IPCC Inventory Software - Users' Guidebooks
(Energy Sector, Land Representation)

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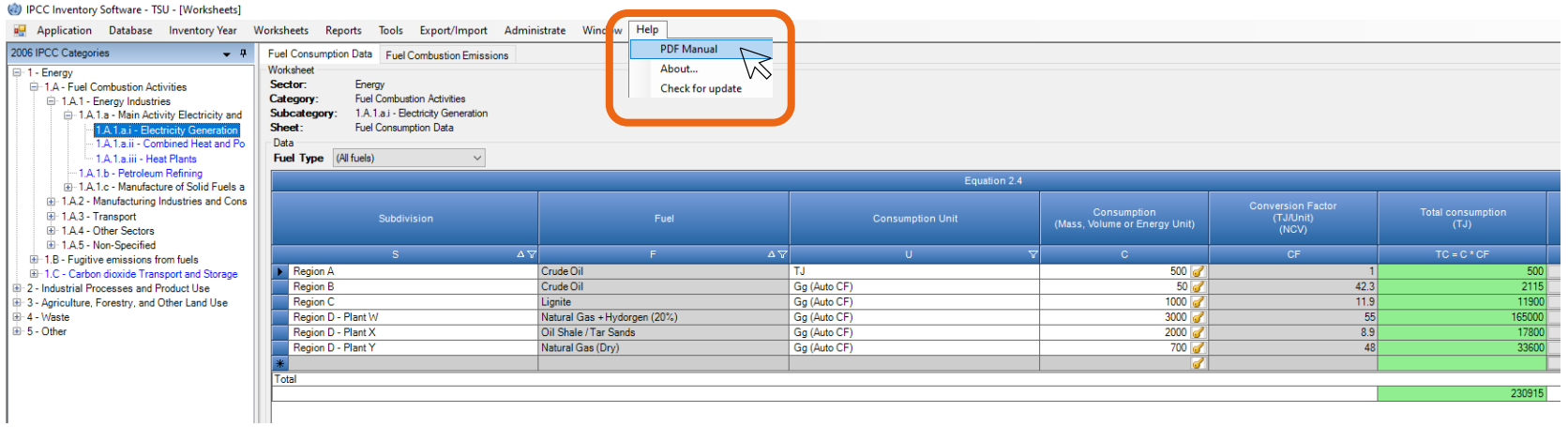
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

User Manual

- In addition to the User Manual, IPCC TFI TSU is producing **a series of Guidebooks to support the use of the Software.**

- **The User Manual can be accessed from the Tab <Help> of the Software**, and it is also published in the IPCC TFI web-site: www.ipcc-nggip.iges.or.jp/software/index.html



- **Unofficial translations in Arabic and French of the User Manual and of the Software are published in IPCC TFI web-site for** *(kindly provided by Prof. Sidaty Ould Dah)*

Users' Guidebooks

Aim

- **To simulate the use of the Software** for each inventory category, and to provide the most relevant references to good practice from the *2006 IPCC Guidelines*, its *Wetlands Supplement*, and its *2019 Refinement* (only where needed)

Structure

- For each inventory category:
  - General information on the category and gas(es) covered
  - Relevant IPCC equations
  - Description of calculation worksheets in the Software
  - Workflow for AD and EF selection and input
  - Results

NOTE Software users SHALL be familiar with the *2006 IPCC Guidelines* and read the *User Manual* before going through the Guidebook.

Users' Guidebooks - Overview

Sectoral Guidebooks

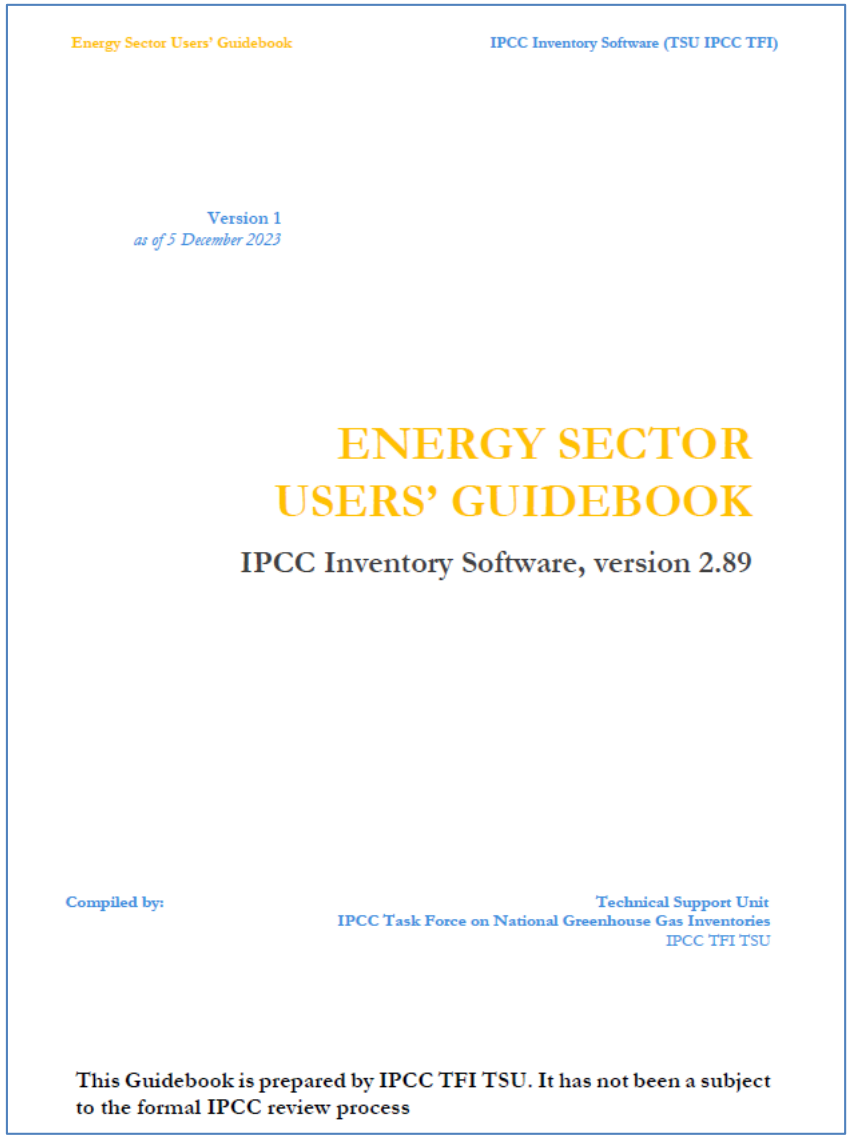
As the IPCC Inventory Software is still subject to improvements within the work on interoperability, the development of sectoral guidebooks is accordingly affected.

