IPCC Inventory Software

Taking some of the pain out of transparency

Rob Sturgiss

IPCC TFI TSU *Head of Operations*

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Transparency and tools

- Transparency has always been critical
  - ✓**Yes**
- Transparency is not always easy
  - ✓**true**
- Tools and software are fundamental: Practical help
  - ✓**Yes**
- IPCC software is something that you choose
  - ✓**Yes**

Transparency has always been critical

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

Article 4

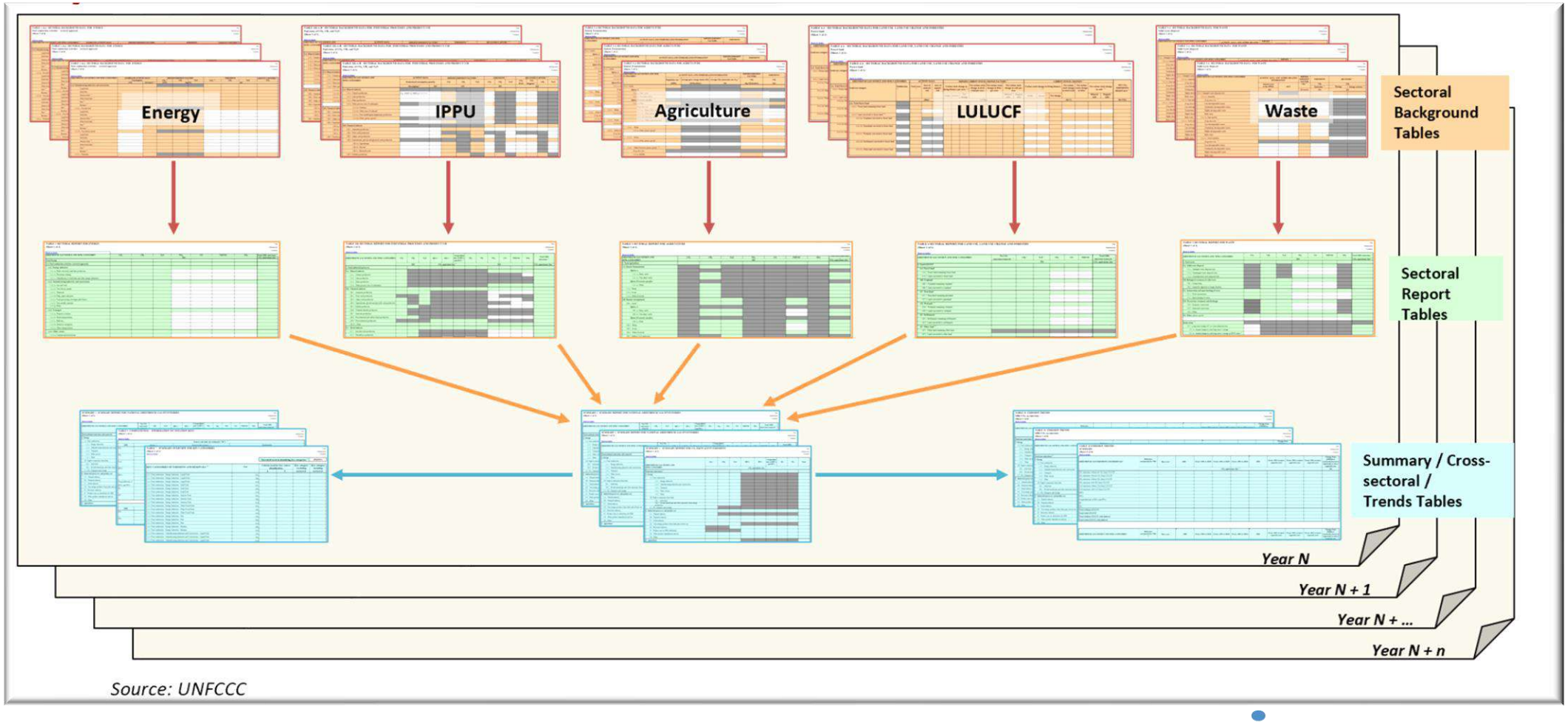
COMMITMENTS

1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

(a) Develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties;

