



National Greenhouse Gas Database Management System (NGHGDMS)

User Manual

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ACKNOWLEDGEMENT

National Greenhouse Gas Database Management System (NGHGDMS) is developed by Department of Climate Change (DCC) of Ministry of National Resource and Environment (MONRE) and supported by Capacity Building Initiative for Transparency Fund (CBIT) via the United Nation Environment Programme(UNEP).

We would like to express our appreciation to representatives of DCC, Mrs Nuansy Thiphaxay, NGHGDMS Project Manager and Director of Division of Greenhouse Gas Monitor and Mitigate (DGHGSM); Mr Bouthee Saythongvanh, Deputy Director of DGHGSM for their participation in design, development, and pilot test of NGHGDMS.

We would like specially to extend our sincere thanks to developer Dr. Saysoth Keoduangsine, National Consultant, and his team members who have been developed, setup NGHGDMS and wrote this manual.

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FORWARD

We are pleased to introduce the User Manual of the National Greenhouse Gas Database Management System (NGHGDMS). This manual aims to provide the system administrators, and end-users with instruction on how to manage and use NGHGDMS data, tools, and functions on GHG reporting.

NGHGDMS was developed by DCC, MONRE, with financial support from UNEP. The NGHGDMS system will be launched for official use on 30 March 2023. This user manual can be downloaded from the NGHGDMS website: <https://ghg.monre.gov.la>

On behalf of the Department of Climate Change, I would like to express my profound appreciation to Division of GHG Monitor and Mitigation for its support in development of NGHGDMS. I would like to extend my sincere thanks to National and International experts on MRV who provided advice and recommendation for NGHGDMS development. I strongly believe that all stakeholders working in GHG reduction will use the NGHGDMS for data analysis to monitor GHG impacts and revise the National Communications (NC), Biennial Update Reports (BUR) and Biennial Transparency Reports (BTR).

Department of Climate Change

Ministry of Natural Resources and Environment

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ACRONYMS

DCC	Department of Climate Change
IPCC	Intergovernmental Panel on Climate Change
Lao PDR	Lao People Democratic Republic
MAF	Ministry of Agriculture and Forestry
MES	Ministry of Education and Sports
MLSW	Ministry of Labor and Social Welfare
MH	Ministry of Health
MEM	Ministry of Energy and Mines
MONRE	Ministry of National Resource and Environment
MPWT	Ministry of Public Work and Transportation
NGHGDMS	National Greenhouse Gas Database Management System
UNEP	United Nations Environment Programme
AD	Activity Data
AWMS	Animal Waste Management System
BOD	Biochemical Oxygen Demand
C	Carbon
C2F6	Hexafluoroethane
CF4	Tetrafluoromethane
CH4	Methane
CO	Carbon Monoxide
CO2	Carbon dioxide
COD	Chemical Oxygen Demand
Dm	Dry matter
Gg	Gigagram
Ha	Hectare
HFC	Hydrofluorocarbon
hl	Hectolitre
K	kilo
Kg	kilogram

Kha	kilo hectare
Kt	kilo tonne
LTO	Landing/Take Off
LUCF	Land-Use Change and Forestry
LULUCF	Land Use, Land-Use Change and Forestry
M3	cubic meter
MCF	Methane Correction Factor
Mg	Megagram
Mha	Mega hectare
MSW	Municipal Solid Waste
N	Nitrogen
N2O	Nitrous Oxide
NFP	National Focal Point
NH3	Ammonia
NMVOG	Non-Methane Volatile Organic Compound
NOX	Nitrogen Dioxide
PFC	Perfluorocarbon
RA	Reference Approach
SE	Sectoral Expert
SF6	Sulphur Hexafluoride
SO2	Sulphur Dioxide
SWDS	Solid Waste Disposal Site
T	Tonne
Tg	Tera-gram
TJ	Terajoules
XML	Extensible Markup Language

1. Introduction

National Greenhouse Gas Database Management System (NGHGDMS) is guided by Department of Climate Change (DCC) of Ministry of National Resource and Environment (MoNRE) and financially supported by Capacity Building Initiative for Transparency Fund (CBIT) via the United Nation Environment Programme(UNEP).

The CBIT supports the government of Lao PDR mainly in strengthening its Enhanced Transparency Framework by means of improving the accuracy, completeness and consistency of its Greenhouse Gas inventories, and increasing its capacities to domestically track and evaluate mitigation measures and related finance support received, as well as generating the technical inputs needed for a medium and long-term planning contributing to improve climate related decision-making in the country.

This NGHGDMS system will enable line ministries and agencies to input data into the system in line with their responsibilities identified under institutional arrangements, and the DCC as coordinating agency to manage it, including review the data, clean, and use for analysis. NGHGDMS shall enable Lao PDR to prepare more frequent updates of its GHG inventory data to comply with the new requirements of the Biennial Transparency Reports (BTR).

The NGHGDMS will also utilize the existing data archiving system but will significantly expand its scope to allow for direct GHG emission calculations and QA/QC procedures within the system. It will also be updated it with revised emission factors and activity data as well as files and documents important to the inventory process and will be made permanent. The database system will be a web-based system to enable data input and estimation from the authorized users of different line ministries.

The NGHGDMS is a web-based application designed to enable Lao PDR to estimate and its national GHG inventories according to the UNFCCC guidelines and using the IPCC methodologies, and to report the results in its National Communications (NC) and Biennial Update Reports (BUR).

The User Manual of the NGHGDMS aims to provide the end user with instructions on how to use NGHGDMS data and tools to generate report by sectors including Energy, IPPU, AFOLU and Waste. The NGHGDMS data is ongoing and will be updated by DCC, MoNRE. It is open and accessible to the public at <http://ghg.monre.gov.la>

1.1 Purpose and Scope of this Manual

This user manual is for end-users from line ministries, but not limited to public users to access NGHGDMS system for general information. For authorized user, this user manual provides descriptions step by step of using each NGHGDMS functions, data entry, data edit, data delete, data management and generate a report. Moreover, the user manual is also for authorized users (administrator or supper user) which attend to manage the database at the backend of the system.

1.2 Technical requirements to run NGHGDMS

The supported browsers and minimum requirement to run NGHGDMS are listed below:

- Supported web browsers include Microsoft Edge 20.0 or greater, Mozilla Firefox, Google Chrome, and Safari 11.1 or greater;
- Internet connectivity to public network: 5Mbps or more; and
- Wireless connectivity: 802.11b/g/n or later with frequency of 2.4Ghz-5.0GHz.

1.3 NGHGDMS limitation

NGHGDMS has been developed in line with IPCC software, but it does not support Tier 2 emissions factors. The front-end of the system support two languages, Lao and English, while the back-end support English only.

2 Home Page

The home GHGDMS page shows summary of GHG data in form of graphs, news and events, and documents for downloading including user manuals, reports and other GHG related documents. It supports two languages, English and Lao version. The information on this home page is updated by authorized user or DCC focal points of MONRE.

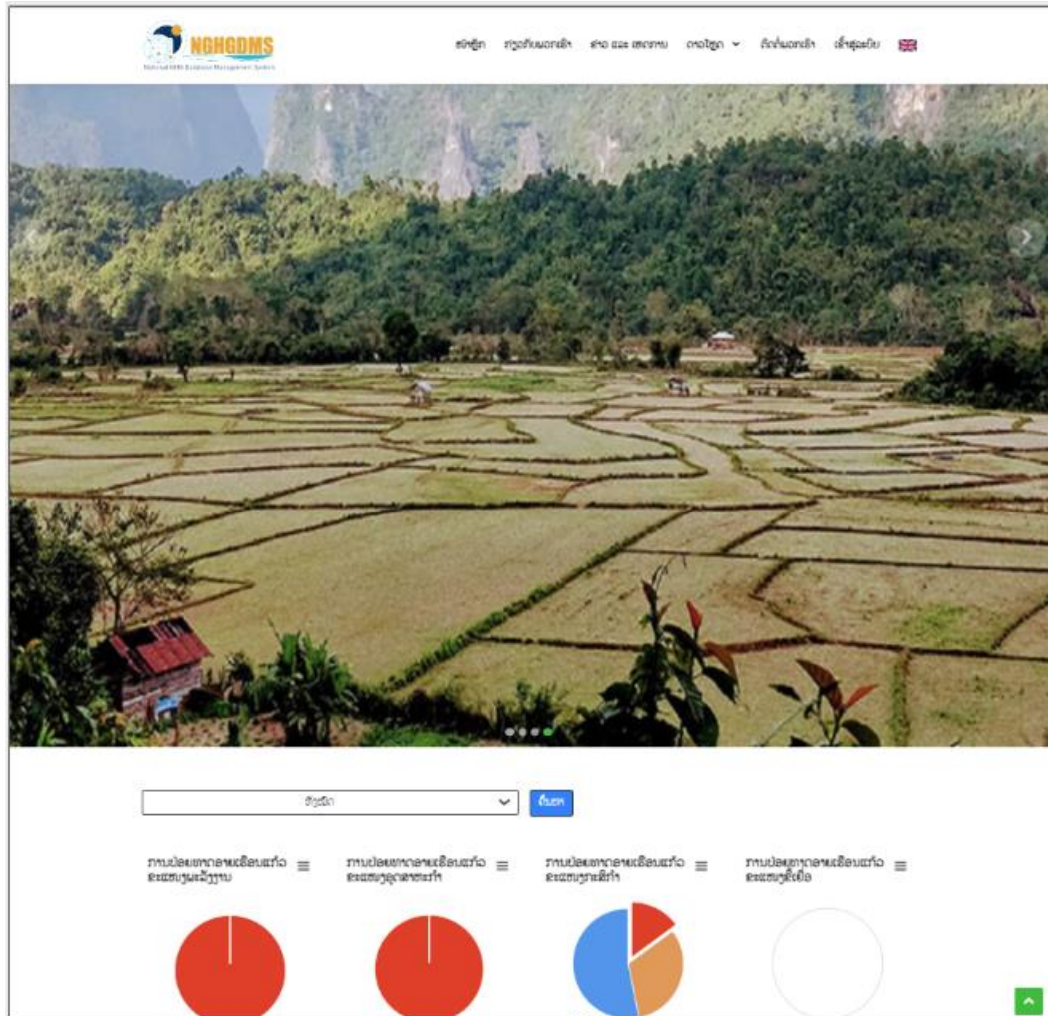


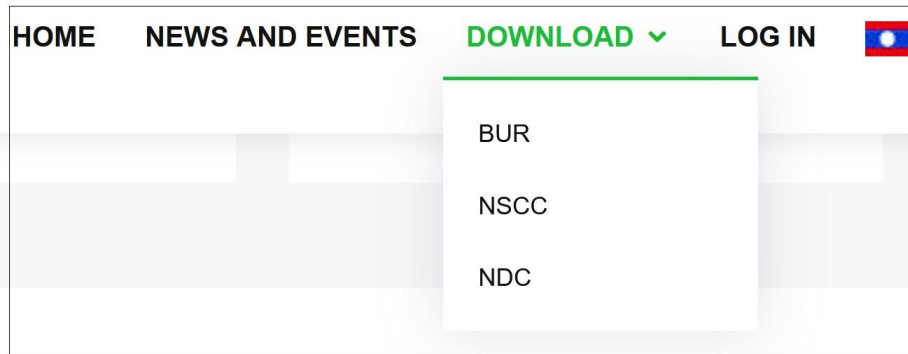
Figure- 1:Home Page

2.1 Changing language

On the right-top conner, just click on the icon  to change to Lao OR click on  to change to English.

