



IPCC Inventory Software

Hands-on demonstration: ENERGY

Papua New Guinea, online - 9 October 2024

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INTERGOVERNMENTAL PANEL ON climate change

WMO

UN environment programme

Goals for our session:

I. **Get familiar with the IPCC Inventory Software Environment**

- Navigate the software **interface** and **worksheets**
- Enter **activity data** and select **emissions factors**
- Create a **New Inventory Year**
- Use the **Time Series Import** functionality

II. **Consider some of PNG's Energy sector activities**

- **Fuel Classification**
- Energy Balance Activity Data – **Non-Energetic Uses**
- **Choice of Methods** and **Emission Factors**

GHG Emissions from Fuel Combustion

GHG EMISSIONS – FUNDAMENTAL FORMULA

$$Emission_{GHG} = Activity \bullet Emission\ Factor_{GHG}$$

GHG EMISSIONS FROM FUEL COMBUSTION

$$Emission_{GHG,fuel} = Energy\ Consumption_{fuel} \bullet Emission\ Factor_{GHG,fuel}$$

CO_2 EMISSIONS FROM FUEL COMBUSTION – DETAILED PARAMETERS

$$Emission_{CO2,fuel} = Fuel\ Consumption_{fuel} * Net\ Calorific\ Value_{fuel} \bullet Carbon\ Content_{fuel} * Oxidation\ Factor * 44/12$$

Amount of fuel used during a certain period, measured in *units of mass or energy*

Energy released per unit of fuel when *completely burned*.

a measure of **how much carbon is contained** within a given **quantity of that fuel**

The **fraction of carbon** in the fuel that **actually oxidizes into CO_2** during combustion

GHG Emissions from Fuel Combustion

Non-CO_2 EMISSIONS FROM FUEL COMBUSTION

$$Emission_{CH4,fuel} = Fuel\ Consumption_{fuel} * Net\ Calorific\ Value_{fuel} \bullet Emission\ Factor_{CH4,fuel}$$

$$Emission_{N2O,fuel} = Fuel\ Consumption_{fuel} * Net\ Calorific\ Value_{fuel} \bullet Emission\ Factor_{N2O,fuel}$$

CH_4 and N_2O Emissions:

- Origin from **incomplete combustion** or **specific combustion processes**.
- **Not directly linked to the carbon content of the fuel**, unlike CO_2 emissions.

Oxidation Factor:

- **Not applicable** for calculating CH_4 and N_2O emissions, as these **do not result from the direct oxidation** of carbon, but rather **other combustion dynamics**

EXERCISE 1 - Enter data into the IPCC Inventory Software



Exercise 1 - Overview

Exercise 1 - OBJECTIVE

- Navigate the software interface and worksheets
- Enter activity data and select emissions factors
- Create a New Inventory Year
- Import Time Series Activity Data

Exercise 1 – Key Steps

1. Start from a **empty database**
    - We are going to use the database in the Exercise Files
    - The database is empty and currently only have the year 2000
2. Enter **activity data** for category 1.A.1.a.i Electricity Generation
    - Fuel information
    - Energy consumption
3. Select **emission factors**
    - Default emission factors from the 2006 IPCC guidelines
4. Create a **new inventory year**
    - Create year 2001 and 2002
5. Import **time series activity data**
    - Export current sub-category structure
    - Update activity data in excel file
    - Import excel file to IPCC software

1. Start from a Empty Database

1.1 Open the IPCC Inventory Software

- If this is the **first time opening the software** you will be promted to enter *Login*, *Country* and *Year* information
  - *This is the first Run, you will have to complete it just to move foward (you can enter anything here)*
- If this is **not the first time opening the software**, you will be asked to enter login and password for the last dabase open in the software – You can ignore it - *You can just click Cancel in the Login window.*

1.2 Close the current Database

Before you will be able to open a database, you have to **close the database** you currently have open. On the menu bar at the top

- Click Database
- Click Close Database, answer YES to the window question and then click OK

1.3 Open the Exercise 1 Database

Now you will be able to Open the Exercise database

- On the menu bar at the top
  - Click Database
  - Click Open Database, from the Energy Exercise Folder, select for "Exercise 1" the file EX1_PNG_2000_emptyDB"
  - Login name: PNG and Password: PNG
  - Choose Inventory Year: 2000 , Click Ok

2. Enter Activity Data

2.1 Select 1.A.1.a.i from the list of 2006 IPCC Categories

- Using the window on the letf side, select the sub-category **1.A.1.a.i Electricity Generarion**

2.2 Make sure you are at Fuel Consumption Data worksheet

- On the main window, top left corner click on "**Fuel Consumption Data**"