Sector	Software	Guidebook
Energy	Developed	Under publication (TFI website)
IPPU	Under Development	Under development
AFOLU	Under Development	Land Representation – uploaded (TFI website)
		Under development
Waste	Developed	Under development
Interoperability	Under Development	Under development

Work in progress:

- ✓ **versions published are periodically revised** *(versions' numbering to be checked by users)*
- ✓ **users' feedback is a key to support Guidebooks' development**

Energy Guidebook



- Around 140 pages, it can be downloaded from the IPCC TFI web-site: www.ipcc-nggip.iges.or.jp/software/index.html
- A work-in-progress document, given it will be periodically reviewed by IPCC TFI TSU with the aim to increase the amount of information and to enhance its usefulness *(real case examples, correction of any errors and further enhancement of the software).*
- Users are therefore required to check periodically the version of the Energy guidebook published on the IPCC TFI website

General Structure

- **Introduction**
- **General Energy Issues**
  - List of Categories
  - Fuel Manager
  - Use of Multiple Tiers
  - Reporting Subdivisions
  - Uncertainty and Time Series
- **Sectoral Guidance**
  - 1A Stationary Combustion
  - 1B Fugitive Emissions
  - 1C Carbon Dioxide Transport and Storage
  - Reference Approach
- **Annex I: Mapping between the IPCC Inventory Software and the UNFCCC CRT Reporting Tool**

The main part: Includes all categories of Energy sector

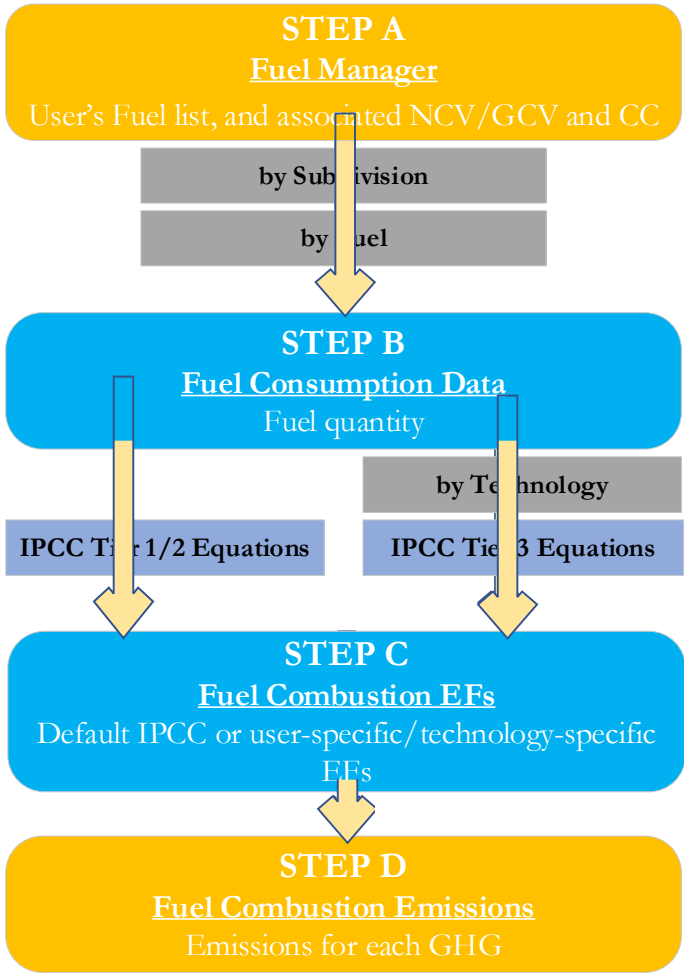
Categories' structure

- **Information**
  - a short information on important issues regarding the IPCC Guidance, Tiers/methods, categories, etc.
- **GHGs**
  - indication of GHGs emitted in each category
- **IPCC Equations**
  - a list of relevant equations from the IPCC Guidelines
- **Software Worksheets**
  - a short description of the Software worksheets
- **Category Flowchart**
  - a schematical diagram of workflow with category's worksheets
- **Activity Data Input**
  - guidance on input of AD in category's worksheets
- **Emission Factor Input**
  - guidance on input of EFs in category's worksheets
- **Results**
  - any issues related to the results of estimation (representation in the Software worksheets and Reporting Tables)