2.2 Document download

In order to find the document in this GHG system to be downloaded, just click on “Download”, the specific document is scrolling down. In this case, there are 3 types of document categories including BUR, NSCC and NDC. Then click the desired document to be downloaded.



2.3 Reviewing “News and Events”

Click on “News and Events”, then scrolling down. The list of news and events show by categories such as Energy, Resources news, and general news. Meanwhile user can search the specify topic of the new and event in the search box.

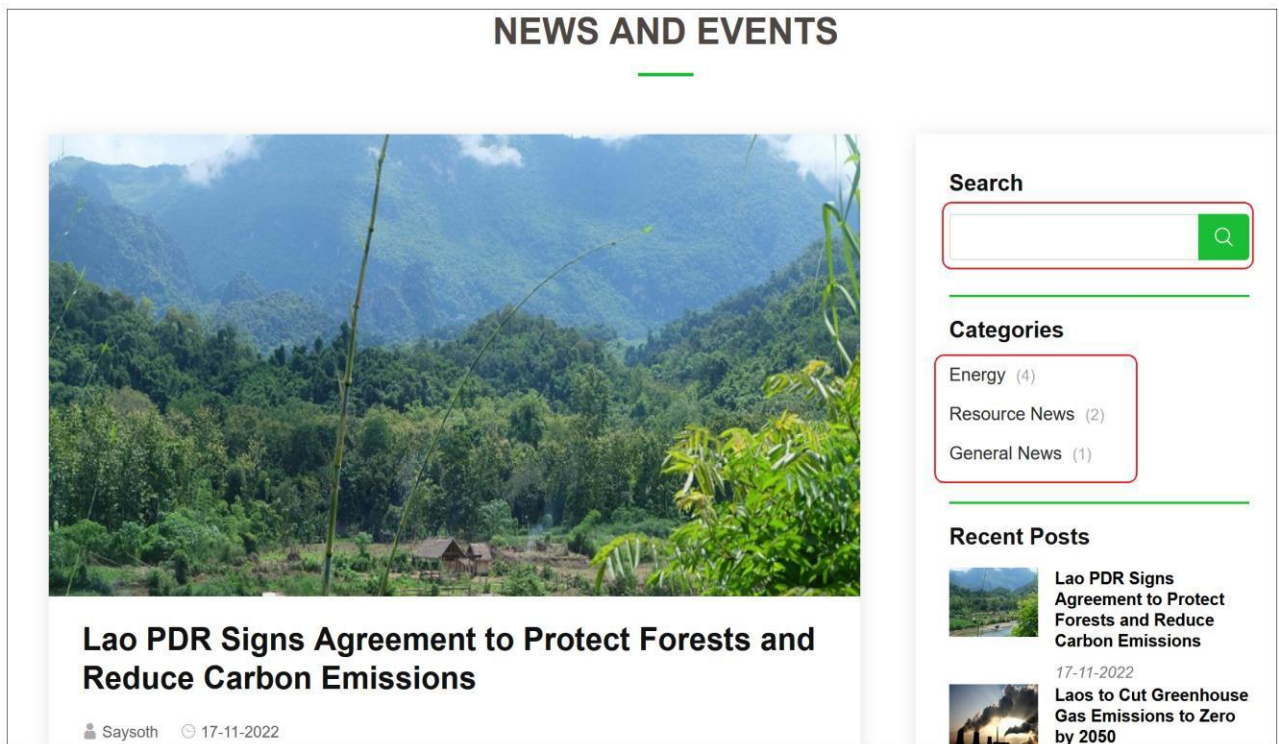
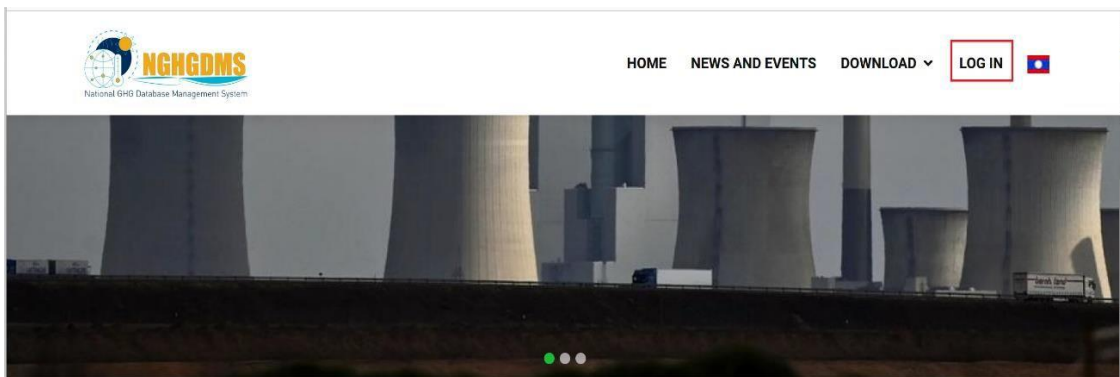


Figure- 2: News and Events

3 System Access

3.1 How to log in

To log in, click on the link to “Log in” located at the upper right corner of the home page.



The supply the provided username and password:

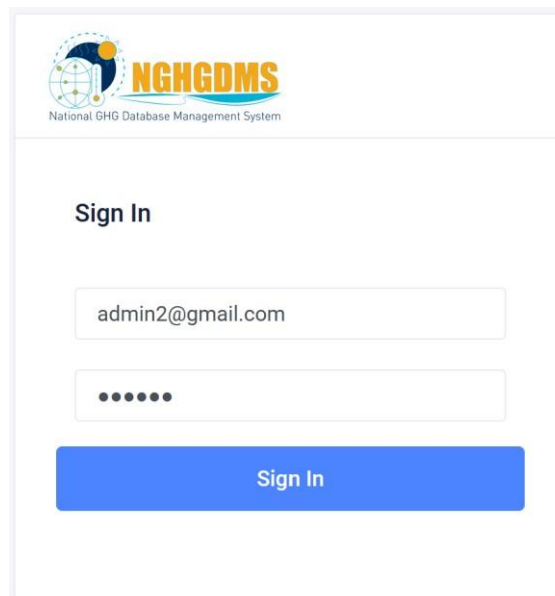
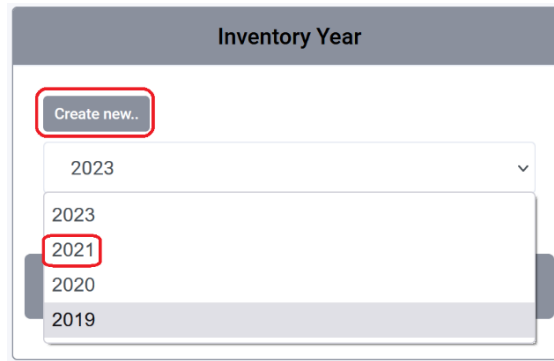
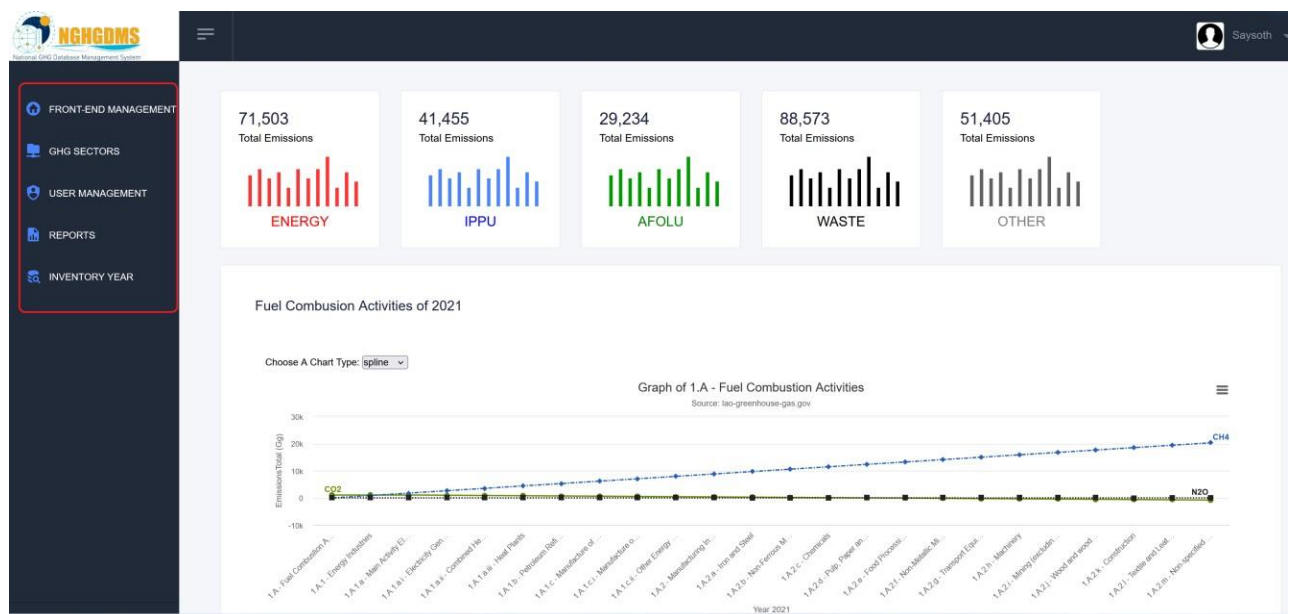
The image shows the login form on the NGHGDMS website. At the top left is the NGHGDMS logo. Below the logo is the text 'Sign In'. There are two input fields: the first contains the email address 'admin2@gmail.com' and the second contains six dots representing a password. Below the input fields is a blue button labeled 'Sign In'.

Figure- 3:Log in form

- Select one of the existing inventory years that you want to access or create the new one. In this case, 2021 is selected.



After login, the management home page shows in below image. On left navigation there are 5 main functions.



- **Front-End management:** for manage all functions that display at the front-end home page;
- **GHG Sectors:** for view or data entry of each sector/sub sectors;
- **User management:** is for providing right access to specific users;
- **Report:** is for creating reports; and
- **Inventory year:** to change/create new inventory year of each sector.

3.2 How to Log out

To log out from the system, just select the drop-down list next to your profile name, then click on “Log out” as shown below image.

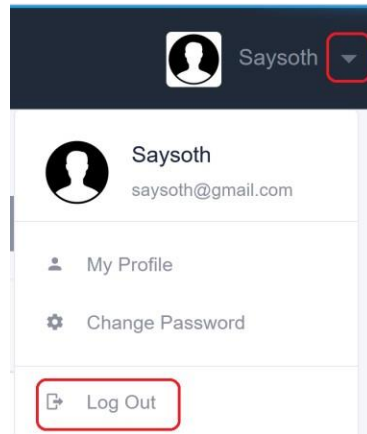


Figure- 4:Log out form

3.3 Home Page management

Click on “Front-end management” will shows 4 front-end data categories to be managed including:

- **Slider:** manage slides of the home page;
- **Document Categories:** management of document on the download link;
- **Document:** management of the document in the contents; and
- **News and Events:** management news and events in the home page contents.