2.3 Enter the following Activity data:

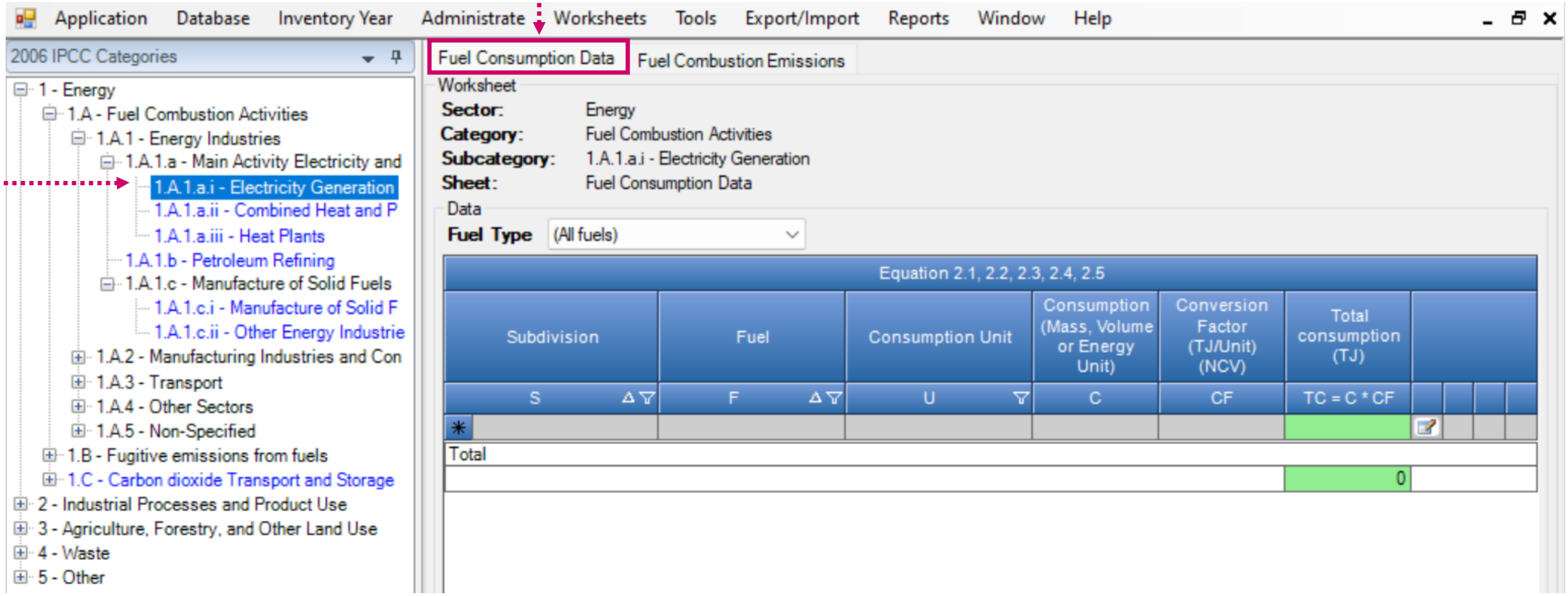
Subdivision	Fuel	Consumption Unit	Consumption
Unspecified	Gas/Diesel Oil	TJ	376.81
Unspecified	Residual Fuel Oil	TJ	2721.42
Unspecified	Natural Gas	TJ	0
Unspecified	Biogas (Landfill Gas)	TJ	0