UNITED NATIONS
1992

Transparency can take a lot of effort



Source: UNFCCC

Inventory tools are fundamental: offer practical help

- Some examples:
  - Australian Greenhouse Emissions Information System
    - AGEIS (2005)
  - Thai Greenhouse Emissions Information System
    - TGEIS (2019)
  - IPCC Inventory Software systems (2012-24)

The IPCC Inventory Software is something you choose

- Supported by the IPCC since 2012
- Encouraged by the parties to the Paris Agreement

✓ **Decision 5/CMA.3** mandates the UNFCCC to develop reporting tools for the electronic reporting of the tables and formats, including common reporting tables (CRT) for GHG inventory reporting .

✓ Decision 5/CMA.3 requests the UNFCCC secretariat **to facilitate interoperability** between the reporting tools and the IPCC inventory software and invites the IPCC to participate in this effort.

Why choose the IPCC Inventory Software?

Replaces excel calculation sheets ….(& consultants…..)

Authority, credibility & confidence of applying IPCC methods

Access to international / UN datasets

Archives your results for next time

Automatically feeds the ETF Reporting tool

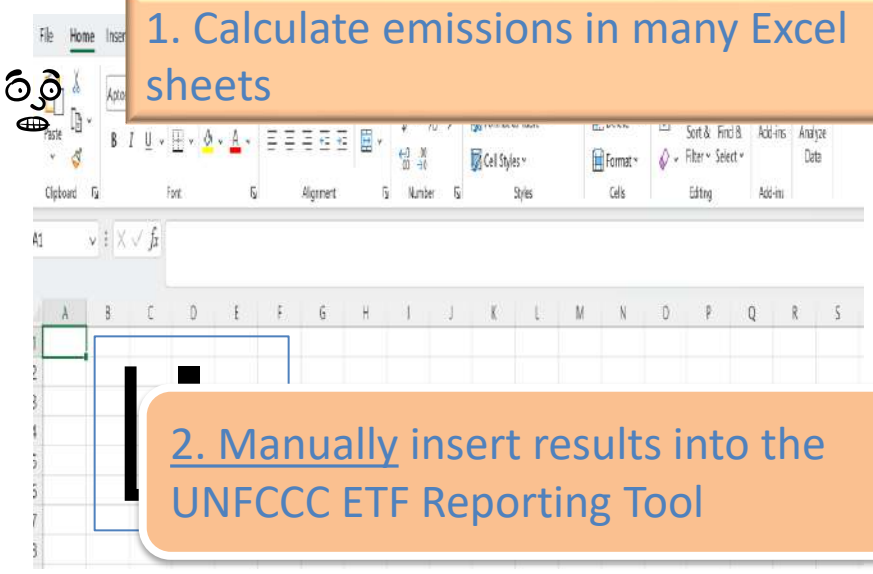
What is interoperability?

- Interoperability = integration
- The IPCC Inventory Software prepares your data for the population of your UNFCCC Common Reporting Tables
- If you choose the IPCC Software..
  - it means you may not need to use UNFCCC ETF tool much at all