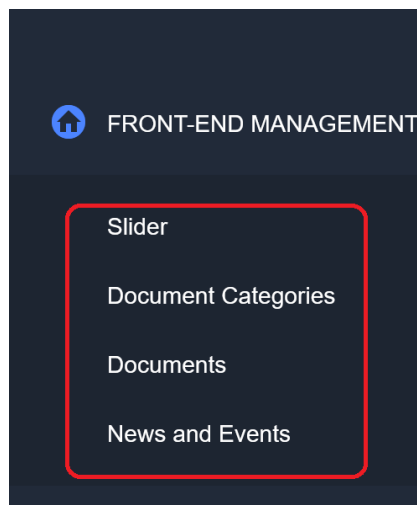


Figure- 5: Front-end management form

6.1.1 Manage slides.

By selecting “Slider” the management page is pop up, authorized users can add a new slide, edit and delete the existing slides.







Home Slider					
+Add New					
SL	Title	Description	Image	Action	
1	Waste management	Waste management		Edit	Delete
2	Agriculture	Agriculture		Edit	Delete
3	Waste management	Waste management		Edit	Delete
4	fire	Slash-and-burn agriculture in Laos and other Southeast Asian countries is a major source of air pollution throughout the region		Edit	Delete
5	Energy	Energy		Edit	Delete

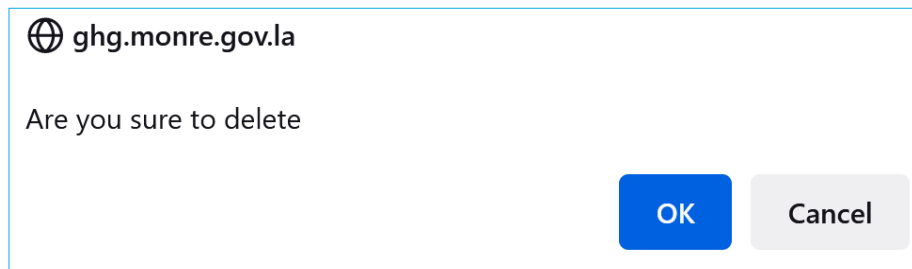
Figure- 6:Slider management

Add a slider: Just click on “Add New”. Then add a name of title and description, then click on “Save”.

Create Slider	
Title	<input type="text" value="Coal-fired power plants"/>
Description	<input type="text" value="Air pollution from coal-fired power plants is linked with asthma, cancer, heart and lung ailments, neurological problems, acid rain, global warming, and other severe environmental and public health impacts"/>
Image	<input type="button" value="Browse..."/> No file selected. 
<input type="button" value="Save"/> <input type="button" value="Cancel"/>	

Edit the existing slide: similarly with adding a new slide, just select the edit button, then update the requirement information, then click on “Save”.

Deleted the existing slide: Click on “Delete”, the delete confirmed box is popped up which asking, “are you sure to delete”, then click **OK**.



6.1.2 Manage document

Manage document is to manage the document under “download” of the header, these document include BUR, NDC, and NSCC.

Document Category					
+Add New					
No.	Category Name in English	Category Name in Lao	Created User	Action	
1	NDC	ນະໂນຸດ NDC	Admin	Edit	Delete
2	NSCC	ນະໂນຸດ NSCC	Admin	Edit	Delete
3	BUR	ນະໂນຸດ BUR	Admin	Edit	Delete

Figure- 7:Document management

Add a new document: to add a document into the download link, first need to supply document category (Lao and English), browser to select document, then click on “Save”.

Create Document Category

Category Name (EN)

Category Name (LA)

Edit: similarly with the addition of a new document, just select on “ Edit”, then update information to be edited, finally click “Save”.

Delete: Click on “Delete”, the delete confirmed box is popped up which asking “are you sure to delete”, then click **OK**.

6.1.3 Manage news and events

Below image shows that “News and Events” can be add, edit and delete. As well as a user can view the status of a new or event was already added into the system. The draft status means the news is not yet online, while publish means, it is currently online.

No.	Title	Preview	Post Date	Status	Action
1	Lao PDR Signs Agreement to Pro...		17-11-2022	PUBLISH	Edit Delete
2	Lao PDR's NDC targets 60% GHG...		05-10-2022	DRAFT	Edit Delete
3	Laos to Cut Greenhouse Gas Emi...		05-10-2022	PUBLISH	Edit Delete

3.3.1 Adding

To add new or event, by click on “Add”, the information table is popped up, a user can supply information as following steps:

1. Select “Category” from the top-down list, if there is not category on the list, then create the new category by clicking on “Add New Category”;
2. Supply names of title, description and tips of both Lao and English;
3. Navigate the image to be uploaded by click on “Browse”;
4. Select the status of the news or even: draft means the news or event is not yet online website, while “Publish” means the news or event will be shown on website; and
5. Then “Submit”.

The screenshot shows a 'Add Post' form with the following elements:

- Category:** A dropdown menu with the text '--Select Category--' and a blue '+ Add New Category' button.
- Title English:** A text input field with the placeholder 'Enter Title in English'.
- Title Lao:** A text input field with the placeholder 'Enter Title in Lao'.
- Details English:** A rich text editor with a toolbar and a large text area.
- Details Lao:** A rich text editor with a toolbar and a large text area.
- Tags English:** A text input field with the placeholder 'Enter Tags in English'.
- Tags Lao:** A text input field with the placeholder 'Enter Tags in Lao'.
- Upload Image:** A section with a 'Browse...' button and the text 'No file selected'.
- Status:** A section with two radio buttons: 'Draft' (selected) and 'Publish'.
- Buttons:** 'Submit' (blue) and 'Cancel' (red) buttons at the bottom left.
- Logo:** A 'HIVE NEWS' logo on the left side.

3.3.2 *Editing*

Similarly, to edit the existing the news or event, just click on “Edit”, then modify or update the information, then click on “Update”.

3.3.3 *Deleting*

Similarly, for deleting the news or event, click on “Delete”, the delete confirmed box is popped up which asking, “Are you sure to delete”, then click OK.

4. Sector Information

This section provides a description of the various functions of the system represented by each sector includes Energy, IPPU, AFULO, Waste and other.

The sectors can be found by selecting the “GHG sectors”, then the drop-down list of each sector is displaying as can be seen below image.



Figure- 8: Back-end home page

4.1 Navigation tree

By selecting the specific sector, the navigation tree displays. To expand or collapse the tree, click on the **+** or **-** signs in front of the nodes, respectively. You can also expand or collapse the entire tree of the sector by clicking the plus and minus signs at the bottom of the tree.

The black color node represents the title of the activities and sub-activities, only blue color represents the active node.

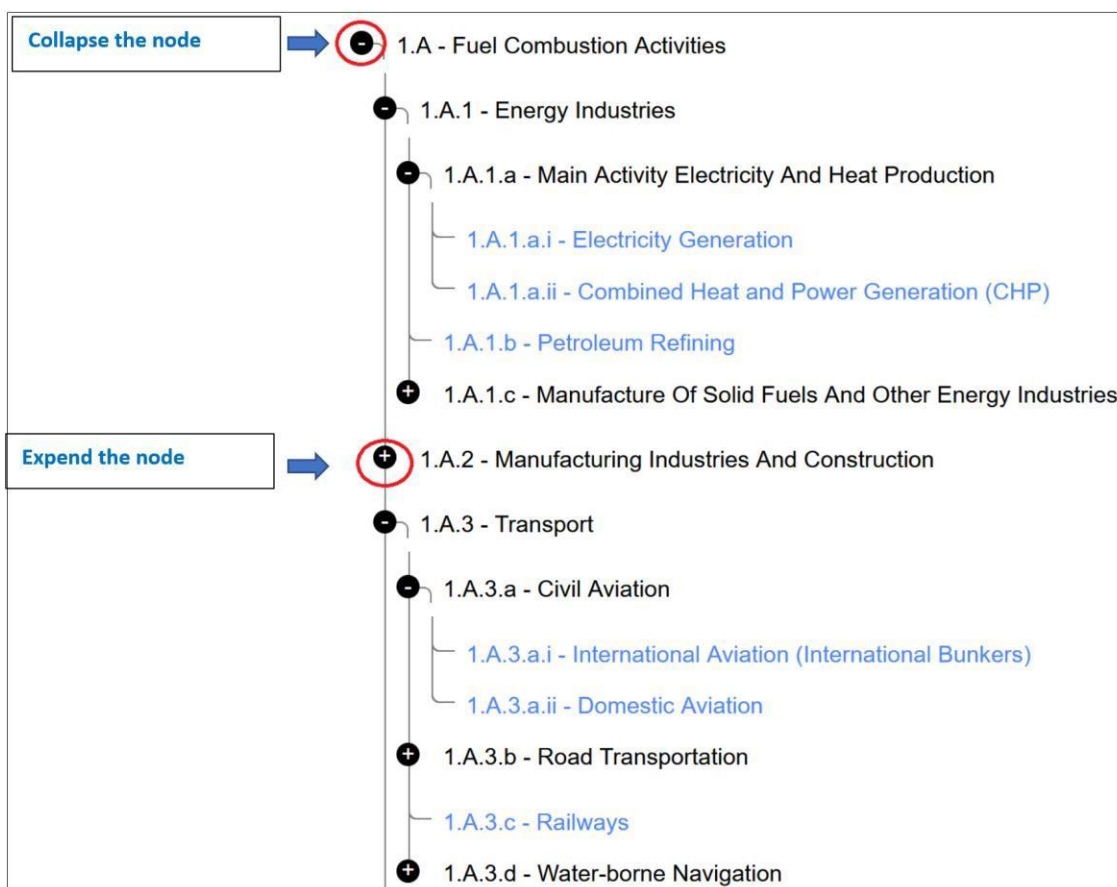


Figure- 9: Navigation tree

1.1 Notation keys

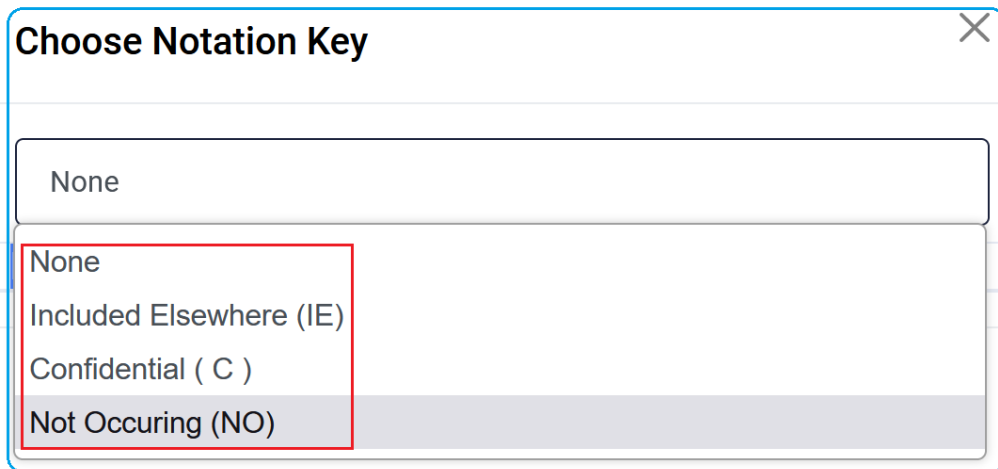
Notation keys are used in this system where data is absent or incomplete, to indicate why data is lacking. The use of notation keys is an internationally recognized good practice. Based on IPCC guideline a notation key can be used if the actual emissions have not been estimated, there are five (5) type of notation keys in below table.