2. Enter Activity Data

Confirm you're in the right place

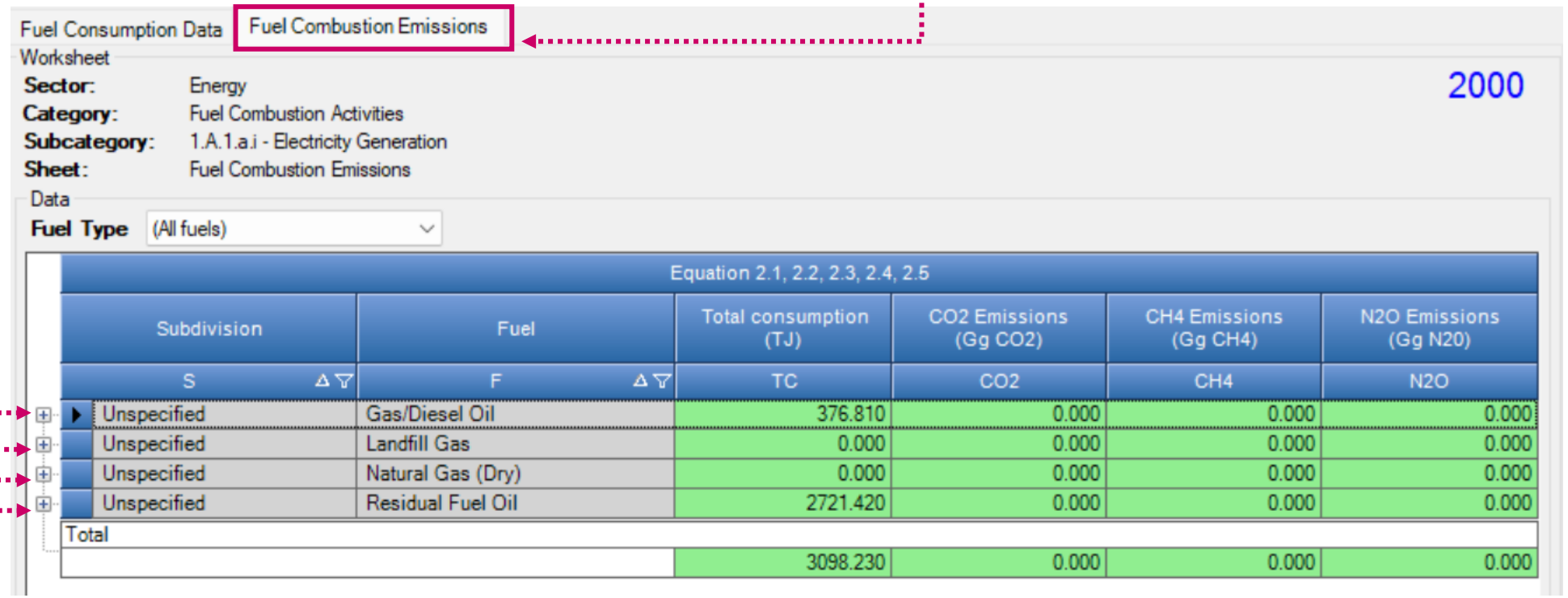
- Select Category - 1.A.1.a.i Electricity Generation
- Select Worksheet - Fuel Consumption Data



3. Selection Emission Factors

3.1 In the same subcategory move to Fuel Combustion Emissions

- On the main window, top left corner click on "**Fuel Consumption Emission**"



3.2 Expand fuel rows to add Emission Factors

- Click the **plus sign (+) to expand the view**

3. Selection Emission Factors

3.3 Select emission factors

IV. Enter Technology Information

|T| Type of Technology: select *Unspecified*

|P| Technology penetration: select *100*

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

IV. Selection of CO_2 Emission Factor

|EF CO_2| Emission Factor:

- **Specified**: select the **IPCC default CO_2 EF** from the drop-down menu
- **Calculated**: calculate CO_2 EF from the **Carbon Content** and **Oxi. Factor**

|Z| Amount of CO_2 Captured: input the value *0*

CO2		
CO2 Emission Factor (kg CO2/TJ)	Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)
EF(CO2)	Z	CO2=C*EF (CO2)/10^6-Z

V. Selection of CH_4 and N_2O Emission Factor

|EF CH_4| : select the **IPCC default CH_4 EF** value from the drop-down menu

|EF N_2O| : select the **IPCC default N_2O EF** value from the drop-down menu

CH4		N2O	
CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)
EF(CH4)	CH4=C*EF (CH4)/10^6	EF(N2O)	N2O=C*EF (N2O)/10^6

3. Selection Emission Factors

3.3 Select emission factors

Technology			CO2 Estimates				CH4 Estimates		N2O Estaimtes	
Type of Technology	Technology Penetration	Consumption (TJ)	CO2 EF Method	EF CO2	Amount Captured	CO2 Emissions	CH4 EF	CH4 Emissions	N2O EF	N2O Emissions
Gas/Diesel Oil										
Unspecified	100		Specified	74100	0		3		0.6	
Landfill Gas										
Unspecified	100		Specified	54600	0		1		0.1	
Natural Gas										
Unspecified	100		Specified	56100	0		1		0.1	
Residual Fuel Oil										
Unspecified	100		Specified	77400	0		3		0.6	

3. Selection Emission Factors

3.4 Select emission factors - Results

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	CO2 Emissions (Gg CO2)	CH4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
S	F	TC	CO2	CH4	N2O
Unspecified	Gas/Diesel Oil	376.810	27.922	0.001	0.000
Unspecified	Landfill Gas	0.000	0.000	0.000	0.000
Unspecified	Natural Gas (Dry)	0.000	0.000	0.000	0.000
Unspecified	Residual Fuel Oil	2721.420	210.638	0.008	0.002
Total					
		3098.230	238.560	0.009	0.002

