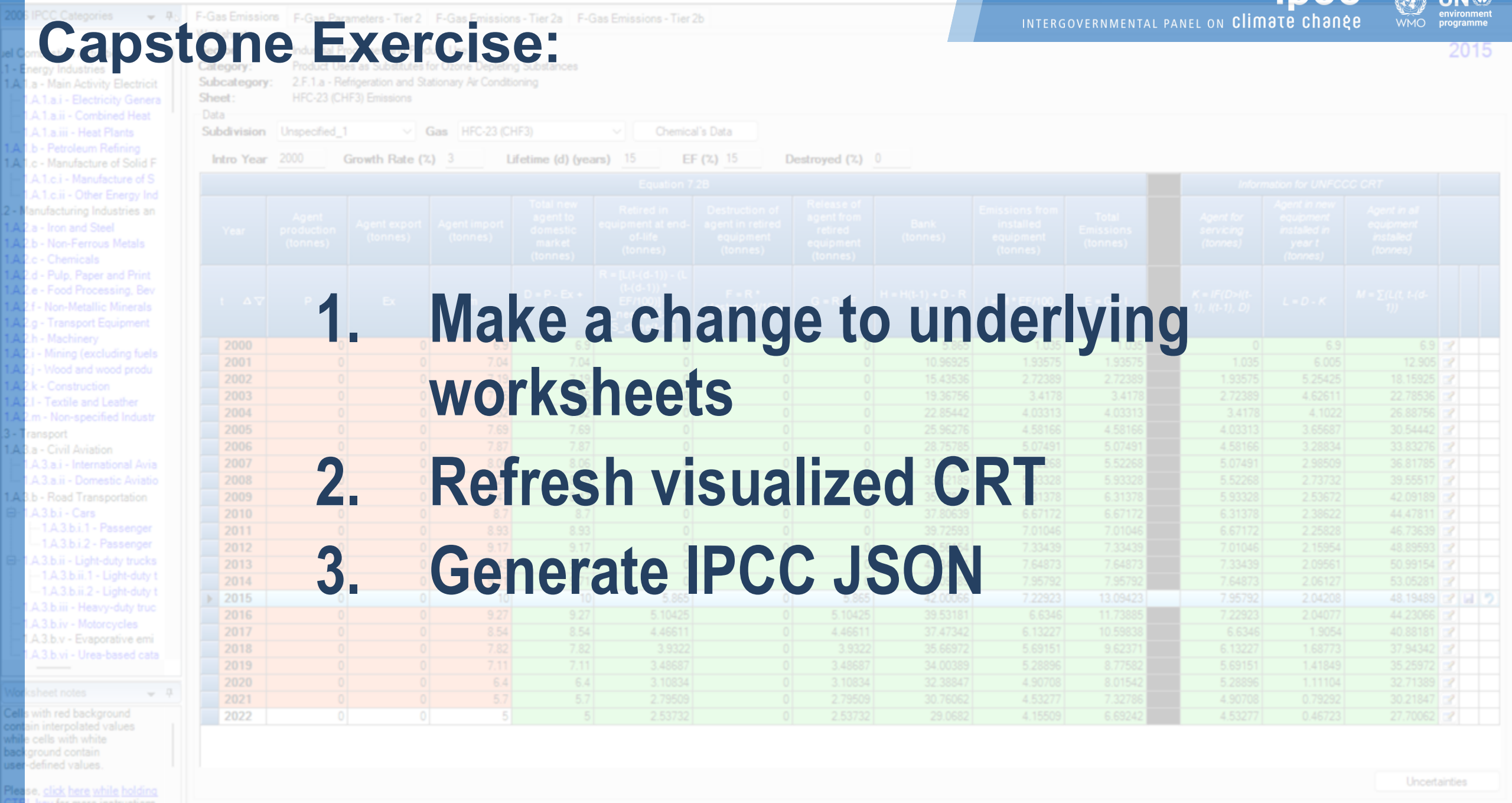
Work along: Results

A	B	C	D	E	F	G
Category	Gas	Flexibility provision	How it is applied	Capacity constraint	Timeframe for improvement	Progress made
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Residual fuel oil / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Residual fuel oil / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Residual fuel oil / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gas/diesel oil / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gas/diesel oil / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gas/diesel oil / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gasoline / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gasoline / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gasoline / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Other liquid fuels [IPCC Software 1.A.4.c.iii] / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Other liquid fuels [IPCC Software 1.A.4.c.iii] / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Other liquid fuels [IPCC Software 1.A.4.c.iii] / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gaseous fuels / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gaseous fuels / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Gaseous fuels / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Biomass / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Biomass / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Biomass / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Other fossil fuels [IPCC Software 1.A.4.c.iii] / Emissions	CO2	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Other fossil fuels [IPCC Software 1.A.4.c.iii] / Emissions	CH4	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one
1.A.4 Other sectors / 1.A.4.c. Agriculture/forestry/fishing / 1.A.4.c.iii. Fishing / Other fossil fuels [IPCC Software 1.A.4.c.iii] / Emissions	N2O	Para. X	Use flexibility of XYZ	Country has limited capacity owing to	Country expects to implement by X year	N/A this is BTR one

Info | 2000 | 2001 | 2002 | 2003 | 2004

Capstone Exercise:

1. Make a change to underlying worksheets
2. Refresh visualized CRT
3. Generate IPCC JSON



Exercise 8

Scenario: You have prepared the visualized CRT, but realized you forgot to estimate GHG emissions for **IPCC category 1.A.3.b.i (Cars)** (you do not have further data on existence of 3-way catalysts). You must go back into the worksheets of the *Software* to add this category.

Your tasks:

a) **Navigate to IPCC category 1.A.3.b.i and estimate CO_2, CH_4 and N_2O emissions for this category using the IPCC Default (Tier 1) method.**

b) **Refresh visualized CRT for the energy sector**

c) **Generate IPCC JSON**

Let's take each task one-by-one

Exercise 8a: Estimate Emissions

Navigate to IPCC category 1.A.3.b.i and estimate CO_2, CH_4 and N_2O emissions for this category using the IPCC Default (Tier 1) method.
Refer to relevant sections of the Energy Sector Users' Guidebook. Extracts below.

Activity data input

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).
2. Column |VT|: enter vehicle type (e.g. sedan, 2-seat, 5-seat, etc.); where no data are available select *Unspecified* from the dropdown menu.
3. Column |ECT|: enter applicable emission control technology (e.g. three-way catalyst, oxidation catalyst, etc.); where no data are available select *Unspecified* from the dropdown menu. The ECT is relevant for Tier 2 and for CH_4 and N_2O emissions only; indeed, the ECT does not impact the estimate of CO_2 emissions given that IPCC methods assume that the entire C content of fuels is oxidised to CO_2.
4. Column |C|: enter amount of fuel consumed by the relevant combination fuel/vehicle type/ECT.
5. Column |U|: enter unit in which fuel consumption data are entered (e.g. Gg, TJ, m^3). To enter a user-specific unit (e.g. m^3) select *Gg (Manual CF)* from the dropdown menu and overwrite *Gg* with the user-defined unit.
6. Column |CF|: enter conversion factor to convert the consumption unit to an energy unit (TJ).

Emission factor input

When Tier 1 & Tier 2 Equations are applied:

The **Fuel Combustion Emissions** worksheet is prefilled by the *Software* with a number of rows corresponding to the number of subdivision/fuel/vehicle type/ECT combinations entered in worksheet **Fuel Consumption Data**. Then, for each row:

1. 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 CC multiplied by 44/12; otherwise enter a user-specific value, kg of CO_2 per TJ.
2. Column |EF(CH_4)|: select from the drop-down menu the IPCC default value for the given fuel or enter a user-specific value, kg of CH_4 per TJ.
3. Column |EF(N_2O)|: select from the drop-down menu the IPCC default value for the given fuel or enter a user-specific value, kg of N_2O per TJ.