IPCC Interoperability: populates the ETF tool

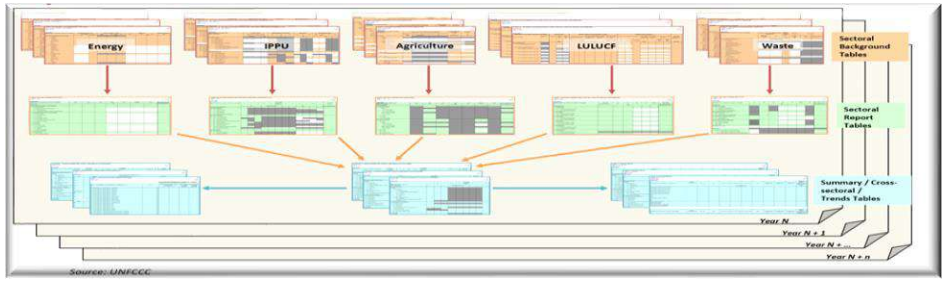
Excel files and ETF

1. Calculate emissions in many Excel sheets



2. Manually insert results into the UNFCCC ETF Reporting Tool

UNFCCC ETF Reporting Tool



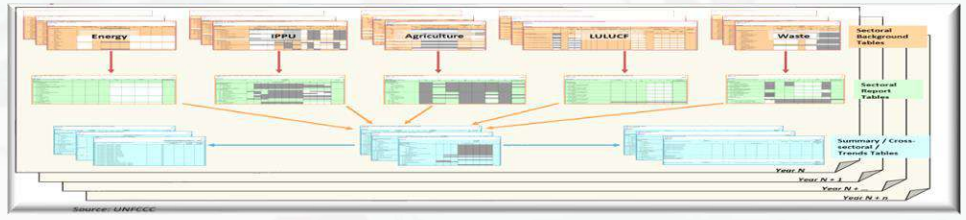
IPCC - ETF integrated software

Calculate emissions in IPCC Software

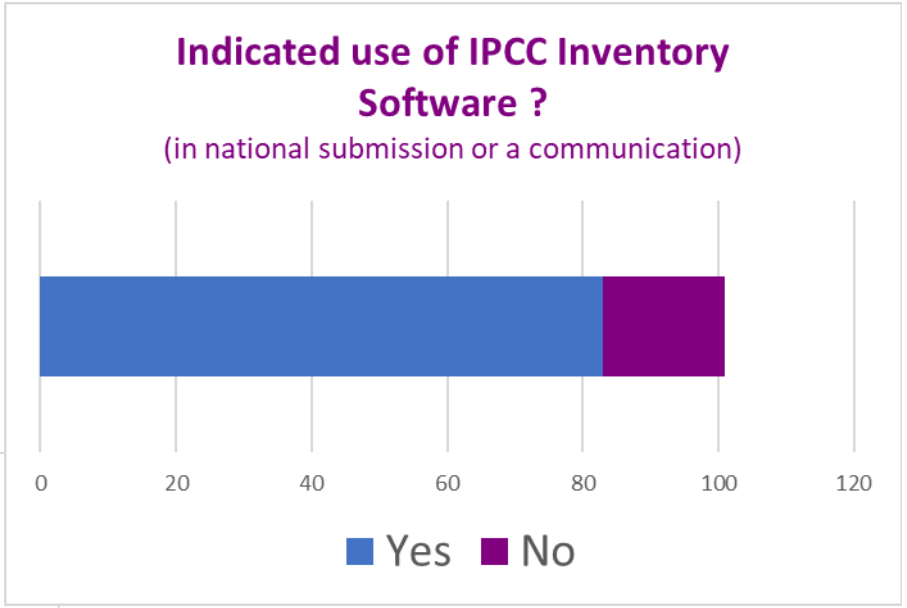
Preview Visualised CRTs

Produce JSON file and upload to populate the UNFCCC ETF Reporting tool

UNFCCC ETF Reporting Tool



Who is using the IPCC Inventory Software?