4. Create a New Inventory Year

4.1 Create a new Inventory for Year 2001

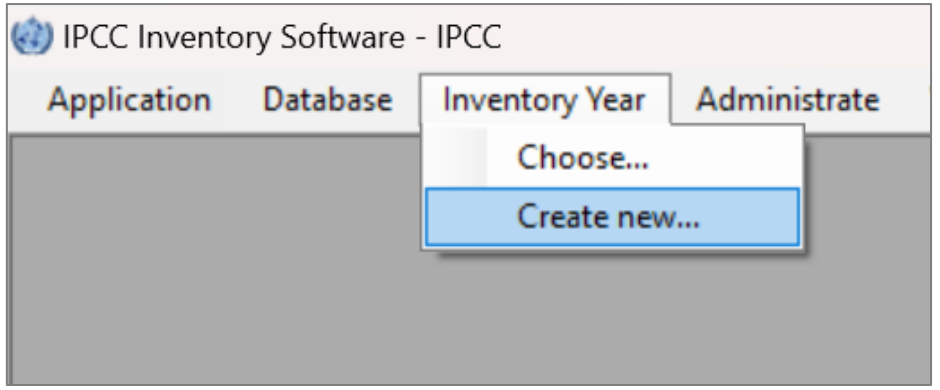
I. Select the year 2001

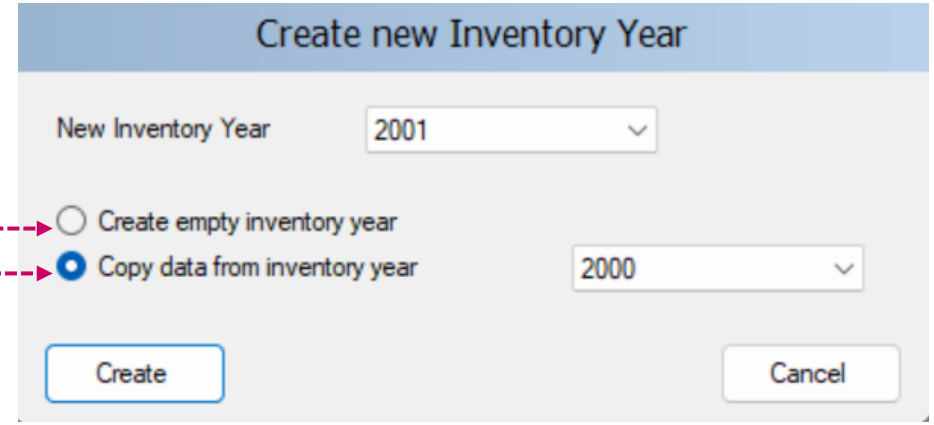
Choose a year from the "New Inventory Year" list.

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 existing year. Year 2000 in this exercise