Key data for the year 2000

- ✓ **Fuel Manager** – no changes
- ✓ Data available at the **national level**, no information on types of vehicles or technologies
- ✓ **Motor gasoline consumption** = 2,500 TJ
- ✓ **Apply IPCC default EFs** for CO_2, CH_4 and N_2O (since no information on technology available, assume "uncontrolled" for CH_4 and N_2O

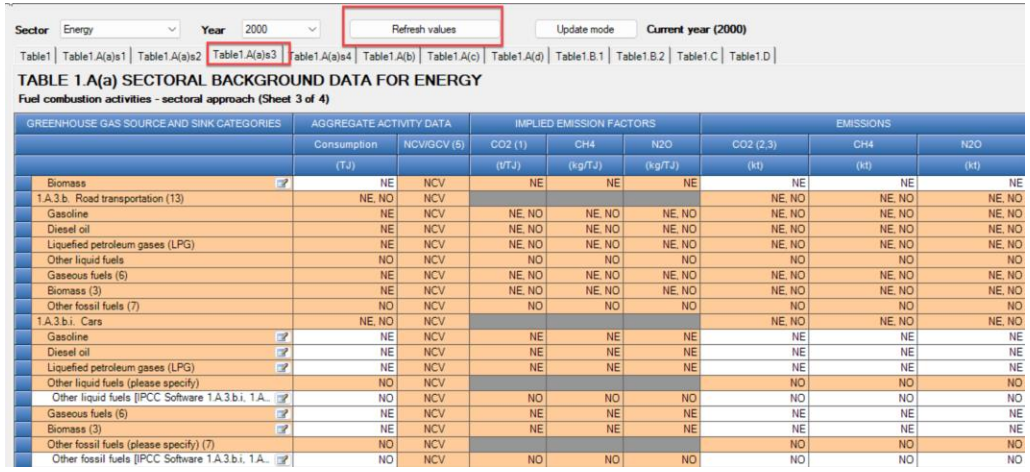
Exercise 8b: Refresh Visualized CRT

Refresh visualized CRT for the energy sector

Tasks:

1. In Main Menu, select **Export/Import → Export → UNFCCC CRT**
   - Note you will receive a message that CRT Tables window is currently open. Select **OK to return to the visualized CRT**.

2. Navigate to Sector = Energy, Table 1.A(a)s3 for the year 2000. When you scroll down to 1.A.3.b.i Cars, you will see that it says "NE". You want to **Select Refresh**, so CRT reflects the latest worksheet data. Say "YES" when asked to compile new worksheet values.

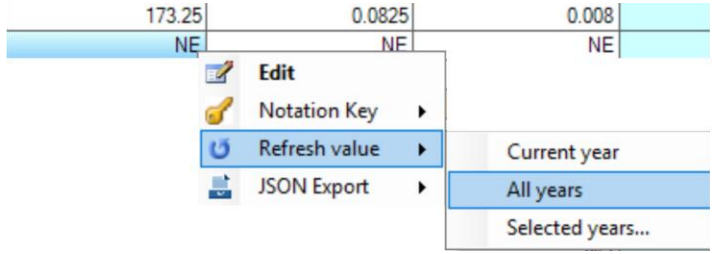


GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS		
	Consumption	NCV/GCV (5)	CO2 (1)	CH4	N2O	CO2 (2,3)	CH4	N2O
	(TJ)		(t/TJ)	(kg/TJ)	(kg/TJ)	(kt)	(kt)	(kt)
Biomass	NE	NCV	NE	NE	NE	NE	NE	NE
1.A.3.b. Road transportation (13)	NE, NO	NCV				NE, NO	NE, NO	NE, NO
Gasoline	NE	NCV	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Diesel oil	NE	NCV	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Liquefied petroleum gases (LPG)	NE	NCV	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Other liquid fuels	NO	NCV	NO	NO	NO	NO	NO	NO
Gaseous fuels (6)	NE	NCV	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Biomass (3)	NE	NCV	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Other fossil fuels (7)	NO	NCV	NO	NO	NO	NO	NO	NO
1.A.3.b.i. Cars	NE, NO	NCV				NE, NO	NE, NO	NE, NO
Gasoline	NE	NCV	NE	NE	NE	NE	NE	NE
Diesel oil	NE	NCV	NE	NE	NE	NE	NE	NE
Liquefied petroleum gases (LPG)	NE	NCV	NE	NE	NE	NE	NE	NE
Other liquid fuels (please specify)	NO	NCV				NO	NO	NO
Other liquid fuels [IPCC Software 1.A.3.b.i, 1.A...	NO	NCV	NO	NO	NO	NO	NO	NO
Gaseous fuels (6)	NE	NCV	NE	NE	NE	NE	NE	NE
Biomass (3)	NE	NCV	NE	NE	NE	NE	NE	NE
Other fossil fuels (please specify) (7)	NO	NCV				NO	NO	NO
Other fossil fuels [IPCC Software 1.A.3.b.i, 1.A...	NO	NCV	NO	NO	NO	NO	NO	NO

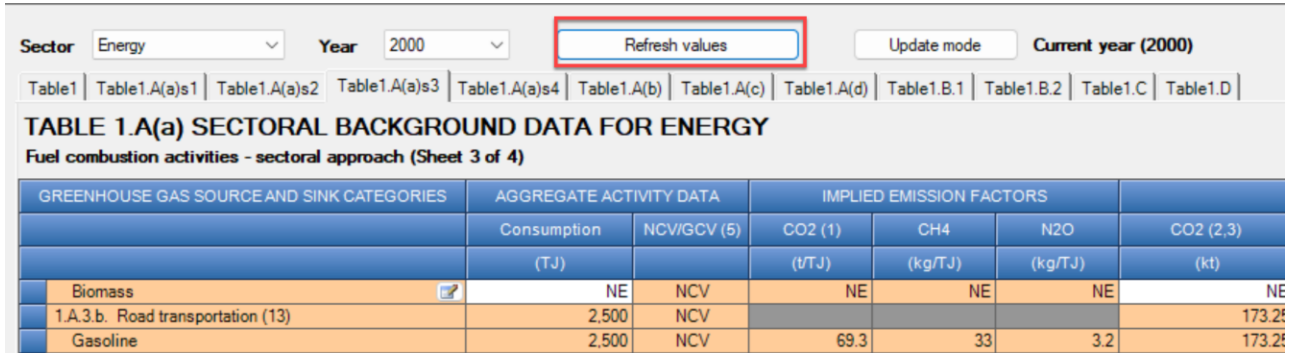
Do you now see your updated estimates for gasoline from cars?