Step-by-step or cookbook approach

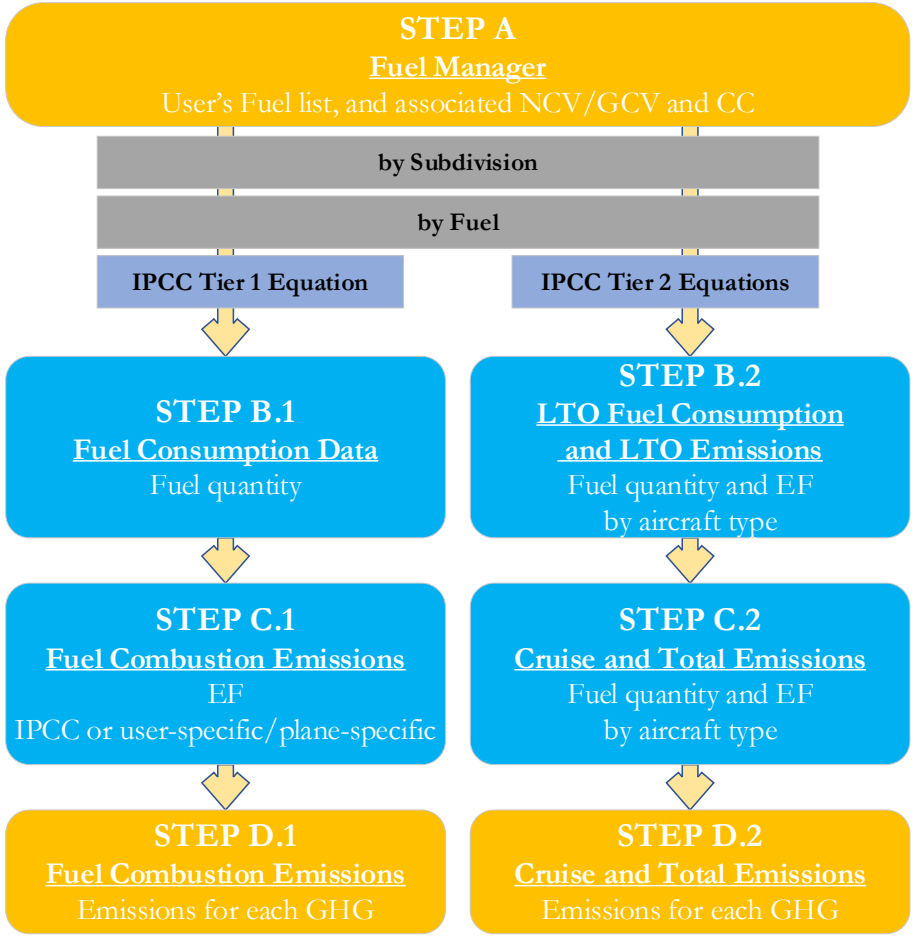
Example of Flowchart (1)

- 1.A - Stationary Combustion Source Categories (1.A.1, 1.A.2, 1.A.4 and 1.A.5)



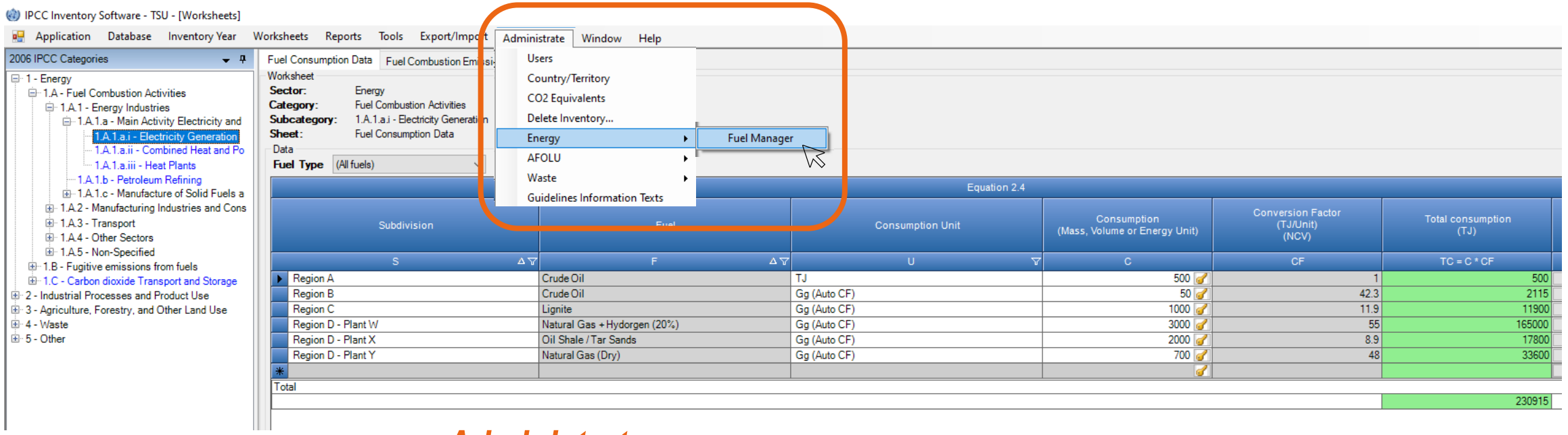
Example of Flowchart (2)

- 1.A.3.a - Civil Aviation



Fuel Manager (1)

- Before entering data in Energy worksheets to estimate emissions from 1.A Fuel Combustion Activities, the **Fuel Manager** shall be populated with all relevant data that will be subsequently used (automatically appear) in Energy worksheets