4.2 Repeat the last step and Create Year 2002

- Select: Copy data from Inventory Year: 2000

4. Create a New Inventory Year

4.1 Create a new Inventory for Year 2001

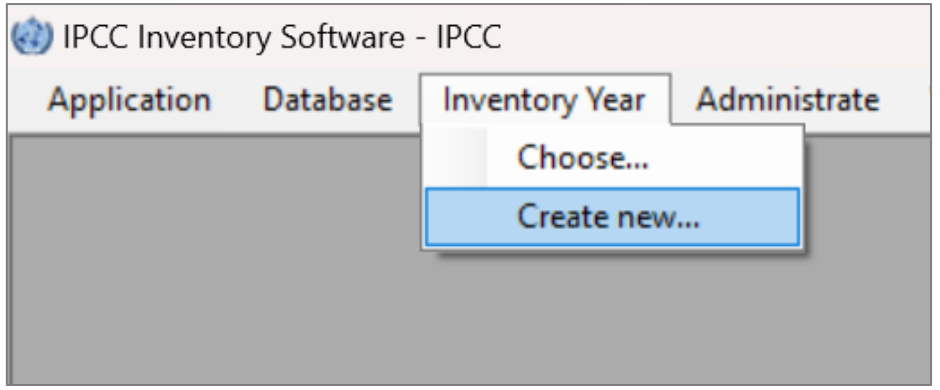
I. Select the year 2001

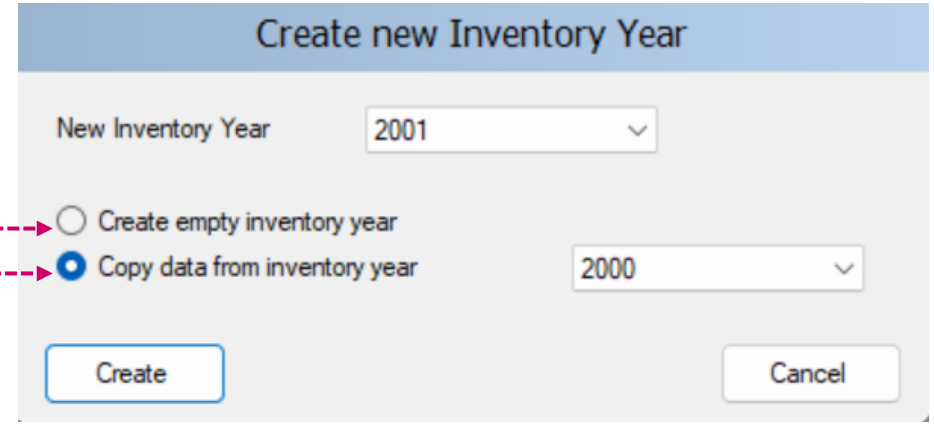
Choose a year from the "New Inventory Year" list.

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 existing year. Year 2000 in this exercise