Multiple Ways to Refresh Visualized CRT

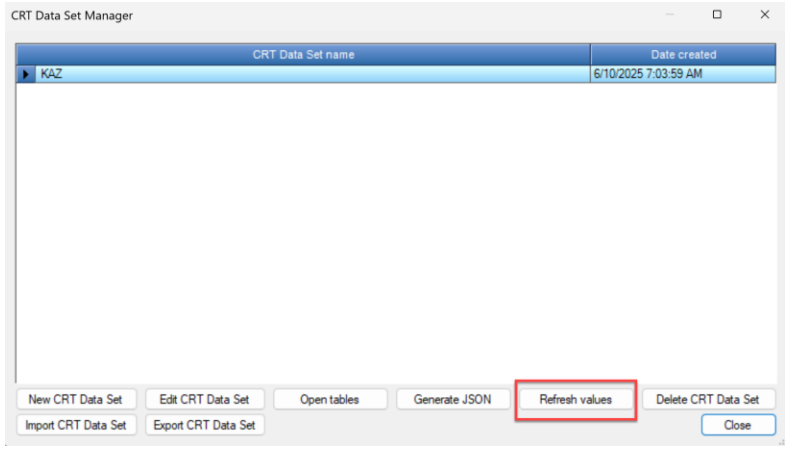
1. **Refresh a single white cell or multiple white cells** in the selected worksheet



2. **Refresh Value for selected years across a given sector**



3. **Refresh all values in all sectors,** for the selected year(s) from the CRT Data Set Manager



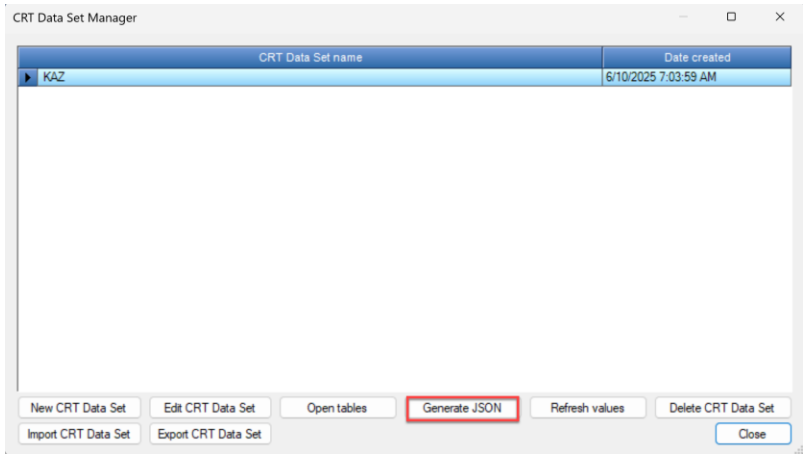
Exercise 8c Generate JSON

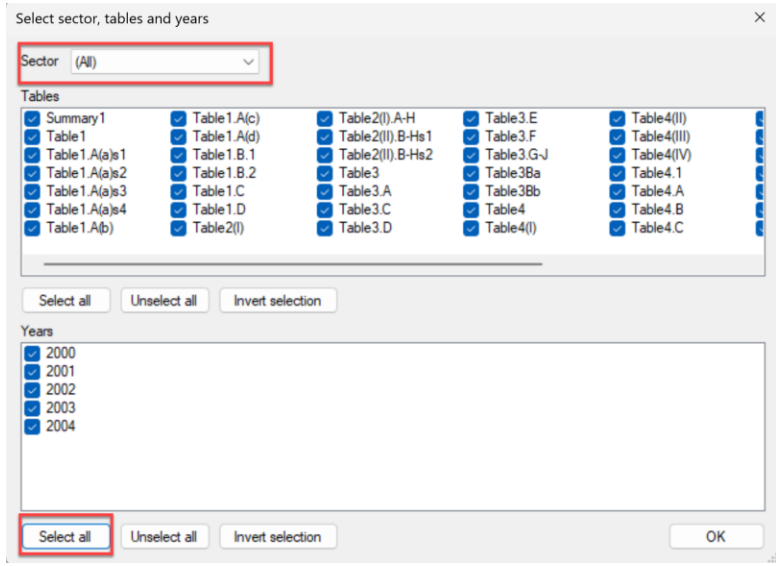
Generate IPCC JSON

Tasks:

1. In Main Menu, select **Export/Import → Export → UNFCCC CRT**
   - Note you will receive a message that CRT Tables window is currently open. Select **Cancel to return to the CRT Data Set Manager**

2. Select **Generate JSON** and generate for **All sectors, all years**



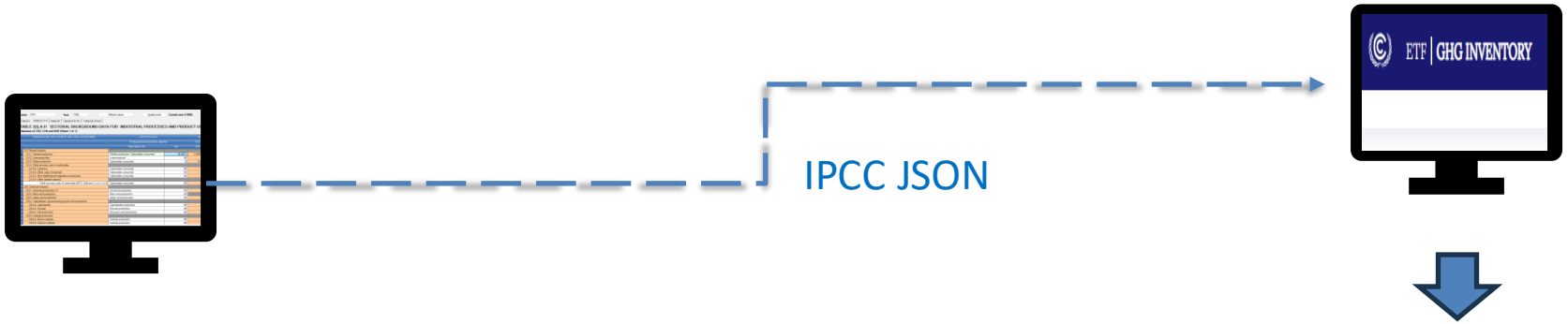


3. **Save the file** to your computer for activities tomorrow

Considerations during Upload into UNFCCC ETF Reporting Tool:

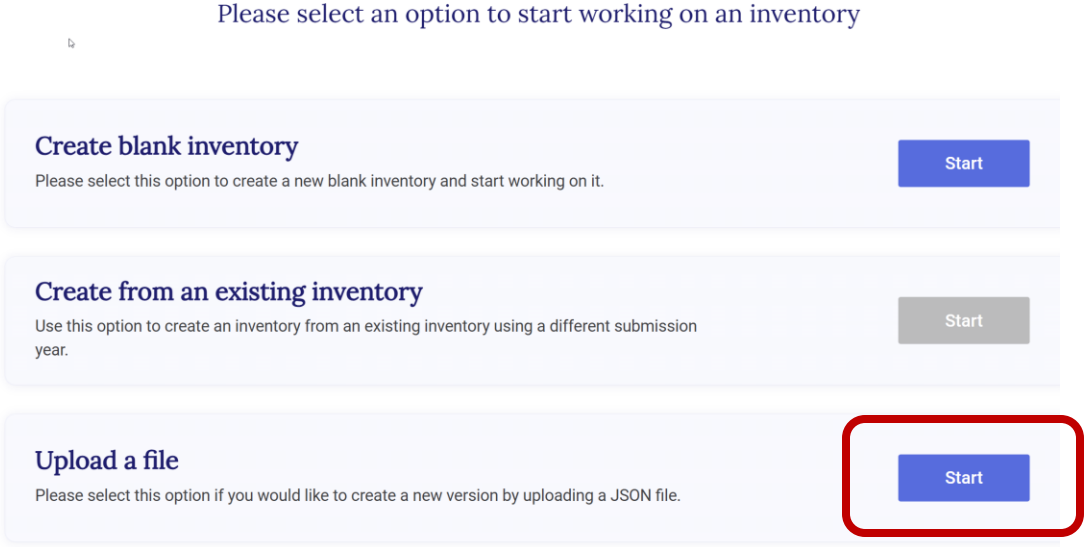
A perspective for users of the IPCC Inventory Software

Upload IPCC JSON into UNFCCC ETF Reporting Tool



In the **UNFCCC ETF Reporting Tool**:

- Create inventory through **Upload a file.**
- Selection prompts the user to **set up the inventory**
- Critical to **select version settings** that are consistent with selections made in the IPCC Inventory Software.