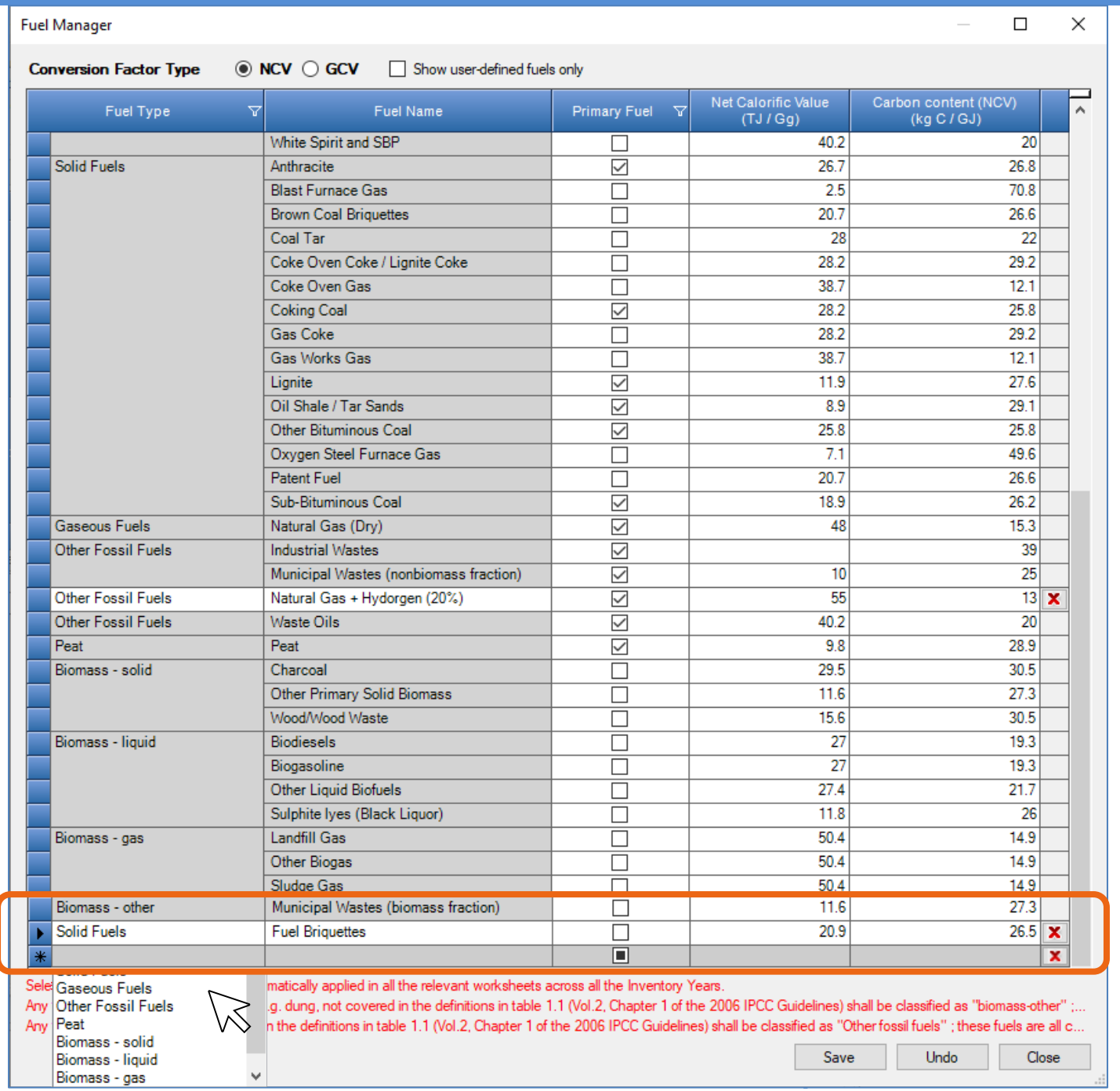


Administrate → ***Energy*** → ***Fuel Manager***

Fuel Manager (2)

- The Fuel Manager contains data on carbon content and calorific value for each fuel.
- All IPCC default fuels are listed in. In addition, users can enter user-specific fuels together with relevant data required by the Fuel Manager (carbon content and calorific value).

Default IPCC fuels (embedded - in grey) and Country-specific fuels (manual input - in white)



Activity Data Input (1)

Worksheets

Fuels *(Selection)*

Units *(Selection)*

Equation

AD – Fuel Consumption *(Manual Input)*

Subdivisions *(Manual Input)*

Drop-down Menu *(fuels from Fuel Manager)*

Fuel Consumption Data | Fuel Combustion Emissions

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
Region A	Crude Oil	TJ	500	1	500
Region B	Crude Oil	Gg (Auto CF)	50	42.3	2115
Region C	Lignite	Gg (Auto CF)	1000	11.9	11900
Region D - Plant W	Natural Gas + Hydorgen (20%)	Gg (Auto CF)	3000	55	165000
Region D - Plant X	Oil Shale / Tar Sands	Gg (Auto CF)	2000	8.9	17800
Region D - Plant Y	[illegible]	[illegible]	700	48	33600
Region A		Gg (Auto CF)			
Total					230915

Fuel Name	Net Calorific Value (TJ / Gg)	Carbon content (NCV) (kg C / GJ)
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

Activity Data and Emission Factor Input

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.

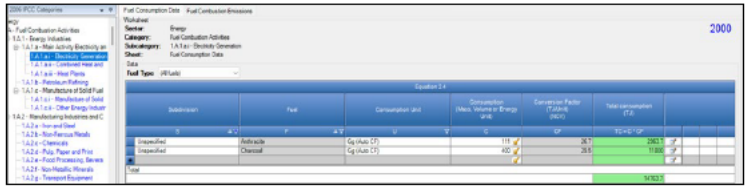
Fuel consumption data in mass or volume units shall first be converted into the energy content of these fuels in Terajoule units (TJ). The GCV/NCV are used to convert Gg of fuels into TJ (IPCC default values for NCV are in Table 1.2). Other units may be entered into the **Fuel Consumption Data** worksheet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

Thus, for the relevant source-category:

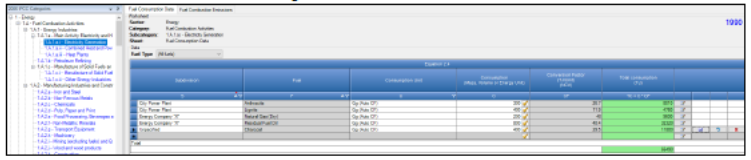
As **Starting step**, users enter in the Fuel Manager all user-specific fuels to be reported in the NGHGI; and for each fuel listed in the Fuel Manager the *calorific Value* and the *carbon content* are entered or, for IPCC default fuels are selected from the dropdown menu.

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

Example: **Single Subdivision (unspecified)**



Example: **Multiple Subdivisions**



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

1. Column |F|: select each fuel used from the drop-down menu (1 row for each fuel).
   Note that fuels shown in the dropdown menu are those listed in the Fuel Manager.
   Note that there is no limit to the number of combinations of subdivision/fuel that can be entered in the Software; the larger the number, the more accurate and precise the estimates are.
2. Column |U|: enter unit of fuel consumption data (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-specific unit.
3. Column |C|: enter amount of fuel consumed.
4. Column |CF|: enter conversion factor to convert the consumption unit to energy unit (TJ).
   Note that where Gg of fuel are converted to TJ, the NCV/GCV is sourced from the Fuel Manager and compiled by the Software as the conversion factor; while if the consumption unit is TJ the Software compiles the conversion factor cell with the value 1. Where other units are applied (e.g. m^3) the user shall enter relevant conversion factor here.