Notation Key	Definition	Explanation
NE	Not Estimated	Emissions and/or removals occur but have not been estimated or reported
NO	Not Occurring	An activity or process does not exist within a country.
IE	Included Elsewhere	Emissions and/or removals for this activity or category are estimated and included in the inventory but not presented separately for this category. The category where these

		emissions and removals are included should be indicated (for example in the documentation box in the correspondent table).
C	Confidential	Emissions and/or removals are aggregated and included elsewhere in the inventory because reporting at a disaggregated level could lead to the disclosure of confidential information.
NA	Not Applicable	The activity or category exists but relevant emissions and removals are considered never to occur. Such cells are normally shaded in the reporting tables.

Figure- 10:Natation Key explanation

During adding data into the form, the Natation Key is popped up as below, then select the options from top down list.



1.2 Category Grids

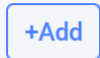
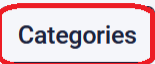


Each node on the navigation tree has a corresponding grid. A grid includes elements required for reporting information such as activity data, other relevant information, and emissions/removals data.




- Top header of the grid - column headers (grey background) are not editable by user, it includes names of sector, category, sub-categories, sheets, and inventory year;

- Small red square button icon is the Notation Key for related parameter which a user can add during data entry;
- Top headers (**blue background**) are not editable by user which represents activity data, emission factors, emissions of one particular activity;
- Editable cells (**white background**) - fields enabling to edit activity data, emission factors and other parameters; and
- Calculated cells (**green background**) – e.g. emissions calculated from activity data and emission factors using the relevant formula. These are not editable but automatically calculated.

Sector : Energy													
Category : Fuel Combustion Activities													
Subcategory : 1.A.1.a.i - Electricity Generation													
Sheet : CO ₂ , CH ₄ , and N ₂ O from fuel combustion by source categories - Tier1													
Inventory Year: 2022													
+Add		Categories		0									
Fuel	Energy Consumption			CO ₂			CH ₄		N ₂ O		Remark	Action	
	Consumption (Mass, Volume or Energy Unit)	Unit	Conversion Factor (TJ/Unit) (NCV)	Consumption (TJ)	CO ₂ Emission Factor (Kg CO ₂ /TJ)	Amount Captured (Gg CO ₂)	CO ₂ Emission (Gg CO ₂)	CH ₄ Emission Factor (Kg CH ₄ /TJ)	CH ₄ Emission (Gg CH ₄)	N ₂ O Emission Factor (Kg N ₂ O/TJ)			N ₂ O Emission (Gg N ₂ O)
A		B	C = A*B	D	Z	E=C*D/10 ⁶ -Z	F	G=C*F/10 ⁶	H	I=C*H/10 ⁶			
Other Bituminous Coal	IE		25.8	0.0	0	0	0.00000	0	0.00000	0	0.00000		
Aviation Gasoline	C	TJ	1	0.0	70000		0.00000	3	0.00000	0.6	0.00000		
Natural Gas (Dry)		2 Gg	48	96.0	56100	3	2.38560	1	0.00010	0.1	0.00001		

Figure- 11: Category Grid table

-  is for adding new data of the current category;
-  is to change to other category of the current sector(e.g. change from 1.A to 1.B);
-  is to show how many records are deleted, and they are still located in the bin;
-  is a notation key which can be (C, IE, NO, and None);

-  is comment/remark that a user may take note for clarification;
-  is for editing the existing data record; and
-  is for deleting the existing data record.

1.3 Data Entry Template

Data Entry Template (DET) is data collection form for recording the approved Activity Data (AD) and relevant emission factors (EF) of each subcategory to support for data entry after being approved from relevant line ministries/stakeholder. The DET includes three (3) type sheets:

- 1. Introduction: includes introduction of DET and instruction how to fill in the data;
- 2. Table of content: is links of each sector and sub-category sheets; and
- 3. Sectorial data sheets: sheets of all subcategories of 4 sectors.

Back to Table of Contents

Sector: Energy
 Category: Fuel Combustion Activities
 Subcategory: 1.A.1.a.i - Electricity Generation
 Sheet: CO2, CH4 and N2O from fuel combustion by source categories-Tier I
 Inventory Year: 2022

Sectorial Information

Please enter amount for each applicable fuels

Fuel Type	Fuel	Consumption (A)	Unit(TJ/Gg)	Amount Captured	Conversion Factor(B)	CO2 Emission Factor(D)	CH4 Emission Factor(F)	N2O Emission Factor(H)
Liquid Fuels	Crude Oil	100	TJ	0	42.3	73300	3	0.6
Liquid Fuels	Orimulsion							
Liquid Fuels	Natural Gas Liquids							
Liquid Fuels	Motor Gasoline	500	Gg	45	44.3	69300	3	0.6
Liquid Fuels	Aviation Gasoline							
Liquid Fuels	Jet Gasoline							
Liquid Fuels	Jet Kerosene							
Liquid Fuels	Shale Oil							
Liquid Fuels	Gas/Diesel Oil							
Liquid Fuels	Residual Fuel Oil							
Liquid Fuels	Liquefied Petroleum Gases							
Liquid Fuels	Ethane							
Liquid Fuels	Naphtha							
Liquid Fuels	Bitumen							
Liquid Fuels	Lubricants							
Liquid Fuels	Petroleum Coke							
Liquid Fuels	Refinery Feedstocks							
Liquid Fuels	Refinery Gas							
Liquid Fuels	Paraffin Waxes			3				
Liquid Fuels	White Spirit and SBD							

Example of data collection

English (United States)
US

To switch input methods, press Windows key + space.

Introduction | Table of contents | 1.A.1.a.i - Electricity Generation | 1.A.1.a.ii - Combined Heat and Power | 1.A.1.b - Petroleum Refining | 1.A.1.ci - Manufacture of Solid Fuels | 1.A.2.a - ...

1.3.1 Use as a data collection form

This DET is to fill/collect the approved activity data, to do so following steps:

1. Go to Table of content (each page has a link to table of contents called “back to table of contents);
2. Browser/scroll down for your desire subcategory to be filled the data in;
3. Save.

1.3.2 Use as a data entry form

In order to enter the approved data into system with specific subcategory, do following steps

1. Login the system, and open online data entry form of the desired sub-category;
2. Open the DET of that sub-category with the approved activity data.
3. Compare and make sure sectorial information on DET with online form which they must be the same;
4. Fill in the data, then Save.

4 Data Entry

4.1 Energy Sector

Energy sector consists of three main categories including 1.A, 1.B, 1.C. which has different data grid and different calculation.

4.1.1 Fuel Combustion Activities

This category covers all sub-sector of category 1.A:

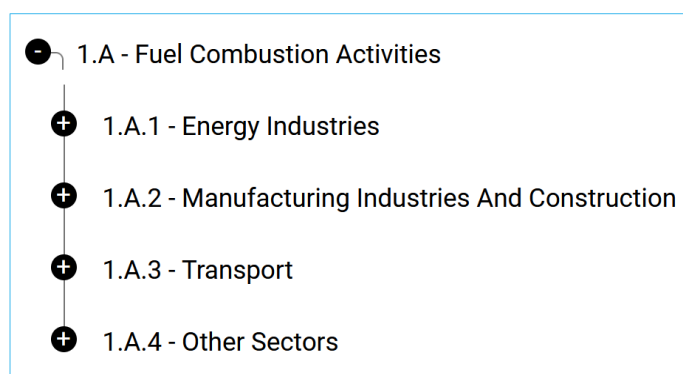




Figure- 12:Energy Sector-Fuel Combustion

4.1.1.1 Adding Data


The data entry form of this sector varies from category by category which is applying for all sub-categories (1.A, 1.B, 1.C.). The form and its functionality are based on IPCC software which has validation functionality such as for checking Emission factor value, range of GHG unit, and notation key options.

- To access into a data entry form, just click on each section on horizontal icon OR expand “GHG Sectors”, and “Energy” sector is selected. Expand or collapse the navigation tree, click on the  or  signs in front of the nodes, respectively. You can also expand or collapse

the entire tree by clicking the plus and minus signs at the bottom of the tree;

- Click on a desired sub-sector(blue), in this case “Electricity Generation” is clicking, the data information of the selected sub-sector is shown;

Fuel	Consumption (Mass, Volume or Energy Unit)	Conversion Factor (TJ/Maj) (NCV)	Consumption (TJ)	CO ₂ Emission Factor (Kg CO ₂ /TJ)	Amount Captured (Gg CO ₂)	CO ₂ Emission (Gg CO ₂)	CH ₄ Emission Factor (Kg CH ₄ /TJ)	CH ₄ Emission (Gg CH ₄)	N ₂ O Emission Factor (Kg N ₂ O/TJ)	N ₂ O Emission (Gg N ₂ O)	Remark	Action
A	B	C = A*B	D	Z	E = C*D/100 - Z	F	G = C*F/100	H	I = C*H/100			
Municipal Wastes (nonbiomass fraction)	7 Gg	9	63.0	74000	19	-14.33800	0	0.00000	9	0.00057		
Total			63.0			-14.33800		0.00000		0.00057		

- Click on , then the form is appearing as it shows below;

Add Fuel Combustion Activities

Sector : Energy
 Category : Fuel Combustion Activities
 Subcategory : 1.A.1.a.i - Electricity Generation
 Sheet : CO₂, CH₄ and N₂O from fuel combustion by source categories - Tier1
 Inventory Year : 2020

Fuel Type: Conversion Factor Type: NCV GCV



Fuel: Consumption (A): Unit: Conversion Factor (B):


CO₂ Emission Factor (D): Amount Captured (Z): CH₄ Emission Factor (F): N₂O Emission Factor (H):

Remark:


- Fill in all information on the form, and choose a notation key(if any); and
- Click on “Save”.

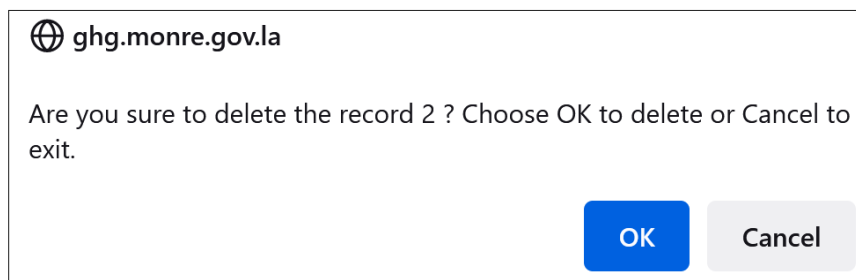
4.1.1.2 Editing data


The existing data can be edited or deleted by click () on the right-hand side of the table. Modified row is saved into database as soon as the user press the  button. Validation of entered data is

performed before the row is updated in the database, e.g., any error in the supplied data, user will be informed to correct it. Adding of data can be canceled by using  action button.