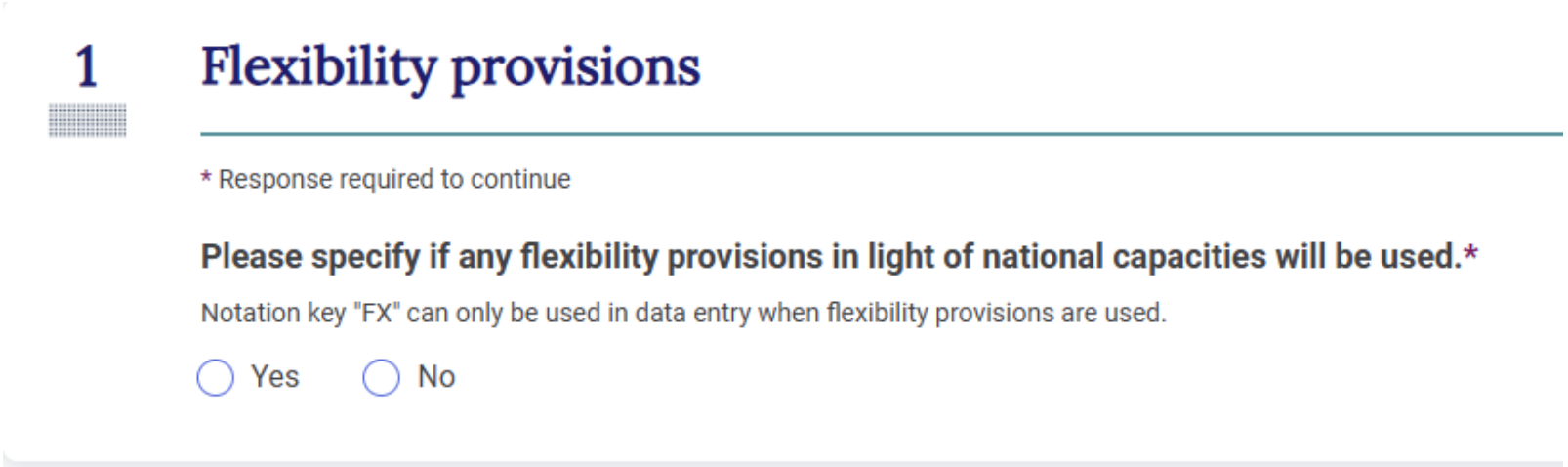
Want to Learn More?

See the UNFCCC CRT Export Quick Start Guide (available on main page of the link) and the ETF - Inventory reporting tool manual, readily accessible through the UNFCCC ETF GHG Inventory Reporting Tool for registered users of that tool.

Version Settings in UNFCCC ETF Reporting Tool

Users must **carefully review questions in the UNFCCC version settings** to **avoid unintentionally making changes** to the IPCC Software inventory upon import into the UNFCCC tool.

Version settings in UNFCCC ETF Reporting Tool:



Users of the IPCC Inventory Software:

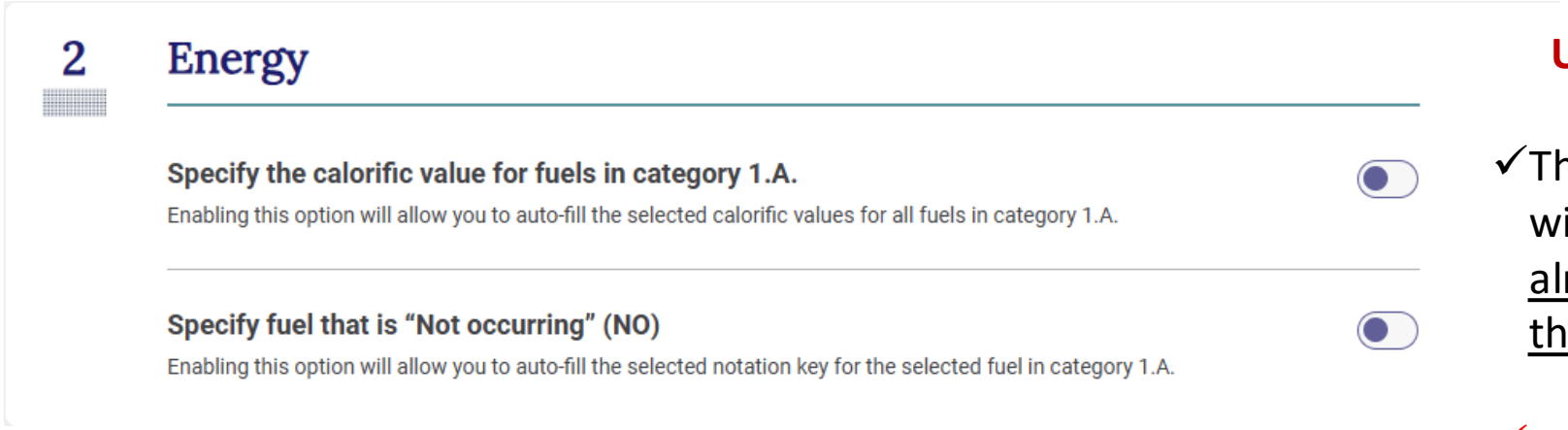
You **must** select "Yes" if you:

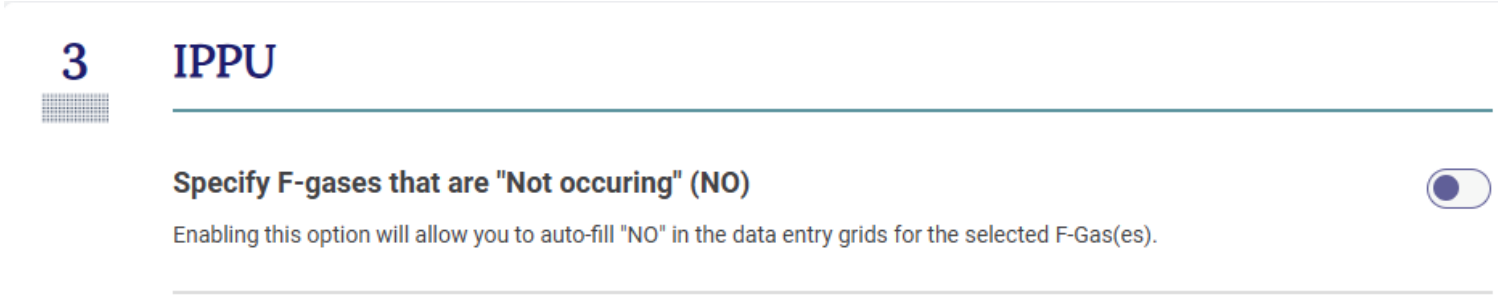
- ✓ have used "FX" in the IPCC Software
- ✓ have not used "FX" in the IPCC Software, but plan on using flexibility for official reporting (e.g. years, F-gases, KCA)
- ✓ You will use another flexibility provision not related to the reporting tables (e.g. uncertainty, QA/QC).

Want to Learn More?
For detailed information on each version setting refer to "Selecting Version Settings in the UNFCCC Reporting Tool" in the UNFCCC CRT Export Quick Start Guide.