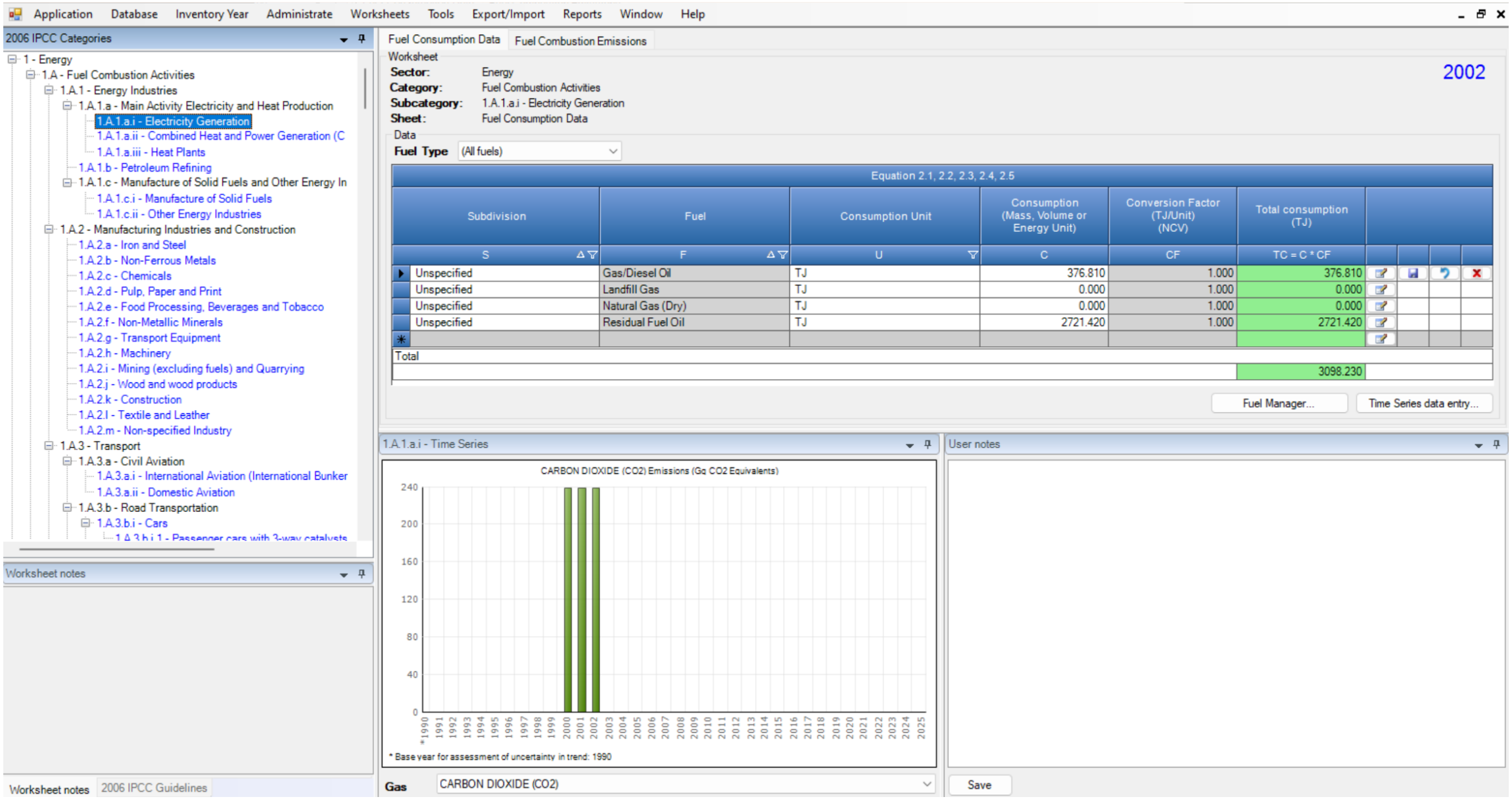




4.2 Repeat the last step and Create Year 2002

- Select: Copy data from Inventory Year: 2000

4. Create a New Inventory Year



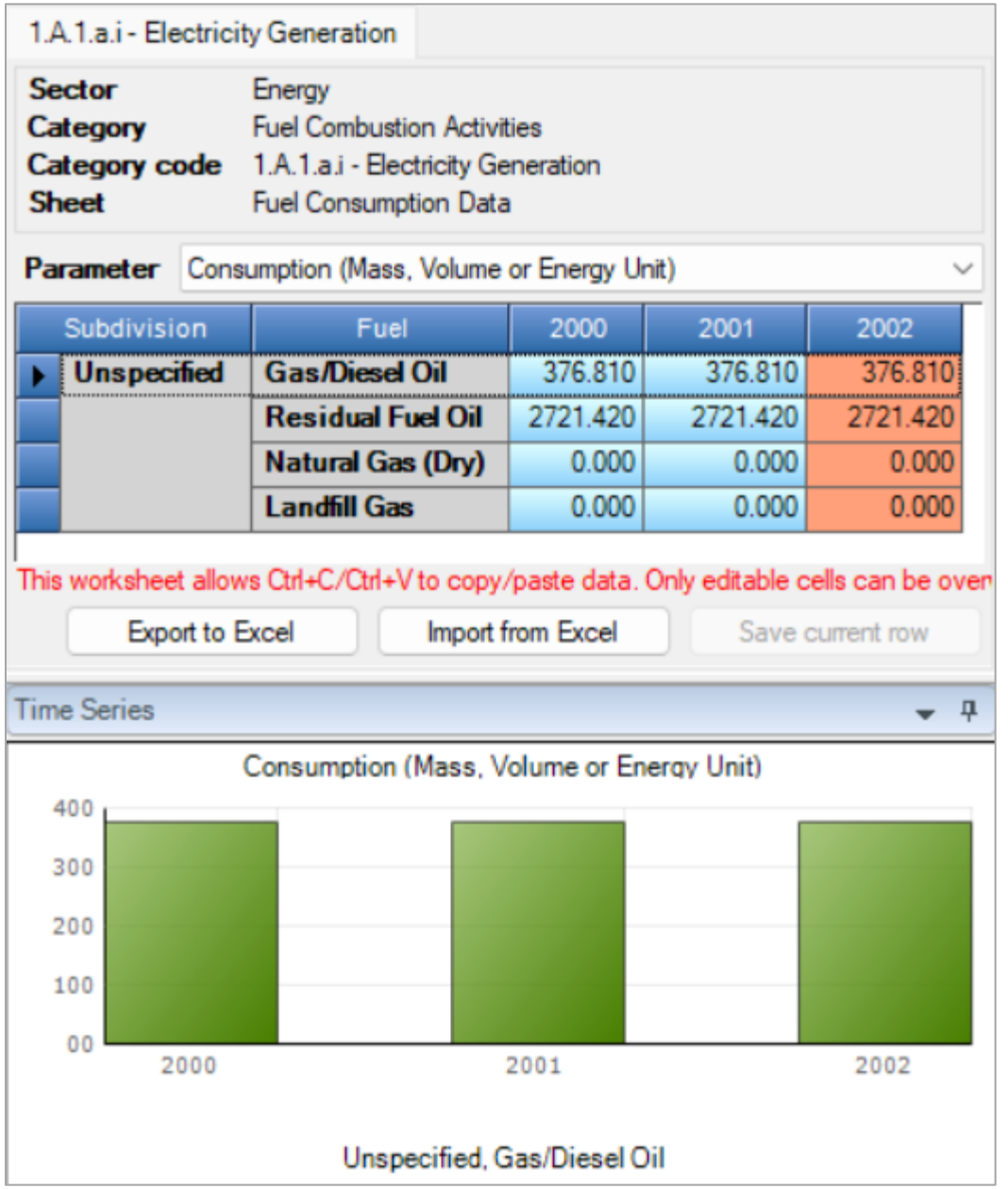
5. Import Time Series Activity data

5.1 Open Time Series data entry window

- You can find the button on the bottom right corner of the main Worksheet

5.2 Check Time Series Data

- In this window you may check the TimeSeries data for diferent Parameters used to estimate emissions from the selected Subcategory
- Theres the possibility to copy data to this table
- However the most efficient way to transfer large amount of data to the software is trought Excel File Importation