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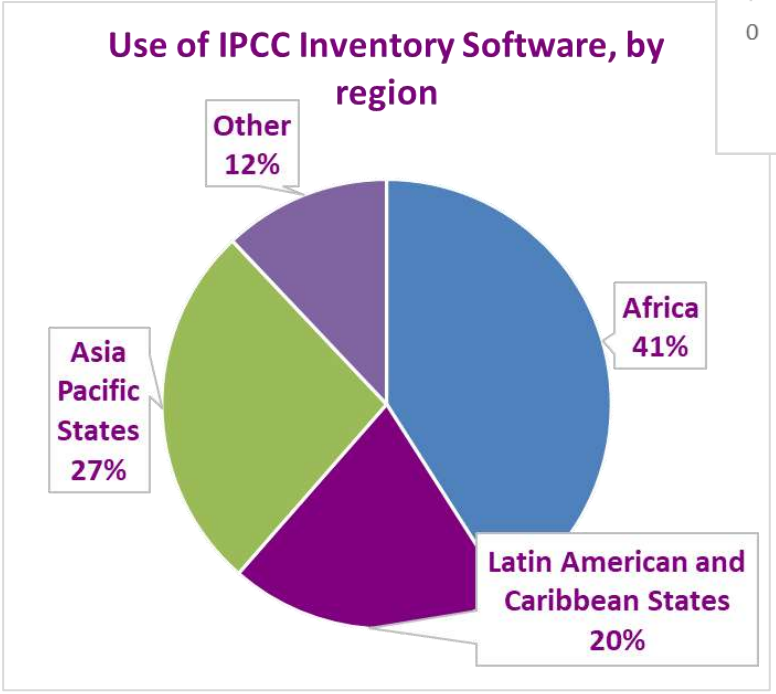
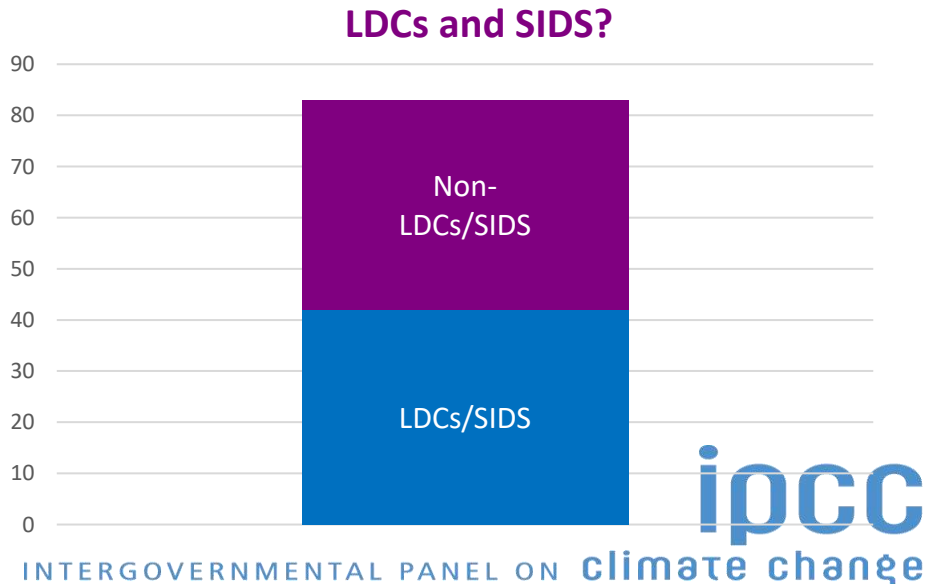
83 Parties





All information as of 7 May 2024

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What are Countries Saying?

✓ The extent to which the *Software* is used, varies, one or more sectors, some only for QA

Systematization and processing of data is easier thanks to the *Software*

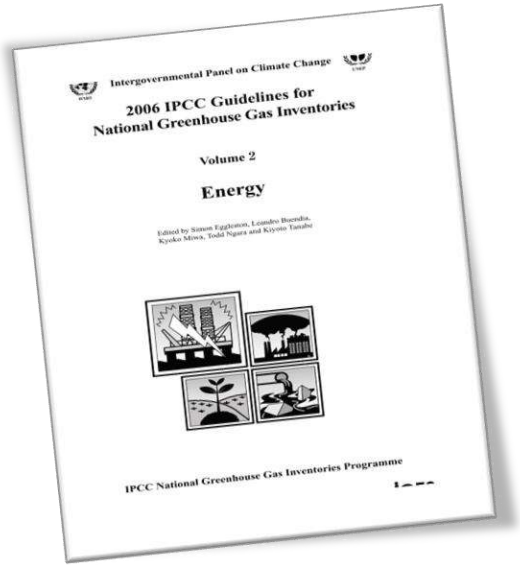
The *Software* offers a better opportunity to choose variables closer to our country