Version Settings in UNFCCC ETF Reporting Tool

Version settings in UNFCCC ETF Reporting Tool:





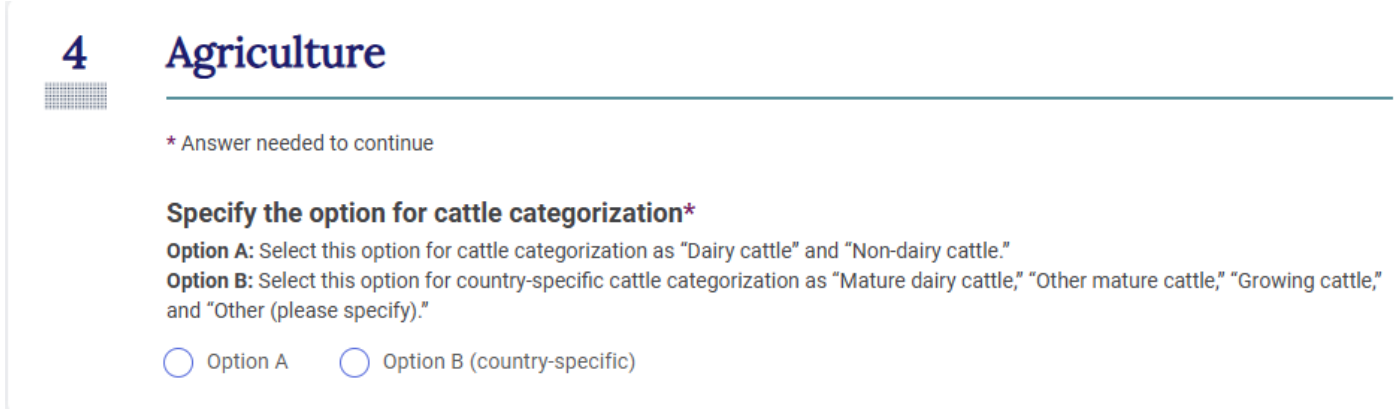
Users of the IPCC Inventory Software:

✓These settings help you populate the cells with NCV/GCV and notation keys; this has already been done in the visualized CRT of the IPCC Inventory Software.

✓**Do NOT enable these version settings**.

Version Settings in UNFCCC ETF Reporting Tool

Version settings in UNFCCC ETF Reporting Tool:



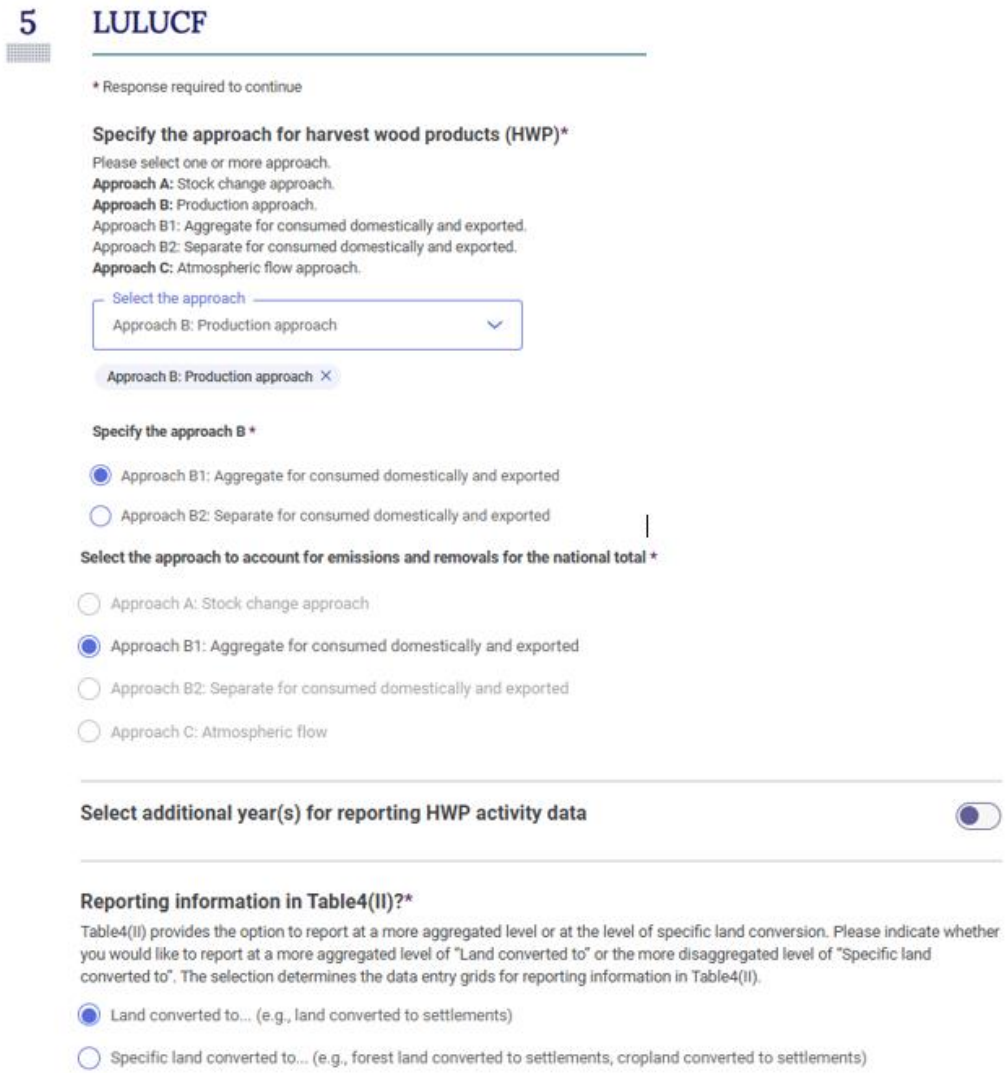
Users of the IPCC Inventory Software:

- ✓ The selection of Option A or Option B for Agriculture, **must be consistent with your livestock characterization**

(if unsure, you can see in the visualized CRT of the IPCC Inventory Software (Table 3.A, 3.B(a) or 3.B(b)) which Option has been used.)

Version Settings in UNFCCC ETF Reporting Tool

Version settings in UNFCCC ETF Reporting Tool:



Users of the IPCC Inventory Software:

- ✓ The IPCC Inventory Software **calculates all approaches for HWP,** so you may select any and/or all approaches.

- ✓ For **Additional years for HWP** (these are years prior to 1990) we are still working to transfer these data. If applicable, these are to be entered directly in the UNFCCC ETF Reporting Tool.

- ✓ For **Reporting Information in Table 4(II),** maintain the default selection of "Land converted to" – the IPCC Inventory Software automatically transfers data at this level.