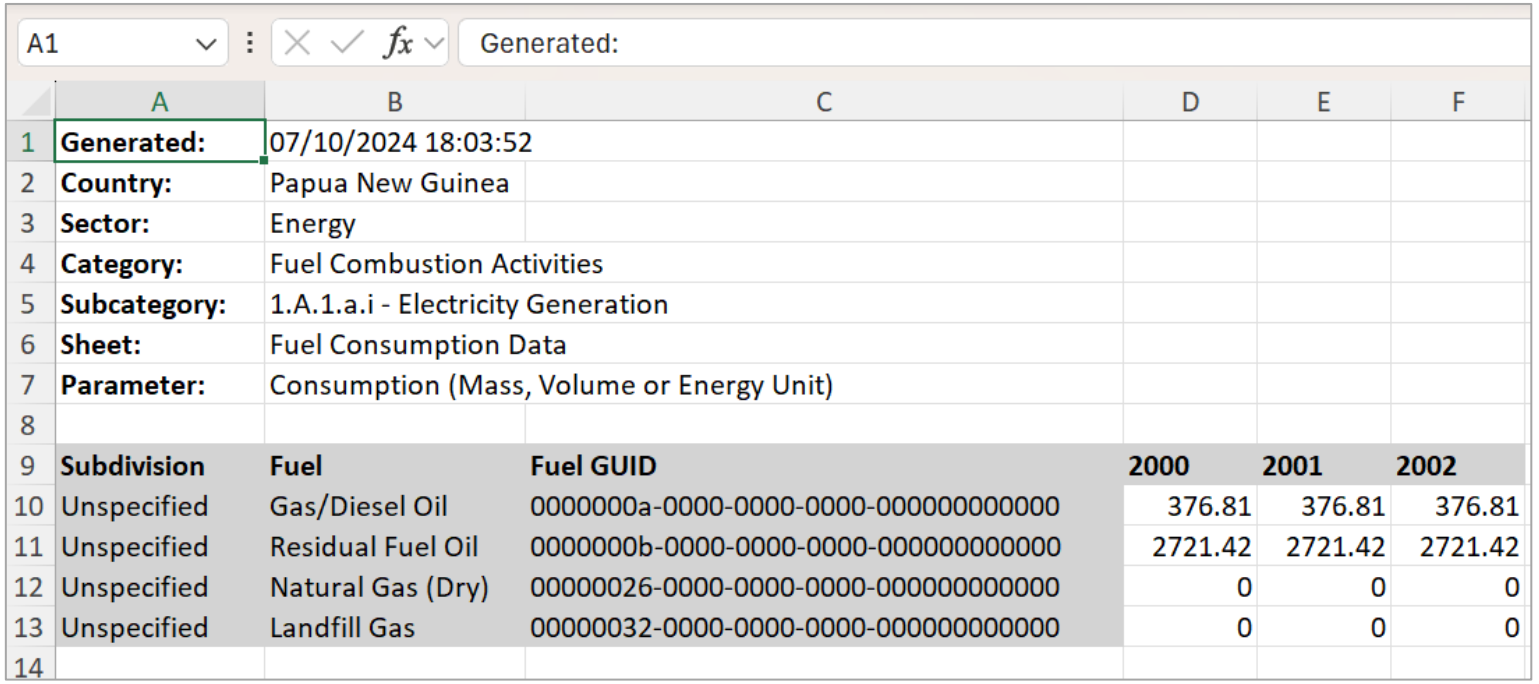
5. Import Time Series Activity data

5.3 Create an Excel File to export data

- Click on “Export to Excel”
- Enter a File Name, and select a folder to save the document
  - Name it “Energy Consumption - 1A1ai 2000-2002”
  - Save it on the “Exercise 1” folder

5.4 Open the created folder in Excel

- When you open the file, you will see somehting like the figure on the right
- The first lines of this document, should not be changed, because they determine where in the software this data will be imported
- You can now edit the information for the years 2000, 2001 and 2002
- Update this values with the activity data provided for this Hands-on session
- Save the changes and close the file