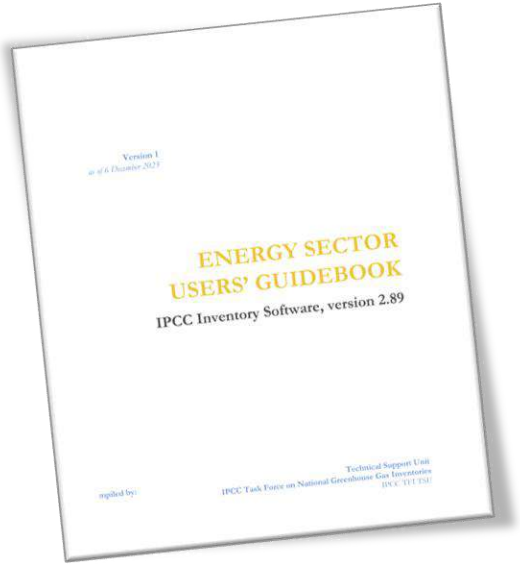
The *Software* is used as the national archiving system

Allows typing errors to be considerably eliminated, while avoiding methodological errors

The commenting feature in the *Software* is also used to input remarks in respective fields for continuity and improvement of the inventory in the future

Available resources





- ✓ Preparation of your GHG inventory
  - ✓ Will be supported by working knowledge of the 2006 IPCC Guidelines for National GHG Inventories
  - ✓ The *Software Users' Guidebooks*
    - ➢ An integrated guide to the Guidelines & the software
- ✓ **IPCC TFI TSU Support** @ ipcc-software@iges.or.jp

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Download the *Software* at

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

(32 vs 64 bit versions)

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Come to the IPCC Inventory Software Presentation

at SBSTA….

5 June

13:15 – 14:30pm

Room: Bonn

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Come to the
IPCC Inventory Software Demonstration workshop

3 days
August 2024

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Example - Estimating GHG Emissions from Fuel Combustion

1. Acquire the necessary activity data

- The *Software* and the IPCC Guidelines identify necessary input data

✓ **In absence of detailed national statistics, may use international datasets**

- UN Statistics Division publishes energy data **for over 200 countries**

- These data can provide an estimate for the Sectoral and Reference Approach

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	174809	..	27515	..	641631	262454
Imports	..	..	3105	183696	17768	..	..	157	..	204684	..
Exports	..	..	-334470	-3999	.	-60	..	-6242	..	-345162	-60
International marine bunkers	..	..	.	-298	.	..	..	..	..	-298	..
International aviation bunkers	..	..	..	-8429	.	..	..	..	..	-8429	..
Stock changes	..	..	1198	8587	.	..	..	..	..	9785	..
Total energy supply	..	..	6213	175518	120166	174869	..	21430	..	502212	262404
Statistical difference	..	..	-12330	-638	10666	0	..	0	..	-2669	27515
Transfers	..	..	..	..	.	..	..	..	..	.	..
Transformation	..	..	-16121	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	11956	.	..	..	..	..	1925	..
Other transformation	..	..	..	..	.	-47580	..	..	..	-47580	-47580
Energy industries own use	..	..	-997	-1332	.	..	..	-2402	..	-4732	..
Losses	..	..	-1225	..	.	..	..	-5854	..	-6879	..
Final consumption	..	..	..	191898	5773	127309	..	65342	..	390629	127309
Final energy consumption	..	..	..	189365	5773	127309	..	65342	..	387788	127309
Manufacturing, const., mining	..	..	..	19562	5773	..	..	..	..	..	..
Iron and steel	..	..	..	..	.	..	..	..	..	..	..
Chemical and petrochemical	..	..	..	..	.	..	..	..	..	..	..
Non-ferrous metals	..	..	..	..	.	..	..	..	..	..	..
Non-metallic minerals	..	..	..	..	.	..	..	..	..	..	..
Transport equipment	..	..	..	..	.	..	..	..	..	..	..
Machinery	..	..	..	..	.	..	..	..	..	..	..
Mining and quarrying	..	..	..	12777	.	..	..	..	..	..	..
Food and tobacco	..	..	..	1245	.	..	..	..	..	..	..
Paper, pulp and printing	..	..	..	105	.	..	..	..	..	..	..
Wood and wood products	..	..	..	..	.	..	..	..	..	..	..
Textile and leather	..	..	..	..	.	..	..	..	..	..	..
Construction	..	..	..	1359	.	..	..	..	..	..	..
Industries n.e.s	..	..	..	4015	5773	..	..	..	..	..	..
Transport	..	..	..	156988	.	..	..	..	..	..	..
Road	..	..	..	156182	.	..	..	..	..	..	..
Rail	..	..	..	195	.	..	..	..	..	..	..
Domestic aviation	..	..	..	539	.	..	..	..	..	..	..
Domestic navigation	..	..	..	71	.	..	..	..	..	..	..
Pipeline transport	..	..	..	..	.	..	..	..	..	..	..
Transport, n.e.s	..	..	..	..	.	..	..	..	..	..	..
Other	..	..	..	18876	.	..	..	..	..	..	..
Agriculture, forestry, fishing	..	..	..	6760	.	..	..	..	..	..	..
Commerce, public services	..	..	..	1098	.	..	..	..	..	..	..
Households	..	..	..	11018	.	..	..	..	..	..	..
Other consumers	..	..	..	..	.	..	..	..	..	..	..
Non-energy use	..	..	..	*3533	.	..	..	..	..	..	..