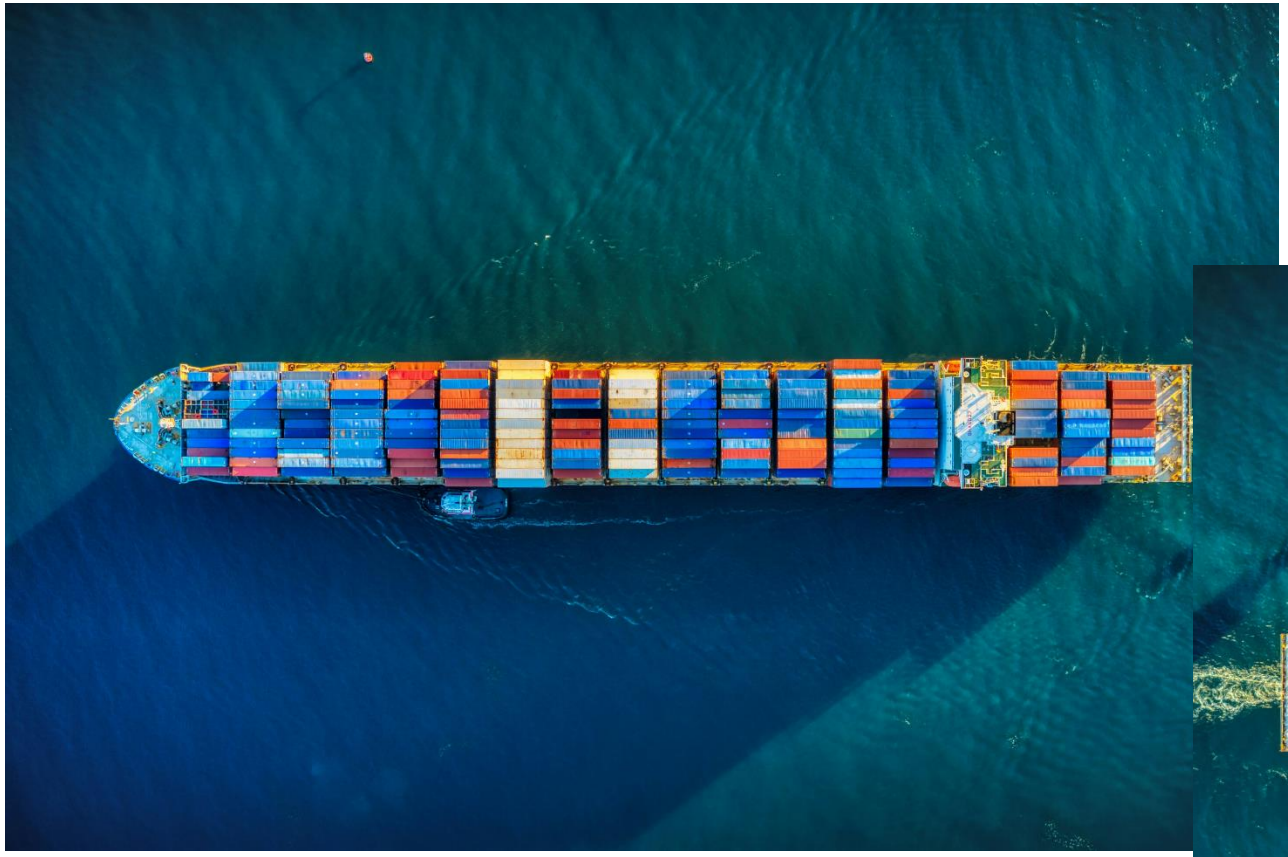
Key Takeaways from Workshop

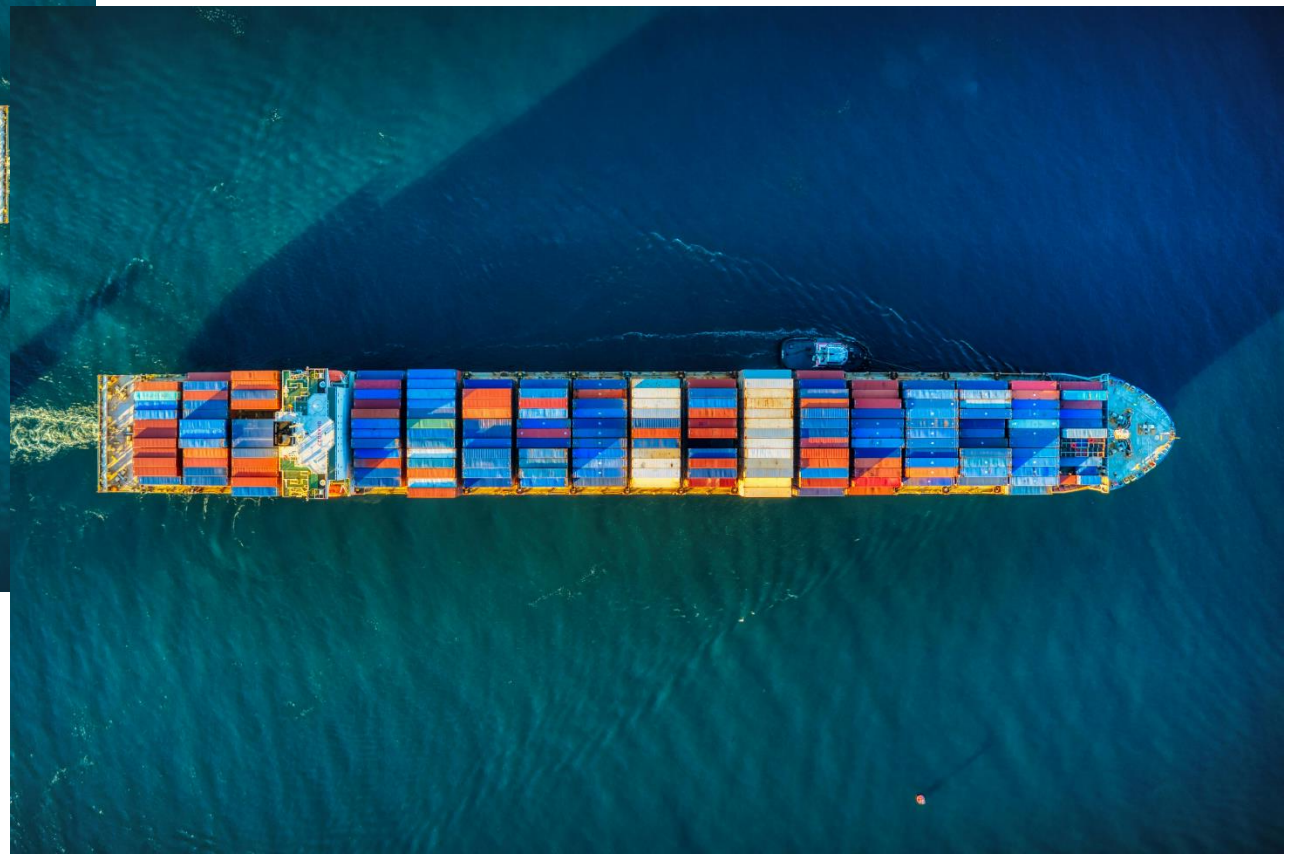
- ✓ The *Software* estimates GHG emissions and removals for all categories contained in the *2006 IPCC Guidelines* and supports population of the UNFCCC CRT, consistent with UNFCCC reporting requirements.

- ✓ If you ever have a question, resources are available to walk you step-by-step on how to use the *Software*.

Additional functionality: Export/Import

XML Import/Export

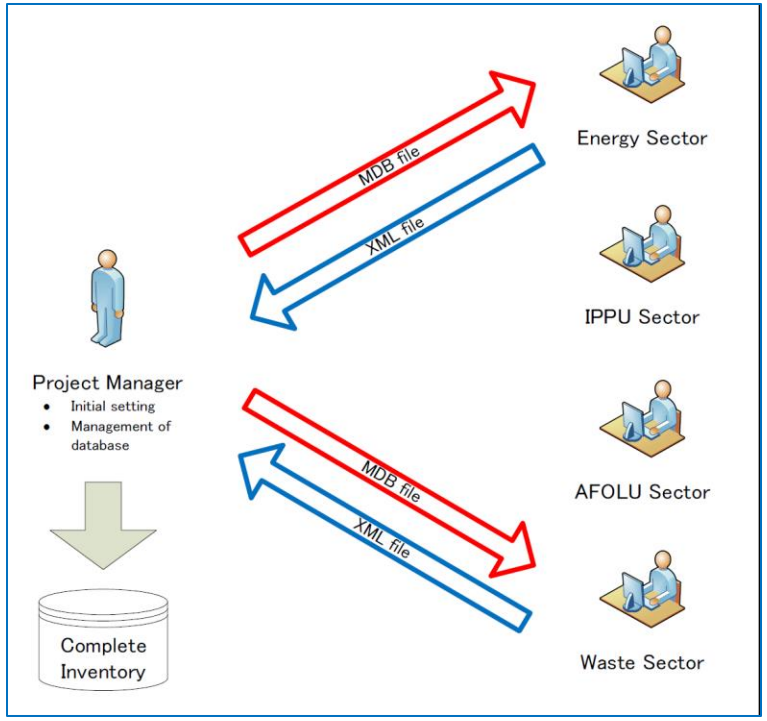




Import and Export of XML Data

- ✓ XML import / export is one way of exchanging data among users who are using the same version of the Software.[1]
- ✓ A user may Export worksheet data (i.e. categories) and CRT. Focus here on worksheet data.
- ✓ XML Export/import carried out for one or more categories, sectors, years.
- ✓ Information contained in Data Managers also in import/export file, as soon as one of the categories relying on that Manager are included.