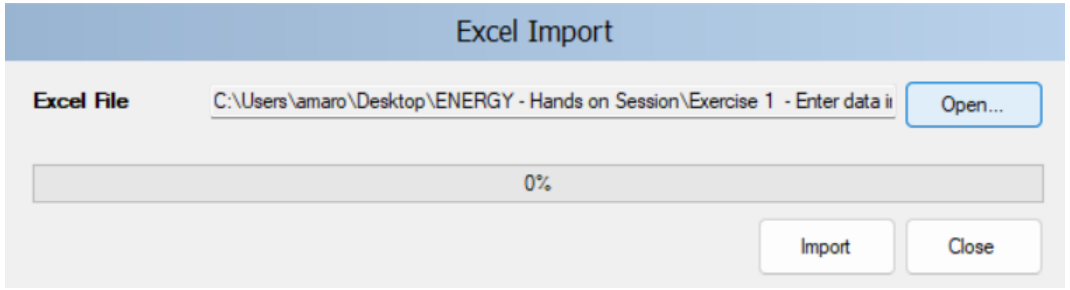


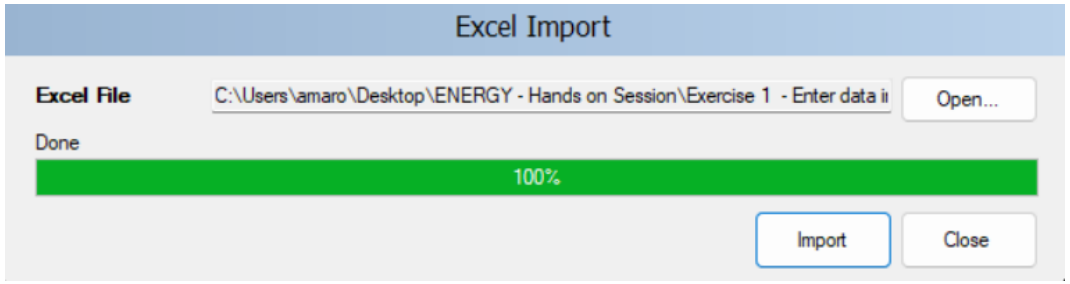
	A	B	C	D	E	F
1	**Generated:**	07/10/2024 18:03:52				
2	**Country:**	Papua New Guinea				
3	**Sector:**	Energy				
4	**Category:**	Fuel Combustion Activities				
5	**Subcategory:**	1.A.1.a.i - Electricity Generation				
6	**Sheet:**	Fuel Consumption Data				
7	**Parameter:**	Consumption (Mass, Volume or Energy Unit)				
8						
9	**Subdivision**	**Fuel**	**Fuel GUID**	**2000**	**2001**	**2002**
10	Unspecified	Gas/Diesel Oil	0000000a-0000-0000-0000-000000000000	376.81	376.81	376.81
11	Unspecified	Residual Fuel Oil	0000000b-0000-0000-0000-000000000000	2721.42	2721.42	2721.42
12	Unspecified	Natural Gas (Dry)	00000026-0000-0000-0000-000000000000	0	0	0
13	Unspecified	Landfill Gas	00000032-0000-0000-0000-000000000000	0	0	0
14						

5. Import Time Series Activity data

5.5 Import the Excel file to the IPCC Software

- Click on "Import from Excel"
  - Open the Updated Excel File
- Click "Import"
  - You will receive a message informing you that you will overwritten the data in the current data base. Answer Yes
  - One you get the message: "Done" and the "100%" notification, the import of data process have been concluded
- Click "Close", to close "Excel Import window"
- The TimeSeries data for Consumption should now be updated
  - Close window to return to subcategory worksheets.





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

Parameter Consumption (Mass, Volume or Energy Unit)

Subdivision	Fuel	2000	2001	2002
Unspecified	Gas/Diesel Oil	376.812	669.888	879.228
	Residual Fuel Oil	2721.420	4479.876	5987.124
	Natural Gas (Dry)	0.000	0.000	0.000
	Landfill Gas	0.000	0.000	0.000

EXERCISE 2 – Setup an Inventory that reflects Country activities



Exercise 2 - Overview

Exercise 2 - OBJECTIVE

- Capture in IPCC Software the main activities of Papua New Guinea's energy sector
- Analyse Activity data
- Make assumptions about the choice of methods and emission factors

Exercise 2 – Key Steps

1. Look at Country Activity Data for Energy Sector
2. Identify Key Activities and Key Parameters
3. Chose Methods, Input Activity Data and Select Emission Factors in the IPCC Software

EXERCISE 3 - Complete Inventory 2000-2017 – Energy Sector



Exercise 3 - Overview

Exercise 3 - OBJECTIVE

- Create a complete Inventory between 2000 and 2017 for the Energy sector
- Compare the results of the estimates made in this exercise with the last submission.
- Compare assumptions and methodological choices made to identify differences

Exercise 3 – Key Steps

1. Import Activity Data to the Energy Sector for the 2000-2017 timeseries
2. Generate Reports and Create CRT Tables Datasets
3. Compare emissions to previous submissions

FOR YOUR ATTENTION

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