- **AD and EF input**

Energy guidebook provides a detailed structured description for input of AD and EFs for:

- *each column*
- *each worksheet*
- *each category*

Guide to Land Representation

- Land Representation is one of the most important issues in National GHG Inventories.

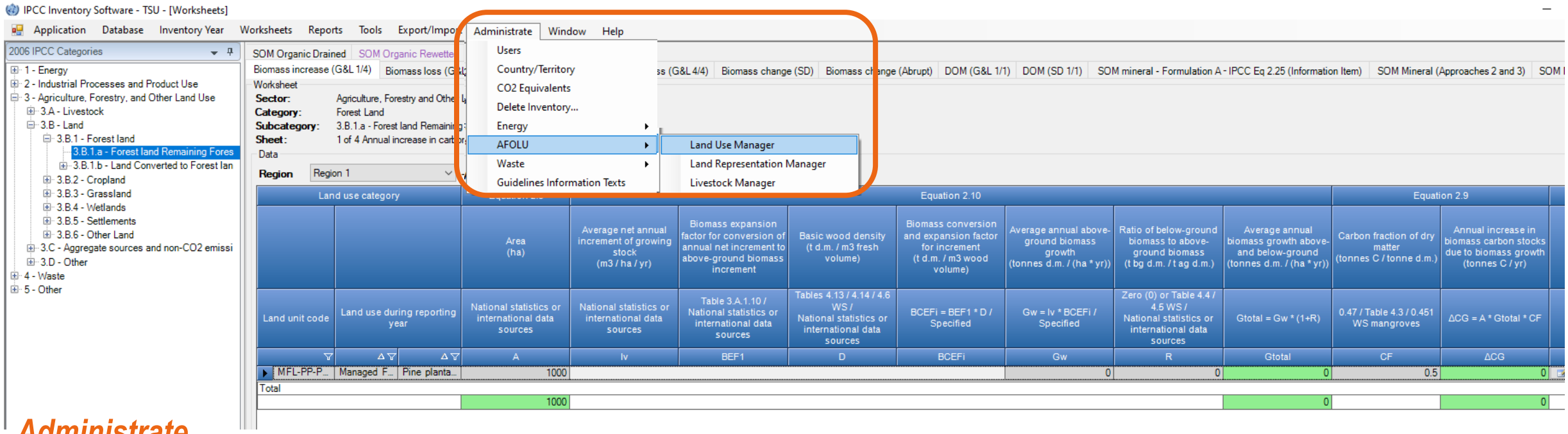
- The Guide to Land Representation in the IPCC Inventory Software provides a detailed guidance *(around 80 pages)* on how to make the first step in AFOLU inventory, particularly how to make inputs in two Managers:
  - Land Use Manager
  - Land Representation Manager

- The Guide can be downloaded from the IPCC TFI web-site: www.ipcc-nggip.iges.or.jp/software/index.html

AFOLU - Managers

- Like with all Software Managers, in AFOLU Sector – users before working on sectoral worksheets need to populate three AFOLU Managers:
  - Land Use Manager
  - Land Representation Manager
  - Livestock Manager