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	..	*-5588	..	*-4014	2161	1837	*-5603	*-1854
Electricity plants	..	*-5588	..	..	..	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/)

Three worksheets to deal with Fuel Combustion

GHG emissions from Fuel combustion (~70% of national emissions, excluding LULUCF)

1. Fuel Manager, 2. Fuel Consumption Data, 3. 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 Consumption Data

Data

Fuel Type (All fuels)

Equation 2.4

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	
Country X	Anthracite	Gg (Auto CF)	40,000.000	26.700	1,068,000.000	
Country X	Charcoal	Gg (Auto CF)	4,000.000	29.500	118,000.000	
Country X	Gas/Diesel Oil	Gg (Auto CF)	1,000.000	43.000	43,000.000	
Country X	Liquefied Petroleum Gases	Gg (Auto CF)	2,900.000	47.300	137,170.000	
Country X	Municipal Wastes (nonbiomass fraction)	Gg (Auto CF)	200.000	10.000	2,000.000	
Country X	Natural Gas (Dry)	Gg (Auto CF)	10,000.000	48.000	480,000.000	
Country X	Peat	Gg (Auto CF)	3,500.000	9.760	34,160.000	

Total

Fuel Manager...

Basic Approach - AD - Fuel Consumption Data worksheet

2. Enter activity data

- ✓ Enter from your energy balance, in TJ, the amount of each fuel consumed e.g. for Electricity generation
- ✓ *[illegible]*

Fuel Consumption Data | Fuel Combustion Emissions

Worksheet

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

2022

Minimum country-specific data– type and amount of fuel consumed

Data

Fuel Type (All fuels)