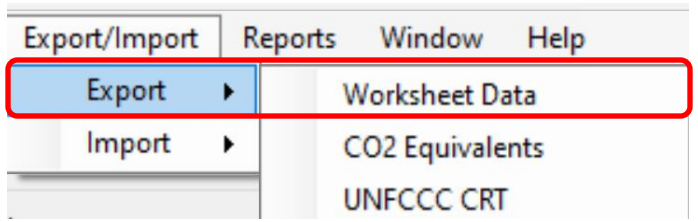
Workflow – when not using internet/intranet to share IPCC Software database



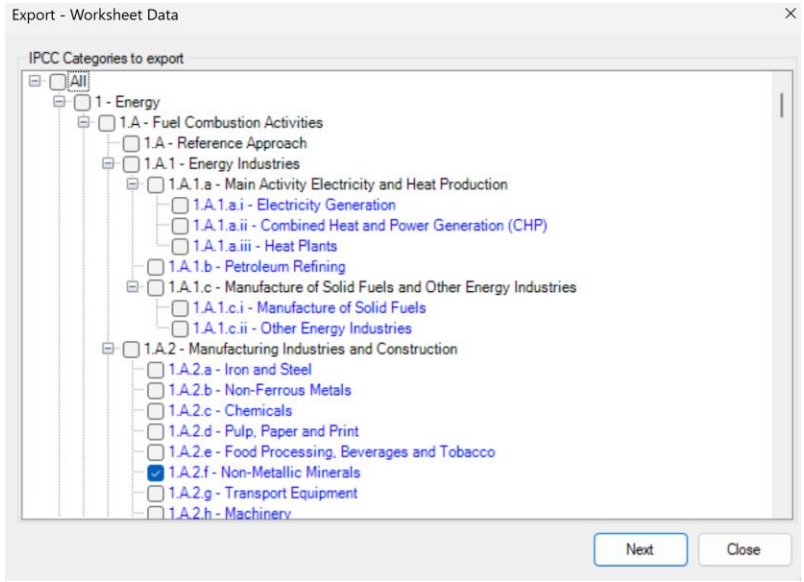
1. When users wish to share data among users working in different versions of the Software (e.g. version 2.89 and 2.96) data transfer occurs via upload (and upgrade) of the Access database

XML Export of Worksheet Data

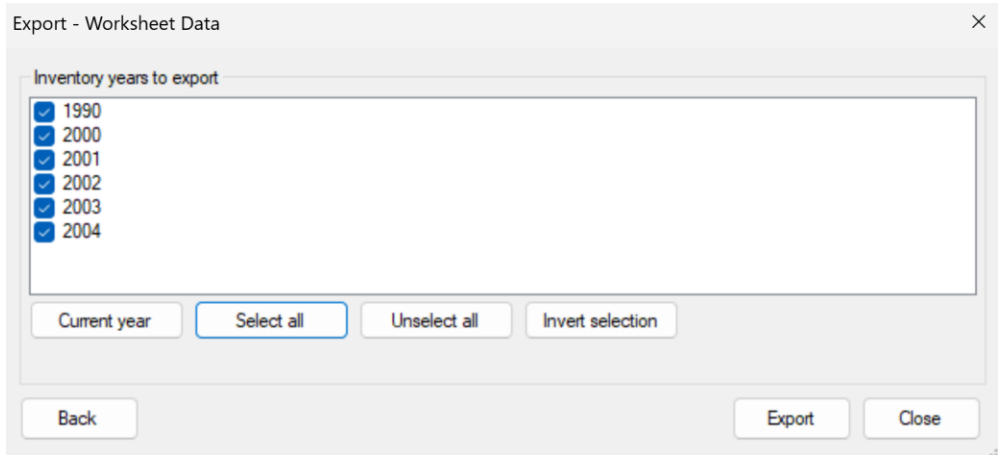
- ✓ User may generate an XML file containing one or more years of worksheet data; (e.g. to send to an inventory compiler via email)
- ✓ From main menu, select **Export/Import → Export→ Worksheet Data**



- ✓ Select categories to export and Next

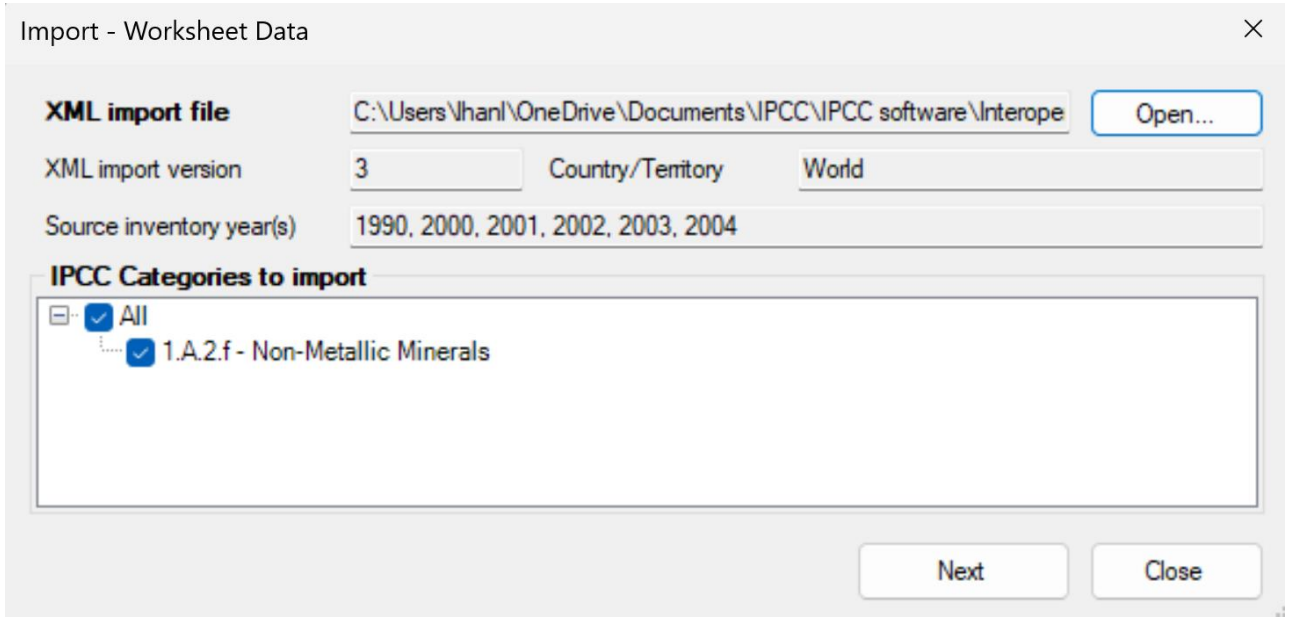


- ✓ Check off year(s) to include in XML file, select Export to save to the file



XML Import of Worksheet Data

- ✓ From main menu, select **Export/Import → Import → Worksheet Data.** The structure/contents of the import file will be indicated in top box
  - ✓ Can only import XML that has been exported from the same import version of the *Software*
- ✓ Although import file may contain multiple years for import, in the next step the user may select which year(s) for import
- ✓ Select category/ies or sectors for import and select **Next**