Guide to Land Representation



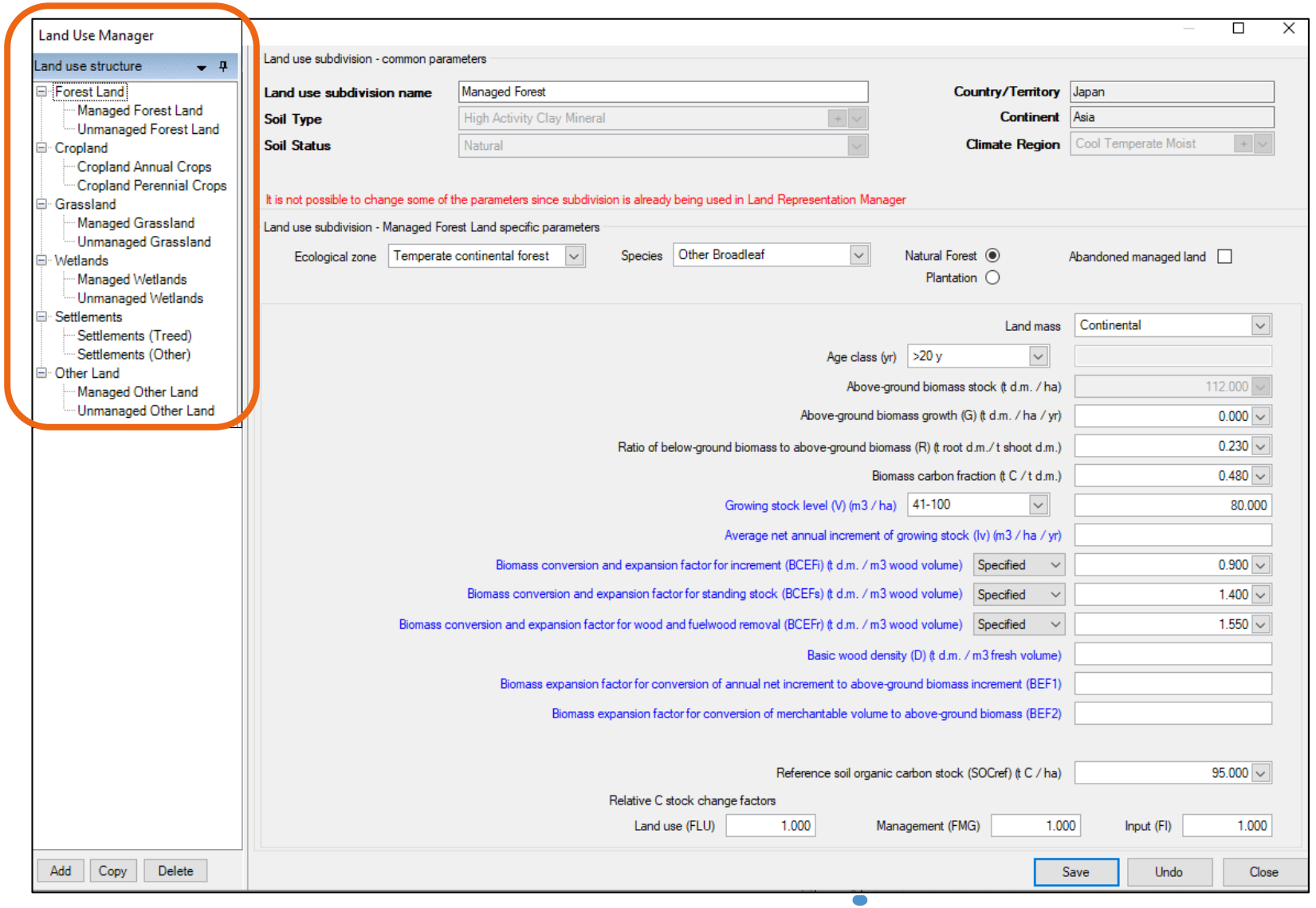
Administrate

➡ *AFOLU*

➡ *Land Use Manager*
Land Representation Manager

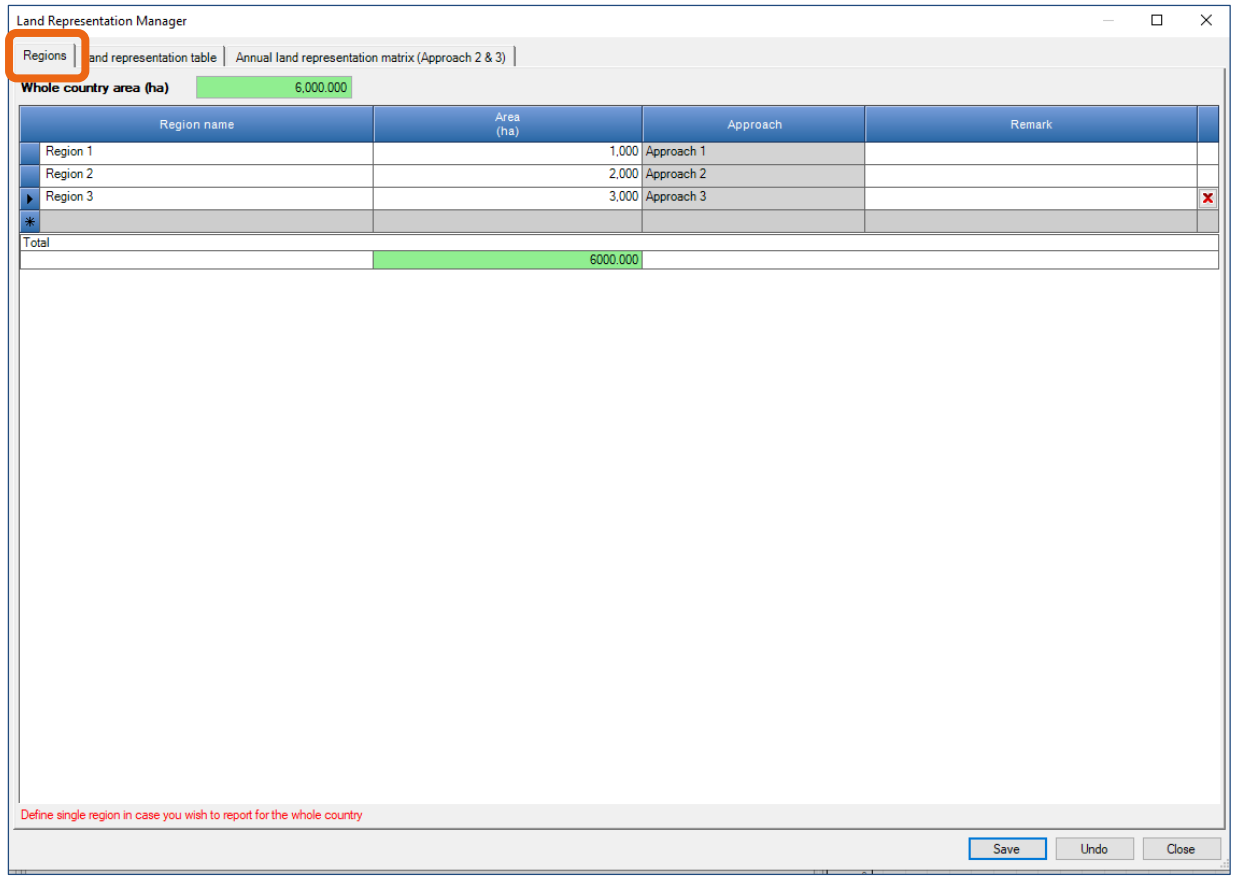
Land Use Manager

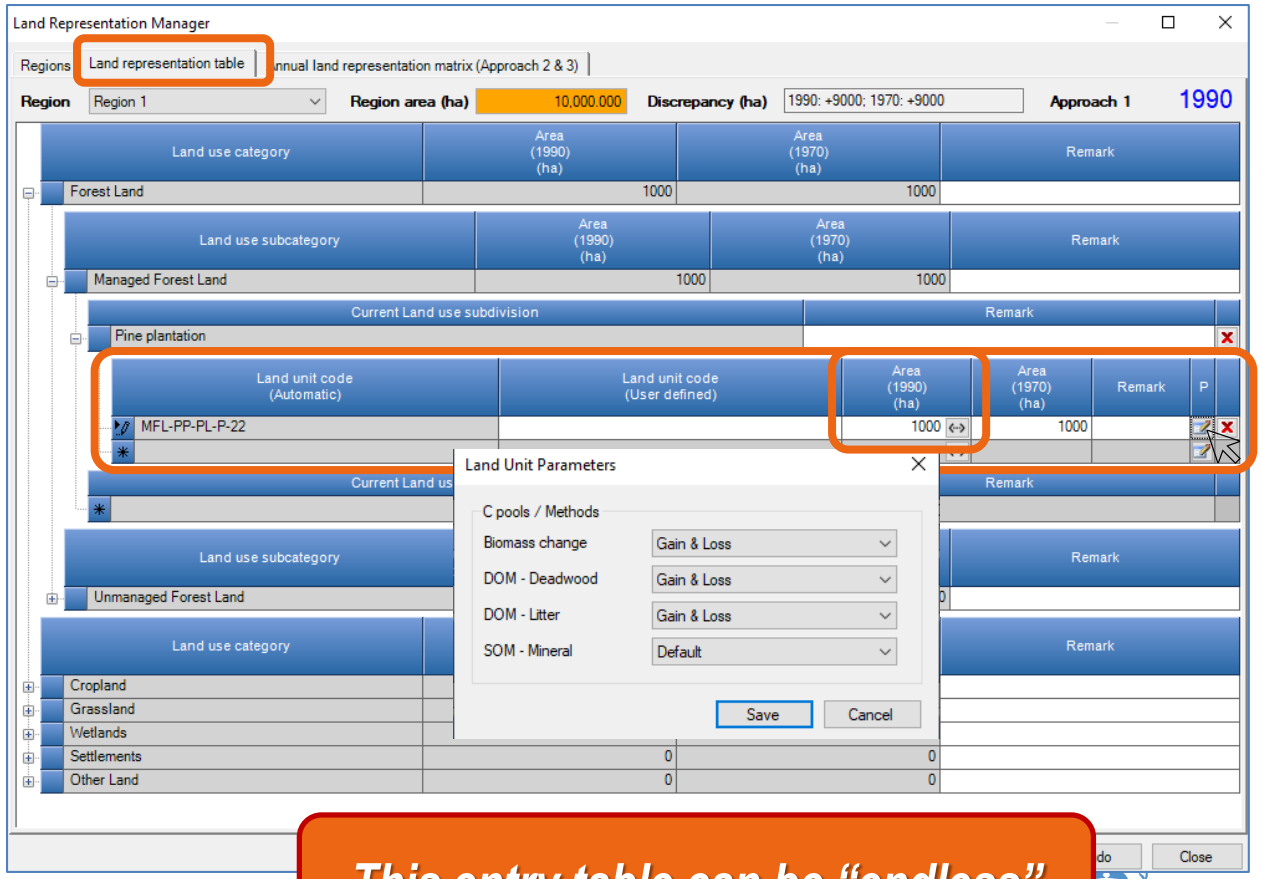
- Land Use Manager allows to characterize all land types within the Six IPCC land use categories, further stratified in 12 sub-categories
- Different land use categories have a different set of parameters
- Guidebook provides a step-by-step guidance on what information needs to be input to characterize land types in each land use category



Land Representation Manager (Tabs 1 and 2)

- **Land Representation Manager allows to:**
  i. Stratify the territory in Regions, and assign to each the IPCC Approach applied for land representation *(1 or 2 or 3)*
  ii. Stratify the region in units of land homogeneous per current and historical land use, and assign to each the area and for each resident C pool, the IPCC method to be applied .