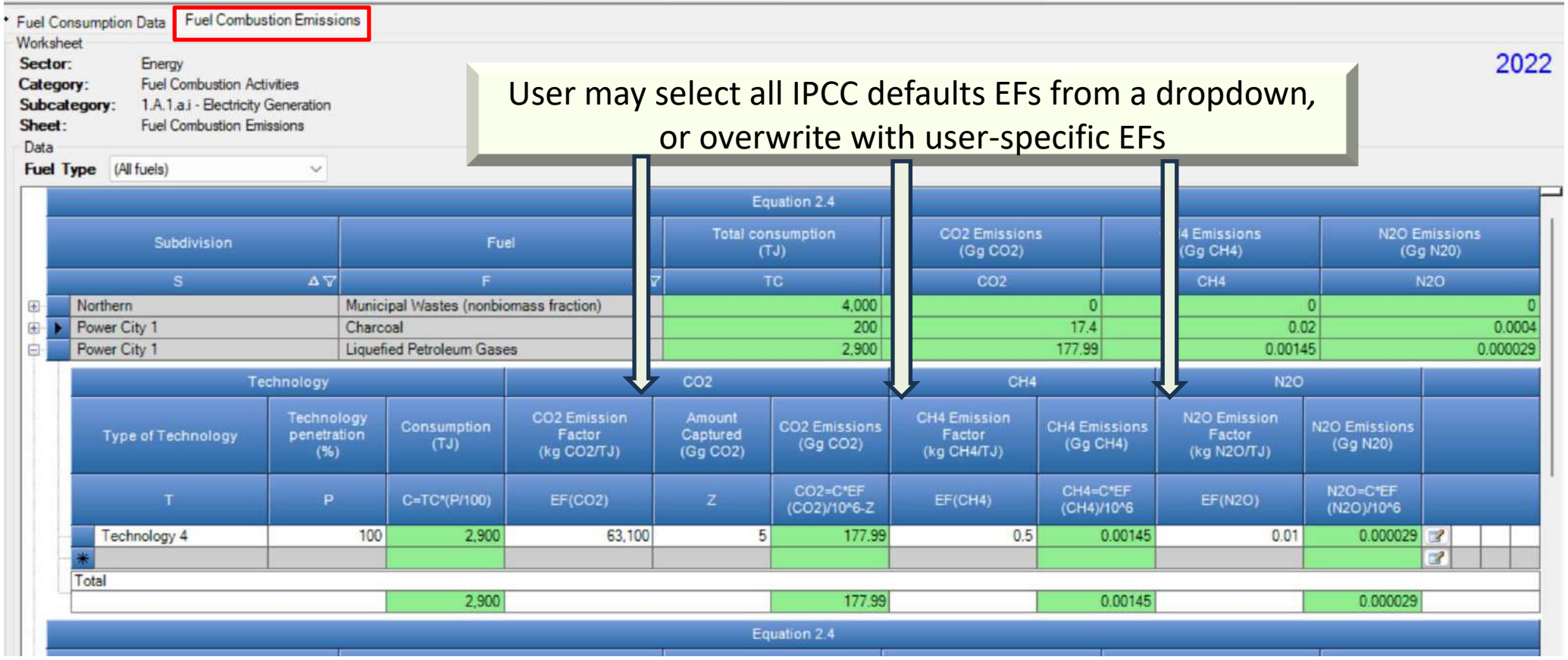
Equation 2.4

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
Northern	Municipal Wastes (nonbiomass fraction)	TJ	4,000	1	4,000
Power City 1	Charcoal	TJ	200	1	200
Power City 1	Liquefied Petroleum Gases	TJ	2,900	1	2,900
Unspecified	Anthracite	TJ	40,000	1	40,000
Unspecified	Gas/Diesel Oil	TJ	1,000	1	1,000
Unspecified	Natural Gas (Dry)	TJ	10,000	1	10,000
Unspecified	Peat	TJ	3,500	1	3,500
Total					61,600

Basic Approach - AD - Fuel Consumption Emissions worksheet

3. Apply IPCC EF and Calculate GHG Emissions

✓ *May refine estimates by disaggregating to e.g. regions, technologies, and reporting the quantity of CO_2 captured*



Fuel Consumption Data | Fuel Combustion Emissions

Worksheet

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

2022

User may select all IPCC defaults EFs from a dropdown, or overwrite with user-specific EFs

Data

Fuel Type (All fuels)

Equation 2.4

Subdivision	Fuel	Total consumption (TJ)	CO2 Emissions (Gg CO2)	4 Emissions (Gg CH4)	N2O Emissions (Gg N20)
S	F	TC	CO2	CH4	N2O
Northern	Municipal Wastes (nonbiomass fraction)	4,000	0	0	0
Power City 1	Charcoal	200	17.4	0.02	0.0004
Power City 1	Liquefied Petroleum Gases	2,900	177.99	0.00145	0.000029