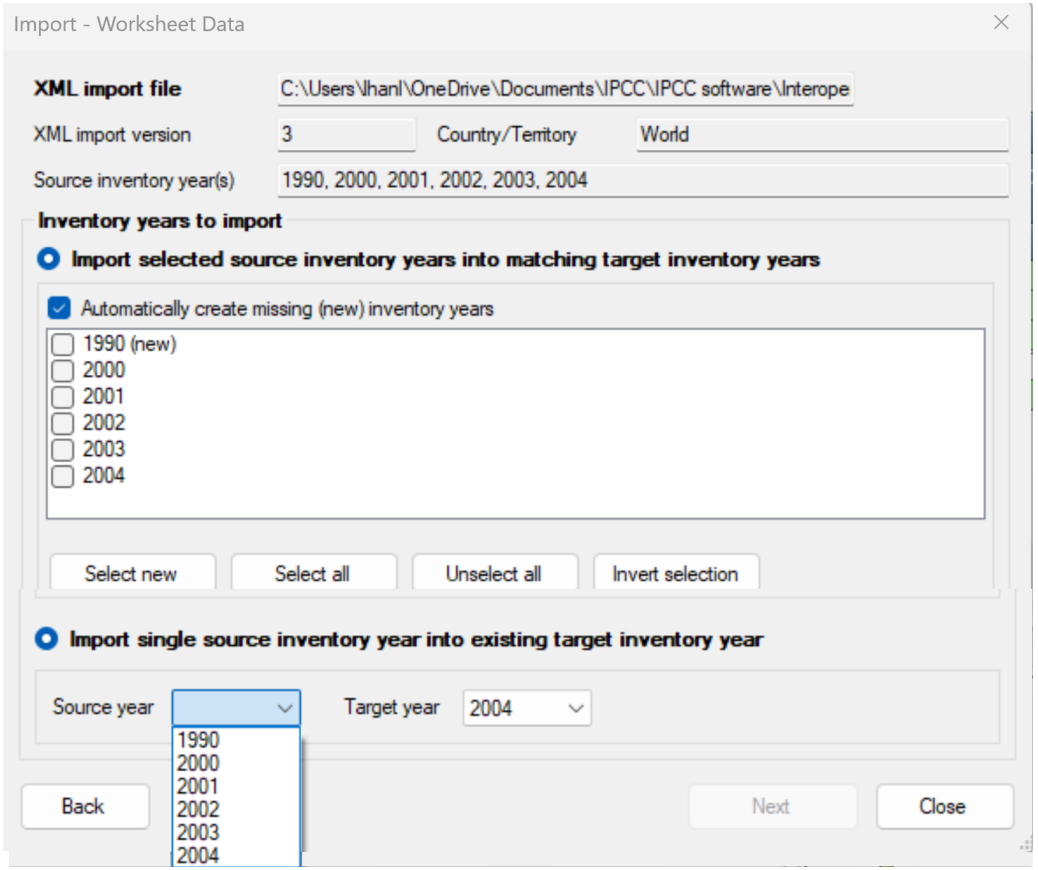
XML Import of Worksheet Data

- ✓ Select whether to import **multiple selected years** or **import single source inventory year** into the currently open database

- ✓ Note that when "Automatically create missing (new) inventory years " is checked (by default), the user may import data for an inventory year that is not in the currently open database; designated as the year followed by "(new)"

Knowledge check: Review the pop-up box to the right that appeared when importing an XML file. Which inventory years exist in the *IPCC Software database* currently open on the user's computer?

- ✓ If **Import single source inventory year** is chosen, the user may import any year from the source database (the XML file being imported) into any target year (year in the currently open database)

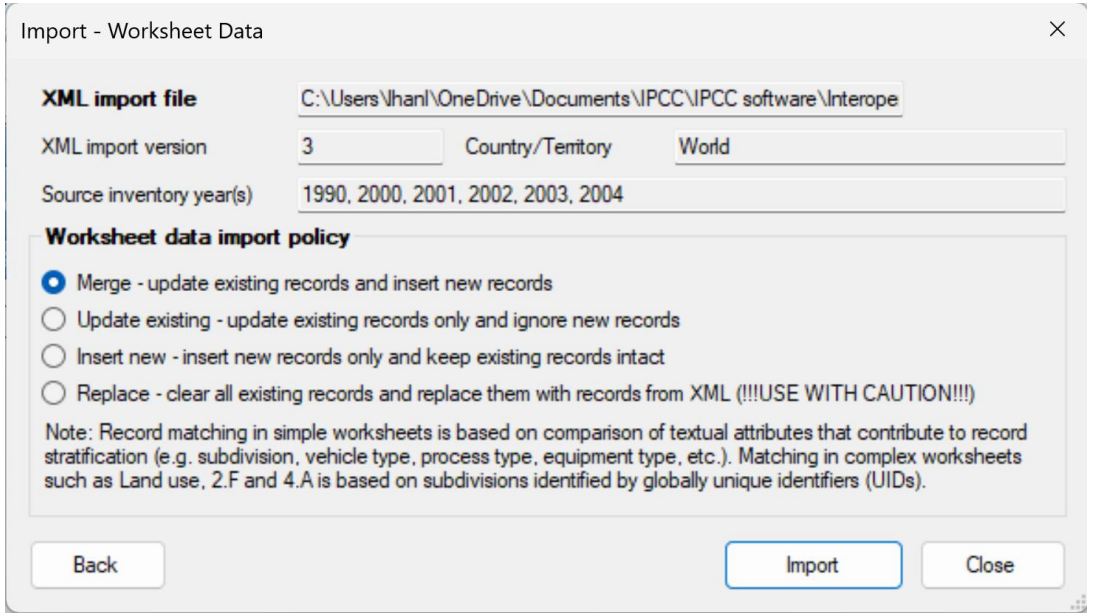


XML Import of Worksheet Data

Select data import policy

- ✓ When importing an XML, a user has four options on how the worksheet data and any data populated in the Data Managers will be considered from the imported XML

- ✓ Functions of “merge”, “update existing”, “insert new” and “replace” are done for individual subdivisions/processes/technologies/etc.



Merge
Update existing records and insert new records

Update existing
Update existing records only and ignore new records

Insert new
Insert new records only and keep existing records intact

Replace
Clear all existing records and replace with records in XML. Use with caution, as all existing data will be replaced.

It is good practice to **save a backup of your database** prior to import.

Exercise 9: Export / Import XML Data

Scenario:
You have data for the 2004 inventory year for category 1.A.2.f. You want to send it to your colleague, who wants to use it as a basis for the 2005 inventory. In this exercise, you will play the role of both you and your colleague.

Goal:
Incorporate your 2004 data for 1.A.2.f into a newly created 2005 inventory.

Your Task:

1. In Inventory Year 2004, go to **Main Menu→ Export/Import → Export→ Worksheet Data**, and export data for 2004 for category 1.A.2.f. Save the export file to your computer.

2. Now, you will assume the role of your colleague and import the data. First, as your colleague is working on the 2005 inventory, you must create the 2005 inventory year in your Software. **Create a new inventory year for 2005 at Main menu → Inventory Year → Create new**

3. Once in year 2005, import the data for 1.A.2.f from the saved Excel file. **Navigate to Main menu→ Export/Import→ Import → Worksheet data**

4. Select **1.A.2.f for import** and select **Next**

5. Select **"import single source inventory year into existing target inventory year".**

   - ✓ Source year = 2004 *(from the excel import file)*
   - ✓ Target year = 2005 *(year in open database into which you want data to import)*

6. Select **Merge for the import policy** (*Insert new* and *Replace* would also work in this scenario)

The 2004 data for category 1.A.2.f has imported into the 2005 inventory year

Results 9: Export / Import XML Data