4.1.1.3 Deleting data

To delete the existing data row, click on “”, the delete confirmed box is popped up which asking, “are you sure to delete”, then click OK, otherwise click on “Cancel”.



The number of deleted data can be seen at the bin (), in this case no deleted data on the bin. The deleted data can be restored back when it is required.

4.1.1.4 Example: Electricity Generation

To estimate CO₂ emission from “1.A.A.a: Electricity Generation” with Diesel fuel consumption of 500 tonne(0.5Gg) without any capture. Do follow below steps:

1. Check the subcategory;
2. Select” Fuel type” in this case “Liquid Fuel” is selected;
3. Select Fuel, in this case “Diesel “ is selected;
4. Fill total consumption of fuel: 0.5;
5. Choose Fuel Unit (Gg);
6. Amount capture is 0(because assume that there is not capture technology available);
7. Put any remark if any; and
8. Save.

All factors are automatically popup when all data is entered, the online form is shown as below.

Sector : Energy
 Category : Fuel Combustion Activities
 Subcategory : 1.A.1.a.i - Electricity Generation ¹
 Sheet : CO₂, CH₄, and N₂O from fuel combustion by source categories - Tier1
 Inventory Year: 2023

Fuel Type
 ² Conversion Factor Type NCV GCV ³

Fuel ⁴ Consumption (A) ⁵ Unit ⁶ Conversion Factor (B)

CO₂ Emission Factor (D) Amount Captured (Z) ⁷ CH₄ Emission Factor (F) N₂O Emission Factor (H)

Remark
 ⁸

⁹

After saving the data record will be added into the system and it is on the top of data row.

Sector : Energy
 Category : Fuel Combustion Activities
 Subcategory : 1.A.1.a.i - Electricity Generation
 Sheet : CO₂, CH₄, and N₂O from fuel combustion by source categories - Tier1
 Inventory Year: 2023

Fuel	Energy Consumption			CO ₂			CH ₄		N ₂ O		Remark	Action
	Consumption (Mass, Volume or Energy Unit)	Unit	Conversion Factor (TJ/Unit) (NCV)	CO ₂ Emission Factor (Kg CO ₂ /TJ)	Amount Captured (Gg CO ₂)	CO ₂ Emission (Gg CO ₂)	CH ₄ Emission Factor (Kg CH ₄ /TJ)	CH ₄ Emission (Gg CH ₄)	N ₂ O Emission Factor (Kg N ₂ O/TJ)	N ₂ O Emission (Gg N ₂ O)		
	A		B	D	Z	E=C*D/10*6-Z	F	G=C*F/10*6	H	I=C*H/10*6		
Gas/Diesel Oil	0.5	Gg	43	74100	0	1.59315	3	0.00006	0.6	0.00001		
Lignite	15	Gg	11.9	101000	2	16.02850	1	0.00018	1.5	0.00027		

2.1.2 Fugitive Emission from Fuel

This sub-category covers all sub-categories of category 1.B

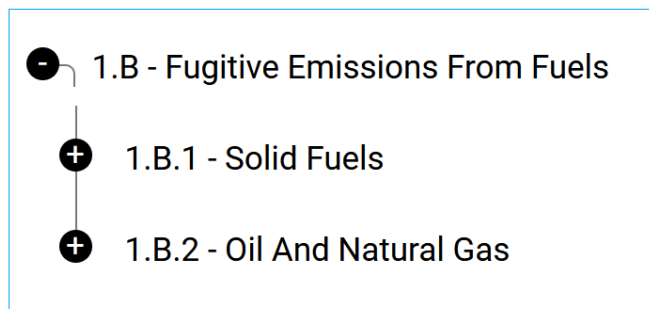



Figure- 13:Energy Sector-Fugitive Emissions

This sub-category has a specific form of data entry (1. B.1.a.ii.1-surface mining and 1.B.1.a.ii.2-post-surface mining). Particularly, it has fixed data entry record forms of two gas types, Carbon Dioxide and Methane for an inventory year.

2.1.2.1 Adding/Editing/Deleting data

Adding or editing data is identical for this sub-category. To enter data for these sub-categories do the following:

- Choose the gas type: Carbon Dioxide or Methane;
- Select “” then fill in the data into the pop-up form; and
- Click on “Save” to that the data is saved into that inventory year.

		(A)	(B)	(C)	(D)	(E)	Remark	Action
		Amount of Coal Produced(tonne)	Emission Factor (m3/tonne)	CO ₂ Emissions(m3) (C=A*B)	Conversion Factor(Gg CO ₂ /m3) (1.83*10 ⁻⁶)	CO ₂ Emission(E=C*D)		
Surface	Mining	1000	0	0	0.00000183	0.00000		
Surface	Post-Mining	1000	2	2000	0.00000183	0.00366		
Total				2,000		0.00366		

However, there is no deleting data option

2.1.3 Carbon Dioxide Transport and Storage

This sub-category covers all sub-categories of category 1.C.

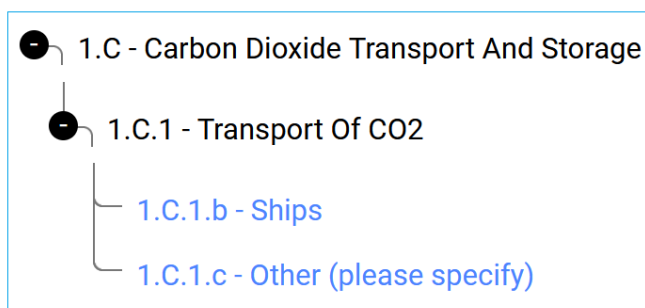



Figure- 14:Energy Sector-Carbon Dioxide Transport and Storage

2.1.3.1 Adding/Editing/Deleting data

This sub-category has a also specific form of data entry (1. C.1.b-Ships and 1.C.1.c-Other) which has fixed data entry record forms for an inventory year.

To enter data for these sub-categories, do the following:

- Choose the gas type: Carbon Dioxide or Methane;
- Select “” then fill in the data into the pop-up form; and
- Click on “Save” to that the data is saved into that inventory year.

Add 1.C - CO₂ Transport, Injection and Storage

Sector :	Energy
Category :	1.C - CO ₂ Transport, Injection and Storage
Sheet :	Table 1.4a Energy Background Table: 1.CO ₂ Transport, Injection and Storage
Inventory Year:	2021

1.C.1.B - SHIPS

Annual Mass Of CO ₂ Transported	Annual Mass Of Fugitive CO ₂ Emissions To The Atmosphere Or Sea Bed (Gg)
<input type="text" value="56"/>	<input type="text" value="78"/>

Remark



4.2 IPPU Sector







IPPU sector consists of eight (8) main categories including (2.A;2. B;2.C;2. D;2. E;2. F;2. G; and 2.H) which have different data grid and different calculation forms.


- 2.A-Mineral Industry
- 2.B-Chemical Industry
- 2.C-Metal Industry
- 2.D-Non-Energy Products from Fuels and Solvent Use
- 2.E-Electronics Industry
- 2.F-Product Uses as Substitutes for Ozone Depleting Substance
- 2.G-Other Product Manufacture and Use
- 2. H-Others

4.2.1 Adding data

The data entry form of this sector varies from category by category which is applying for all sub-categories (2.A;2. B;2.C;2.D;2.E;2.F;2.G; and 2.H). The form and its functionality are based on IPCC software which has validation functionality such as for checking Emission factor value, range of GHG unit, and notation key options.



- To access into a data entry form, just click on each section on horizontal icon OR expand “GHG Sectors”, and “IPPU” sector is selected. Expand or collapse the navigation tree, click on the  or  signs in front of the nodes, respectively. You can also expand or collapse the entire tree by clicking the plus and minus signs at the bottom of the tree;
- Click on a desired sub-sector(blue), in this case “Ammonia Production” is clicking, the data information of the selected sub-sector is shown;

Sector : Industrial Processes and Product Use Category : Chemical Industry Subcategory : 2.B.1 - Ammonia Production Sheet : 1 of 1 Inventory Year :2021										
+Add Categories 										
A	B	C	D	$E = (A * B * C * D) * 44/12$	F	$G = F * 44/60$	$H = E - G$	$I = H / 10^6$	Remark	Action
Amount of Ammonia Produced (tonne)	Fuel Requirement for Ammonia Production (GJ/tonne ammonia produced)	Carbon Content of Fuel (kg C/GJ)	Carbon Oxidation Factor of Fuel (Fraction)	CO ₂ Generated (kg CO ₂)	Amount of Urea Produced (kg)	CO ₂ Recovered for Urea Production (kg CO ₂)	CO ₂ Emissions (kg CO ₂)	CO ₂ Emissions (Gg CO ₂)		
2	3	1	1	22.00000	4	2.93333	19.06667	0.00002		 
3	4	4	1	176.00000	4	2.93333	173.06667	0.00017		 
Total				198.00000	8	5.86667	192.13333	0.00019		

- Click on , then the form is appearing as it shows below;

Add Ammonia Production

Sector : Industrial Processes and Product Use
 Category : Chemical Industry
 Subcategory : 2.B.1 - Ammonia Production
 Sheet : 1 of 1
 Inventory Year :2021


Ammonia Production (A)  Fuel Requirement (B) 

Carbon Content Of Fuel (C) Carbon Oxidation Factor Of Fuel (D) Urea Production (F)


Remark
 Enter remark here..


- Fill in all information on the form, and choose a notation key(if any); and
- Click on “Save”.

4.2.2 Editing data


The existing data can be edited or deleted by click () on the right-hand side of the table. Modified row is saved into database as soon as the user press the button. Validation of entered data is performed before the row is updated in the database, e.g., any error in the supplied data, user will be informed to correct it. Adding of data can be canceled by using action button.

4.2.3 Deleting data

To delete the existing data row, click on “”, the delete confirmed box is popped up which asking, “are you sure to delete”, then click OK, otherwise click on “Cancel”.

 ghg.monre.gov.la

Are you sure to delete the record 2 ? Choose OK to delete or Cancel to exit.

The number of deleted data can be seen at the bin () , in this case no deleted data on the bin. The deleted data can be restored back when it is required.

4.2.4 Example: Cement Production

To calculate CO₂ emission from national cement production 3000 tonne including Portland Cement 1000 tonne and green bull 2000. But clinker import of 100 tonne and clinker export 300 tonne.

To record the cement production into the system do following steps:

Update Mineral Industry - Cement Production

Sector : Industrial Processes and Product Use
Category : Mineral Industry
Subcategory : 2.A.1 - Cement production 1
Sheet : 1 of 1
Inventory Year :2023

Type Of Cement Produced Cement Produced (A) Clinker Fraction In Cement (B)

Portland Cement(ပတ်လန်ဇီမင်) 1000 0.95

Remark

Enter remark here..