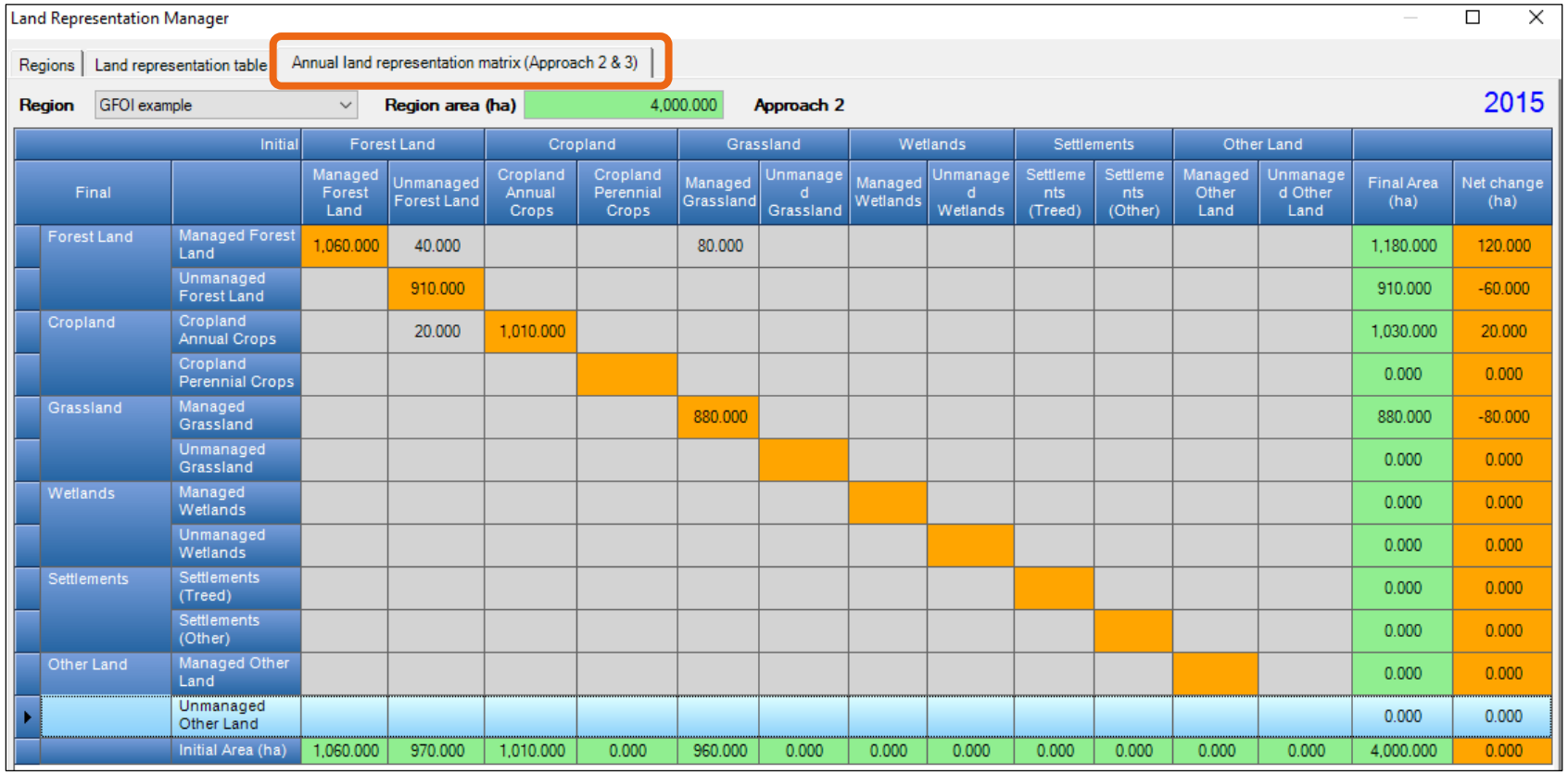




This entry table can be "endless"

Land Representation Manager (Tab 3)

- **For Land Representation Approaches 2 and 3, Land matrix Tab provides the total area of the land classified as:**
  - i. land that has not undergone a change between the initial year (rows) and final year (columns)
  - ii. land that has undergone a change between two different subcategories



Land Representation Manager

Regions | Land representation table | Annual land representation matrix (Approach 2 & 3)

Region: GFOI example | Region area (ha): 4,000.000 | Approach 2 | 2015

Final		Initial: Forest Land – Managed Forest Land	Forest Land – Unmanaged Forest Land	Cropland – Cropland Annual Crops	Cropland – Cropland Perennial Crops	Grassland – Managed Grassland	Grassland – Unmanaged Grassland	Wetlands – Managed Wetlands	Wetlands – Unmanaged Wetlands	Settlements – Settlements (Treed)	Settlements – Settlements (Other)	Other Land – Managed Other Land	Other Land – Unmanaged Other Land	Final Area (ha)	Net change (ha)
Forest Land	Managed Forest Land	1,060.000	40.000			80.000								1,180.000	120.000
	Unmanaged Forest Land		910.000											910.000	-60.000
Cropland	Cropland Annual Crops		20.000	1,010.000										1,030.000	20.000
	Cropland Perennial Crops													0.000	0.000
Grassland	Managed Grassland					880.000								880.000	-80.000
	Unmanaged Grassland													0.000	0.000
Wetlands	Managed Wetlands													0.000	0.000
	Unmanaged Wetlands													0.000	0.000
Settlements	Settlements (Treed)													0.000	0.000
	Settlements (Other)													0.000	0.000
Other Land	Managed Other Land													0.000	0.000
	Unmanaged Other Land													0.000	0.000
	Initial Area (ha)	1,060.000	970.000	1,010.000	0.000	960.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4,000.000	0.000

Transfer of Area Data from Managers to Worksheets

- The compilation of data in Land Representation Manager allows the Software to populate area data of units of land in the relevant worksheets for each AFOLU category

- This means that area data cannot be input directly into the worksheets. The AFOLU Managers need to be populated first

- The transfer of units of land (and associated area) to the relevant worksheets is ruled by:
  - Current and Previous Land use category
  - Characterization of Land Type, as input in Land Use Manager
  - Land representation Approach, as selected in Land Representation Manager
  - Method to calculate C stock changes in each C pool as selected in Land Representation Manager

✓ *The sectoral guidebook for work with AFOLU worksheets is still under development*

Guide to Land Representation

5th level

It shows the complete history of transitions of the unit of land relative to the current inventory year, ordered by year of transition descending and shown in grey (picture below).

Indeed, the Land unit conversion in a given point of time -i.e. the chosen inventory year- is automatically presented considering current status of land unit together with its history of transitions. For example, a unit of land experiences multiple conversions within the time period analyzed for inventory purposes. Note that although the inventory period is 1990-2022, the inventory compiler has analyzed a time series of data starting in 1971 -i.e. 1971-2022- because of the transition period applied is of 20 years. Then,

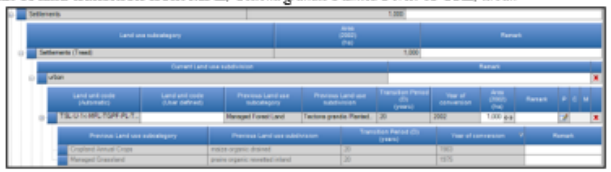
in **1975**, the unit of land **transition from** *MGL/ prairie organic rewetted inland* **to** *ACL/ maize organic drained*

Note: this conversion occurred before the initial year of the inventory time series -i.e. 1990-2020; thus it is input in the year 1990

in **1983**, the unit of land **transition from** *ACL/ maize organic drained* **to** *MFL/ Tectona grandis Planted Forest*

Note: this conversion occurred before the initial year of the inventory time series -i.e. 1990-2020; thus it is input in the year 1990

in **2002**, the unit of land **transition from** *MFL/ Tectona grandis Planted Forest* **to** *TSL/ urban*



Note: this is the latest conversion of this unit of land and occurred in the inventory year visualized -i.e. Year of conversion = Inventory year = 2002-, thus the button "C" for intervening new conversion is NOT available.

- Guide to Land Representation explains all steps of data input into the Managers for units of land, which are used then for all 3.B categories and some of 3.C categories.
- Throughout the Guide, the text entered in **lilac color** represents information taken from the ***Wetlands Supplement.***

Conclusion

- IPCC TFI TSU is continuously working on the IPCC Inventory Software and supporting materials (Guidebooks) in order to meet users' needs as well as to respond to improvement of user-friendliness of the IPCC TFI products and rectification of any issues (bugs, errors, etc.)

We would appreciate users' feedback, which can be sent to us at:
ipcc-software@iges.or.jp

Thank you

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

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