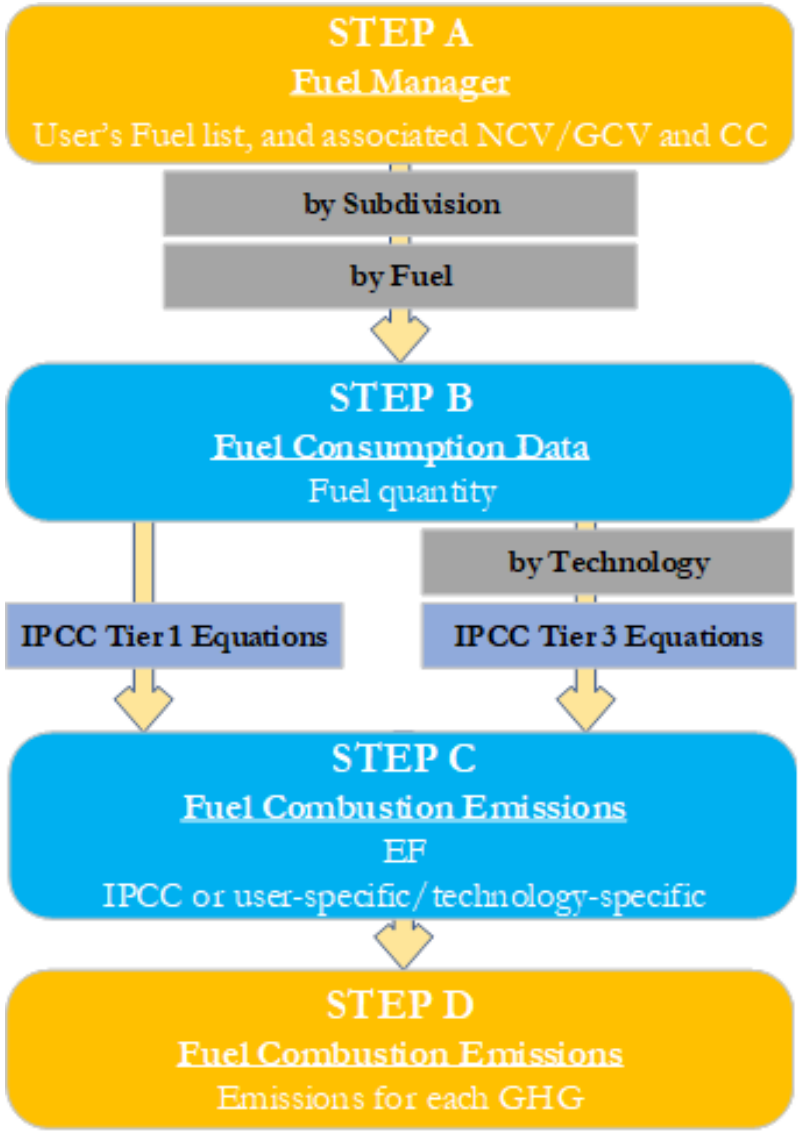
Technology			CO2			CH4		N2O		
Type of Technology	Technology penetration (%)	Consumption (TJ)	CO2 Emission Factor (kg CO2/TJ)	Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)	CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)	
T	P	C=TC*(P/100)	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 4	100	2,900	63,100	5	177.99	0.5	0.00145	0.01	0.000029	
Total		2,900			177.99		0.00145		0.000029	

Equation 2.4

Ongoing Work

- ✓ **Paris Agreement requirements**
  - ➢ Interoperability with ETF reporting tool, to be concluded by **June 2024** (adding IPPU sector F-gases, and Indirect emissions tables)
- ✓ **Extending capacity for Uncertainty Analysis** and **Key Category Analysis**
- ✓ **Facilitating export/import of data (Time series)**
- ✓ **Completing publication of Guidebooks**
- ✓ **Step-by-step instructions**, *in a ppt/video format,* **to implement IPCC default methods**

Guidebook - Structure



For each category, the Guidebook includes, *inter alia,* the following information:

- ✓ The relevant equations from the *2006 IPCC Guidelines*
- ✓ A description of the relevant worksheets.

- ✓ A **User's Work Flowchart**
  - ➢ **Step A: Fuel Manager**
  - ➢ **Step B: Fuel Consumption Data**
  - ➢ **Step C: Fuel Combustion Emissions - EFs**
  - ➢ **Step D: Fuel Combustion Emissions - Results**
- ✓ Step-by-step guidance to input **activity data** and **emission factor** information
- ✓ **Results**