Update Reset Back

1. Check the subcategory;
2. Type for cement type(in this case, it is Portland cement);
3. Fill amount of cement production (1000 tonne);
4. Select the clinker fraction in cement(if don't know this value check with guideline of this category(2.A.1));
5. Put any remark if any; and
6. Save.

Similar process for “Green Bull” cement. After save the data record, the data grid shows as below.

	A	B	C = A * B				
Individual Type of Cement Produced	Mass of Individual Type of Cement Produced (tonne)	Clinker Fraction in Cement (Fraction)	Mass of Clinker in the Individual Type of Cement Produced (tonne)	Remark	Action		
Porland Cement(ກະຍິງແດງ)	1000	0.95	950		 		
Green bull(ກະຍິງຂຽວ)	2000	0.75	1500		 		
Total	3000		2450				
Cement Production - CO₂ Emissions							
D	E	F	G = (D - E + F)	H	I = (G * H)	J = (I / 1000)	Action
Mass of Clinker in the Individual Type of Cement Produced (tonne)	Imports for Consumption of Clinker (tonne)	Export of Clinker (tonne)	Mass of Clinker in the Country/Territory (tonne)	Emission Factor for the Clinker (tonne CO ₂ /tonne Clinker)	CO ₂ Emissions (tonne CO ₂)	CO ₂ Emissions (Gg CO ₂)	
2450	100	300	2650	0.52	1378	1.378	

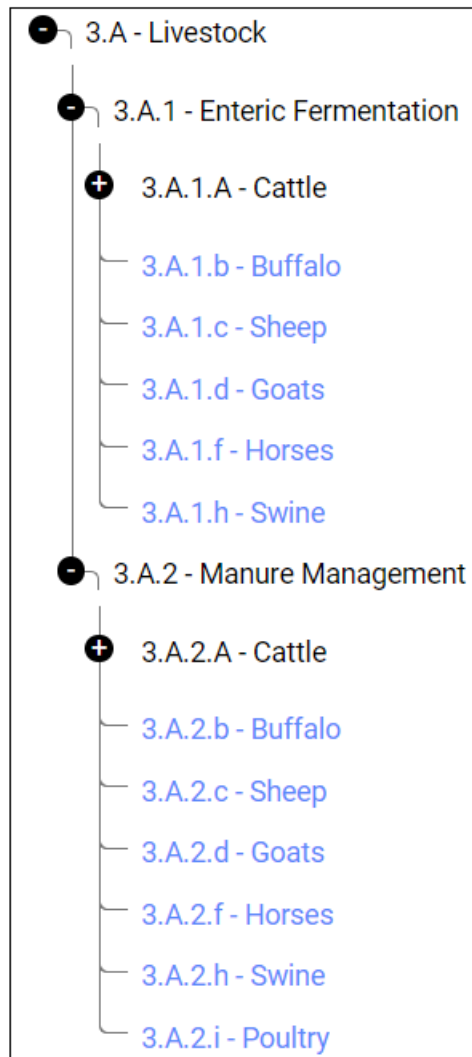
4.3 AFULO Sector

AFULO sector consists of four (4) main sub-sectors including (3.A;3. B; 3.C; and 3.D) which have different data grid and different calculation forms.

- 3.A-Livestock
- 3.B-Land
- 3.B-Aggregate Sources and Non-CO2 Emissions Sources on land
- 3.D-Others

4.3.1 Livestock

This category covers all sub-sector of category 3.A:



4.3.1.1 Adding Data

The data entry form of this sector varies from category by category which is applying for all sub-categories (3.A.1 and 3.A.2). The form and its functionality are based on IPCC software which has validation functionality such as for checking Emission factor value, range of GHG unit, and notation key options.

- To access into a data entry form, just click on each section on horizontal icon OR expand “GHG Sectors”, and “Energy” sector is selected. Expand or collapse the navigation tree, click on the or signs in front of the nodes, respectively. You can also expand or collapse the entire tree by clicking the plus and minus signs at the bottom of the tree;
- Click on a desired sub-sector(blue), in this case “Diary Cow” is clicking, the data information of the selected sub-sector is shown;

Sector : Agriculture, Forestry and Other Land Use
 Category : Livestock/Enteric Fermentation
 Subcategory : 3.A.1.a.i - Dairy Cows
 Sheet : 1 of 1
 Inventory Year:2021

Gas

METHANE (CH4) 1

Livestock Manager Categories 2

T	N(T)	EF(T)	CH4 = N(T) * EF(T) * 10 ⁻⁶		Remark	Action
Species/Livestock Category	Number of Animals (Head)	Emission Factor [Kg CH ₄ /(Head yr)]	CH ₄ Emissions (Gg CH ₄ /yr)			
Dairy cows	1500	20		0.03000		
Dairy cows	500	58		0.02900		
Total				0.05900		

Take the following steps to add new data:

- Choose “Methane (CH₄), then select “Livestock Manager”
- Fill in the information as required
- Click on “Save”

Category

Dairy Cows

Livestock Subcategory (T) 1 Annual AV Population N(T) 2

Typical Animal Mass(T) 3 Excretion Rate Per Mass Per Day 4

Remark


Enter remark here..

Save Reset Back 5


Categories

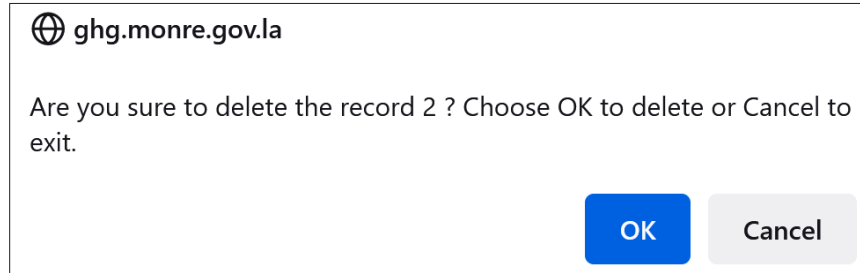
T	N(T)	TAM(T)	ER	Nex(T) = TAM(T)/1000 * 365 * ER		Remark	Action
Livestock Subcategory	Annual Average Population (Head)	Typical Animal Mass (Kg)	Excretion Rate per mass per day [Kg N/(1000Kg animal mass day)]	Excretion Rate per animal per year [Kg N/(animal yr)]			
Dairy cows	1500	250	50		4562.5		
Dairy cows	500	300	40		4380		

4.3.1.2 Editing data

The existing data can be edited or deleted by click () on the right-hand side of the table. Modified row is saved into database as soon as the user press the **Update** button. Validation of entered data is performed before the row is updated in the database, e.g., any error in the supplied data, user will be informed to correct it. Adding of data can be canceled by using **reset** action button.

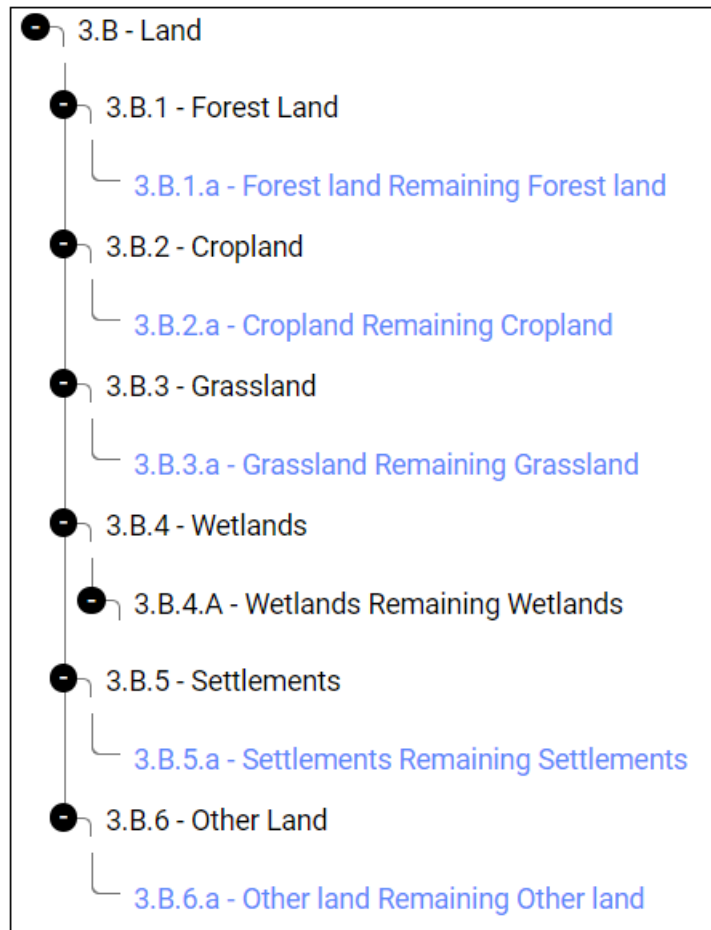
4.3.1.3 Deleting data

To delete the existing data row, click on “”, the delete confirmed box is popped up which asking, “are you sure to delete”, then click OK, otherwise click on “Cancel”.



4.3.2 Land

This category covers all sub-sector of category 3.B(3. B.1;3. B.2; 3.B.3; 3.B.4; 3.B.5; 3.B.6).



Before adding the data into the each “Land Type” category, it requests to identify them namely Land Forest, Cropland, Grassland, Wetland, Settlements, and other land.

4.3.2.1 Create Land type

To create the land type, do the following steps. In this case we create Land Forest for “Conifer forest”. The information for land type manager can be found in Annex 3.

- Just on “Land Type Manager”

Sector :	Agriculture, Forestry and Other Land Use
Category :	Land
Subcategory :	3.B.1.a - Forest land Remaining Forest land
Sheet :	Area Entry Table
Inventory Year:	2025

Land Type Manager
Categories

- Fill in information for each Land type as below.

- Save by clicking on “Submit” button.

Update Common Land Type Data

Land Use Subcategory

Climate Region

Soil Type

Forest Land Data

Ecosystem Type

Continent Type

Species

Age Class (Yr)

Natural Forest Plantation

Growing Stock Level (M3/Ha)

Carbon Fraction Of Aboveground Forest Biomass (Tonne C/Tonne D.M.)

Ratio Of Below-Ground Biomass To Above-Ground Biomass (R) (T Root D.M./T Shoot D.M.)

Biomass Conversion And Expansion Factor For Wood And Fuelwood Removal (BCEF) (T / M3 Wood Volume)

Above-Ground Biomass In Forest (T D.M./Ha)

Above-Ground Biomass Growth In Plantation/Natural Forests (T D.M./Ha/Yr)

Abandoned Managed Land

Relative Stock Change Factor
 Land Use (FLU)

Management (FMG)

Input (F)

4.3.2.2 Adding data

After creating the “Land Type Manager”, the activity data can be added in any forest type, do the following steps:

- 4.3.2.2.1 Area Entry Table: the area of specific type of land is added by a user(in this case, 500 ha of bamboo)

1 Area Entry Table 2 Annual increase in carbon stocks in biomass 3 Loss of carbon from wood removals 4 Loss of carbon from fuelwood removals

5 Loss of carbon from disturbance 6 Total CO₂ Emissions

Sector : Agriculture, Forestry and Other Land Use
 Category : Land
 Subcategory : 3.B.1.a - Forest land Remaining Forest land
 Sheet : Area Entry Table
 Inventory Year:2025

Land Type Manager Categories

Land Use	Area (ha)	Action
Bamboo	500	Save

4.3.2.2.2 After that the system will calculate the Biomass Carbon stock in tonne per year(tonne C/yr).

Lan Use Category	Equation 2.9	Equation 2.10			Equation 2.9		Remark
	Area of Forest Land Remaining Forest Land (ha)	Average annual above-ground biomass growth (tonnes dm / (ha * yr))	Ratio of below-ground biomass to above-ground biomass [tonnes bg dm/(tonne ag dm)]	Average annual biomass growth above- and below-ground (tonnes dm / (ha * yr))	Carbon fraction of dry matter [tonnes C / (tonne dm)]	Annual increase in biomass carbon stocks due to biomass growth (tonnes C / yr)	
Land use during reporting year	National statistics or international data sources	Table 4.9, 4.10, 4.12	Zero (0) or Table 4.4	Gtotal = Gw * (1+R)	0.5 or Table 4.3	$\Delta CG = A * Gtotal * CF$	
	A	Gw	R	Gtotal	CF	ΔCG	
Bamboo	500	9	0.2	10.8	0.47	2538	
Total	500			10.8		2538	

4.3.2.2.3 Then, a user need to add the area removal from bamboo, which means loss carbon from wood removal, in this case 50 ha.

Area Entry Table	Annual increase in carbon stocks in biomass	Loss of carbon from wood removals	Loss of carbon from fuelwood removals	Loss of carbon from disturbance	Total CO ₂ Emissions		
Sector : Agriculture, Forestry and Other Land Use Category : Forest Land Subcategory : 3.B.1.a - Forest land Remaining Forest land Sheet : 2 of 4 Loss of carbon from wood removals Inventory Year:2025							
Land Type Manager Categories							
Lan Use Category	Equation 2.12						
	Annual wood removal (m3/yr)	Biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark) (tonnes of biomass removals/m3 of removal)	Ratio of below-ground biomass to above-ground biomass [tonnes bg dm/(tonne ag dm)]	Carbon fraction of dry matter [tonnes C / (tonne dm)]	Annual carbon loss due to biomass removals (tonnes C / yr)		
Land use during reporting year	National statistics or international data sources	Table 4.5	Zero (0) or Table 4.4	0.5 or Table 4.3	$Lwr = H * BCEF * (1+R) * CF$		
	H	BCEF	R	CF	Lwr	Remark	Action
Bamboo	50	10	0.2	0.47	282.000		Save
Total	50				282.000		

4.3.2.2.4 The estimate annual carbon loss from fuelwood removal by adding fuelwood removal of whole tree, volume fuelwood removal as a tree parts, and wood density as below screen

Area Entry Table	Annual increase in carbon stocks in biomass	Loss of carbon from wood removals	Loss of carbon from fuelwood removals	Loss of carbon from disturbance	Total CO ₂ Emissions				
Sector : Agriculture, Forestry and Other Land Use Category : Forest Land Subcategory : 3.B.1.a - Forest land Remaining Forest land Sheet : 3 of 4 Loss of carbon from fuelwood removals Inventory Year:2025									
Land Type Manager Categories									
Lan Use Category	Equation 2.13								
	Annual volume of fuelwood removal of whole trees (m3/yr)	Biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark) (tonnes of biomass removals/m3 of removal)	Ratio of below-ground biomass to above-ground biomass [tonnes bg dm/(tonne ag dm)]	Annual volume of fuelwood removal as tree parts (m3/yr)	Basic wood density (tonnes/m3)	Carbon fraction of dry matter [tonnes C / (tonne dm)]	Annual carbon loss due to fuelwood removal (tonnes C / yr)		
Land use during reporting year	FAO statistics	Table 4.5	Zero (0) or Table 4.4	FAO statistics	Tables 4.13, 4.14	0.5 or Tables 4.3	$Lwr = [FGtrees * BCEF * (1+R) + FGpart * D] * CF$		
	FGtrees	BCEF	R	Gpart	D	CF	Lwr	Remark	Action
Bamboo	20	10	0.2	1500	10	0.47	7,162.800		

4.3.2.2.5 Then calculate the carbon loose from disturbance such as bushfire, erosion, land slide, flood and etc.

Area Entry Table	Annual increase in carbon stocks in biomass	Loss of carbon from wood removals	Loss of carbon from fuelwood removals	Loss of carbon from disturbance	Total CO ₂ Emissions					
Sector : Agriculture, Forestry and Other Land Use Category : Forest Land Subcategory : 3.B.1.a - Forest land Remaining Forest land Sheet : 4 of 4 Loss of carbon from disturbance Inventory Year:2025										
<input type="button" value="Land Type Manager"/> <input type="button" value="Categories"/>										
Lan Use Category	Equation 2.14						Equation 2.11		Remark	Action
	Available Area (ha)	Area affected by disturbances (ha/yr)	Average above-ground biomass of areas affected (tonnes dm/ha)	Ratio of below-ground biomass to above-ground biomass [tonnes bg dm/(tonne ag dm)]	Carbon fraction of dry matter [tonnes C / (tonne dm)]	Fraction of biomass lost in disturbance	Annual other losses of carbon (tonnes C/yr)	Annual decrease in carbon stocks due to biomass loss (tonnes C / yr)		
Land use during reporting year		National statistics or international data sources	Table 4.9	Zero (0) or Table 4.4	0.5 or Tables 4.3		$Ldisturb = A*Bw*(1+R)*CF*fd$	$\Delta CI = Lwr+Lfw+Ldisturb$		
		Adisturb	Bw	R	CF	fd	Ldisturb	ΔCI		
Bamboo	500	<input type="text" value="200"/>	180	0.2	0.47	<input type="text" value="1"/>	20,304.000	27,748.800		<input type="button" value="Save"/> <input type="button" value="Delete"/>
Total		200					20,304.000	27,748.800		

4.3.2.2.6 Finally, it is calculated the total of CO₂ emission from this land areas


Area Entry Table	Annual increase in carbon stocks in biomass	Loss of carbon from wood removals	Loss of carbon from fuelwood removals	Loss of carbon from disturbance	Total CO ₂ Emissions	
Sector : Agriculture, Forestry and Other Land Use Category : Forest Land Subcategory : 3.B.1.a - Forest land Remaining Forest land Sheet : <input type="text" value="Total CO<sub>2</sub> Emissions"/> Inventory Year:2025						
<input type="button" value="Land Type Manager"/> <input type="button" value="Categories"/>						
Lan Use Category	Annual increase in biomass carbon stocks due to biomass growth (tonnes C / yr)	Annual carbon loss due to biomass removals (tonnes C / yr)	Annual carbon loss due to fuelwood removal (tonnes C / yr)	Annual decrease in carbon stocks due to biomass loss (tonnes C / yr)	Net Biomass Carbon Stock	Total CO ₂ Emissions
	A = ΔCG	B = Lwr	C = Lfw	D = ΔCI	E = A - (B+C+D)	F = E * (44/12)
Forest Land	2,538.000	282.000	7,162.800	27,748.800	-32,655.600	<input type="text" value="-119,737.200"/>

4.3.2.3 Editing data

The existing data can be edited or deleted by updating area of the land type. Modified row is saved into database as soon as the user press the button.

Area Entry Table	Annual increase in carbon stocks in biomass	Loss of carbon from wood removals	Loss of carbon from fuelwood removals	Loss of carbon from disturbance	Total CO ₂ Emissions
Sector : Agriculture, Forestry and Other Land Use Category : Land Subcategory : 3.B.1.a - Forest land Remaining Forest land Sheet : Area Entry Table Inventory Year:2025					
<input type="button" value="Land Type Manager"/> <input type="button" value="Categories"/>					
Land Use	Area (ha)				Action
Bamboo	<input type="text" value="500"/>				<input type="button" value="Save"/>

4.3.2.4 Deleting data

To delete the specify “Land type”, just go to “ Land type manager”, then click on  button.

4.4 Waste Sector

Waste sector consists of three (3) main sub-sectors including (4.B;4.C; and 4.D) which have different data grid and different calculation forms.

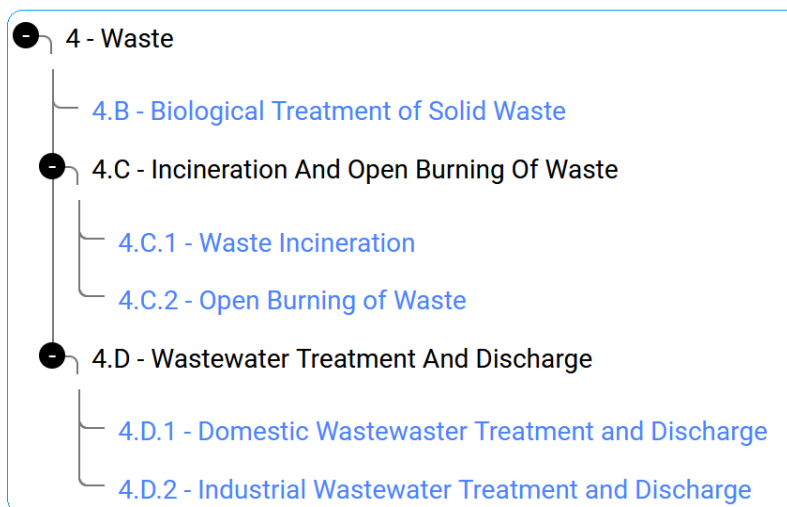







Figure- 15:Waste Sector

4.4.1 Adding data

The data entry form of this sector varies from category by category which is applying for all sub-categories (4.A;4. B;4.C and 4.D). The form and its functionality are based on IPCC software which has validation functionality such as for checking Emission factor value, range of GHG unit, and notation key options.

- To access into a data entry form, just click on each section on horizontal icon OR expand “GHG Sectors”, and “Waste” sector is selected. Expand or collapse the navigation tree, click on the  or  signs in front of the nodes, respectively. You can also expand or collapse the entire tree by clicking the plus and minus signs at the bottom of the tree;
- Click on a desired sub-sector(blue), in this case “Biological Treatment of Solid Waste” is clicking, the data information of the selected sub-sector is shown;

Biological Treatment System	Waste Category	Type of Waste	A Total Annual amount treated by biological treatment facilities (Gg)	B Emission Factor [g CH4/kg waste treated]	C = (A*B)/100 Gross Annual Methane Generation (Gg)	D Recovered/Flared CH4 per year (Gg)	E = (C-D) Net Annual CH4 Emissions (Gg)	Remark	Action
Composting	Municipal Solid Waste	Paper/cardboard	46	5600	2576		2576		 
Anaerobic digestion at biogas facilities	Municipal Solid Waste	Textiles	89	50	44.5	9	35.5		 
Total							2611.5		

- Click on , then the form is appearing as it shows below;

Add Biological Treatment of Solid Waste

Sector: Waste
 Category: Biological Treatment of Solid Waste
 Subcategory: 4.B - Biological Treatment of Solid Waste
 Sheet: 1 of 1 Estimation of emissions from Biological Treatment of Solid Waste
 Inventory Year: 2021

Biological Treatment System: **1**

Waste Category: **2**

Type Of Waste: **3**

Total Annual Amount (A):




Emission Factor (B):

Recovered/Flared (D):


Remark:

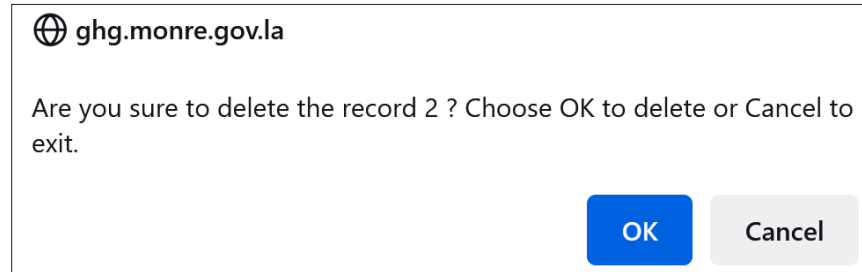
- Select the linking lists from 1 to 3;
- Fill in all information on the form, and choose a notation key(if any); and
- Click on “Save”.


4.4.2 Editing data

The existing data can be edited or deleted by click () on the right-hand side of the table. Modified row is saved into database as soon as the user press the  button. Validation of entered data is performed before the row is updated in the database, e.g., any error in the supplied data, user will be informed to correct it. Adding of data can be canceled by using  action button.

4.4.3 Deleting data

To delete the existing data row, click on , the delete confirmed box is popped up which asking, “are you sure to delete”, then click OK, otherwise click on “Cancel”.



The number of deleted data can be seen at the bin (), in this case no deleted data on the bin, the deleted data can be restored back when it is required.

5 User management

This section describes users’ management functions defined in the database which is divided into two user groups:

Administrator –is a full control user to manage all ordinary users.

Users – is an ordinary user which can see and edit only worksheets specified allowed section and functions only.

The administrator user can access User Management functions which is designated for adding new users and editing and deleting existing users in the currently open database. The main component of User management include:

- **User Name:** the name of a user which was designed by administrator and it shows as the current account is logging in;
- **User Sign-In:** is an email was created for this system only as a login username, but could be a real email;
- **User roles:** are role functions which allow administrator to define user roles for each sector, front/back end or the entire system administration; and
- **Action:** is for edit and delete the existing users.

User Management			
#	User Name	User Sign-in	Action
1	Saysoth	saysoth@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">ENERGY IPPU AFOLU WASTE OTHER FRONTEND MANAGEMENT USER ROLE MANAGEMENT REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>
2	Sodsada	sodsada@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">ENERGY IPPU AFOLU WASTE OTHER FRONTEND MANAGEMENT USER ROLE MANAGEMENT REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>
3	IPPU	ippu@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">IPPU REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>
4	AFOLU 1	afolu@gmail.com 2	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">AFOLU REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete 4</div> </div>
5	WASTE	waste@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">WASTE REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>
6	OTHER	other@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">OTHER REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>
7	Energy	energy@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">ENERGY REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>
8	DCC	dcc@gmail.com	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid red; padding: 2px;">ENERGY IPPU AFOLU WASTE OTHER FRONTEND MANAGEMENT USER ROLE MANAGEMENT REPORT</div> <div style="border: 1px solid red; padding: 2px;">Edit Delete</div> </div>

Figure- 16:User Management

5.1 Adding new user

Take following steps to define new user:

- Login as administrator user;
- Select “Add User”;
- Supply all new user information;
- Select user role for specific requirement (e.g. if create new user to manage Energy sector, just tick “Energy” only); and
- Click on “submit”.

Create User

Name
 1

Email
 2

Password

Confirm Password
 3

USER ROLES



Energy
 IPPU
 AFOLU
 Waste
 Other

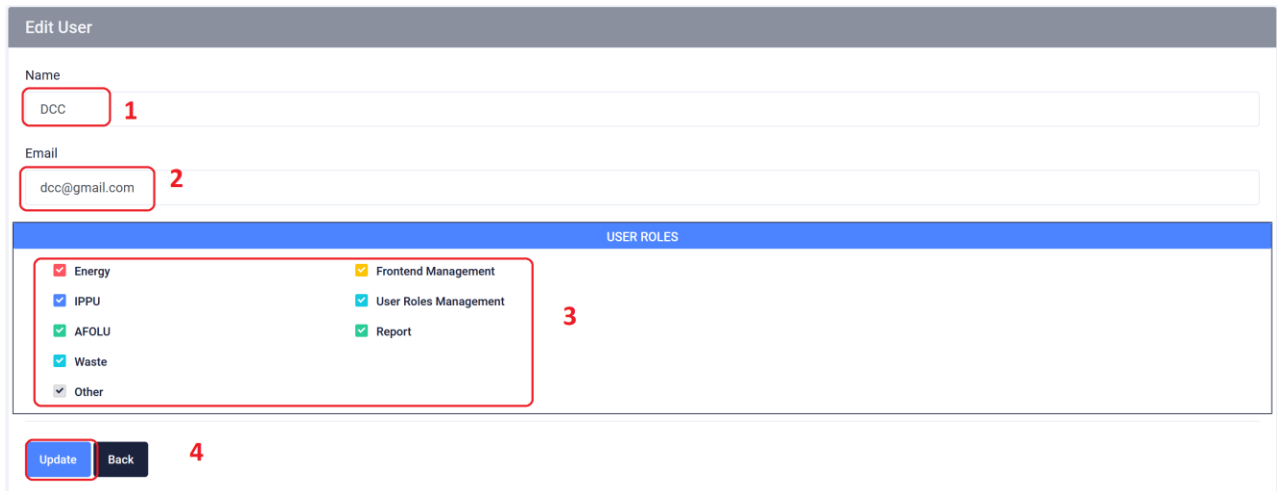
Frontend Management
 User Roles Management
 Report

5

5.2 Editing existing user

Take following steps to edit existing user:


- Login as administrator user;
- In User management navigation, click on “ View all user”;
- Select the button ;
- Modify the information; and
- Click on .

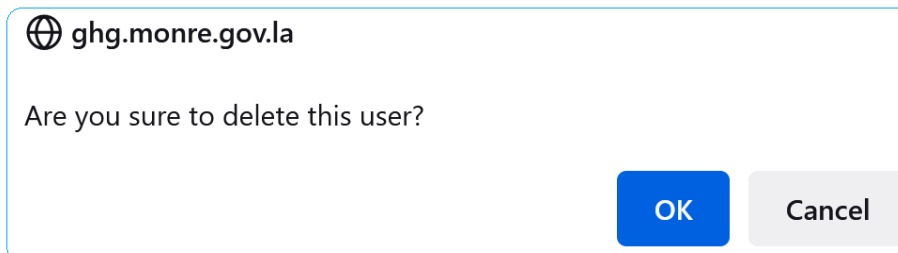


The screenshot shows the 'Edit User' interface. The 'Name' field contains 'DCC' and the 'Email' field contains 'dcc@gmail.com'. The 'USER ROLES' section is expanded, showing a list of roles with checkboxes: Energy, IPPU, AFOLU, Waste, Other, Frontend Management, User Roles Management, and Report. The 'Update' button is highlighted.

5.3 Deleting existing user

Take following steps to edit existing user:

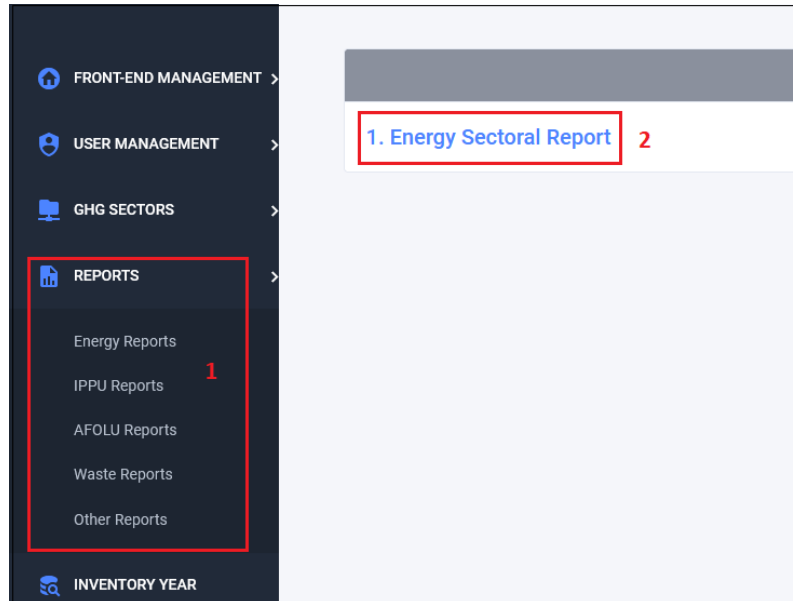
- Login as administrator user;
- In User management navigation, click on “View all user”;
- Select the button ;
- Click on” OK” on pop-up box



The screenshot shows a confirmation pop-up box. It has a globe icon and the text 'ghg.monre.gov.la'. Below that is the question 'Are you sure to delete this user?'. At the bottom are 'OK' and 'Cancel' buttons.

6 Reports

The reporting table enable the user to view the data entered in the system under the data entry section of this web application. The data in the reporting table cannot be modified, but modification to the data should be done through the data entry grids of each sector. There are five (5) sub-reports including Energy, IPPU, AFOLU, Waste and other reports.



6.1 Sectorial reports

Take following steps to view a sectorial report of each sector:

- Login as administrator user;
- Select “Reports Navigation tree”; and
- Select the desired report, in this case “Energy sectorial report” is selected.

Categories	Emissions (Gg)						
	CO ₂	CH ₄	N ₂ O	NO _x	CO	NMVOCs	SO ₂
1 - Energy	518.698	386.025	1,904.001	0.000	0.000	0.000	0.000
1.A - Fuel Combustion Activities	-75.380	0.021	0.001	0.000	0.000	0.000	0.000
1.A.1 - Energy Industries	-75.380	0.021	0.001	0.000	0.000	0.000	0.000
1.A.1.a - Main Activity Electricity and Heat Production	-75.380	0.021	0.001	0.000	0.000	0.000	0.000
1.A.1.a.i - Electricity Generation	-75.380	0.021	0.001	0.000	0.000	0.000	0.000
1.A.1.a.ii - Combined Heat and Power Generation (CHP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.1.b - Petroleum Refining	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.1.c - Manufacture of Solid Fuels and Other Energy Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.1.c.i - Manufacture of Solid Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2 - Manufacturing Industries and Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.a - Iron and Steel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.b - Non-Ferrous Metals	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.c - Chemicals	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.d - Pulp, Paper and Print	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.e - Food Processing, Beverages and Tobacco	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.f - Non-Metallic Minerals	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.g - Transport Equipment	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.h - Machinery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.i - Mining (excluding fuels) and Quarrying	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.j - Wood and wood products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.k - Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.l - Textile and Leather	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.2.m - Non-specified Industry	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Figure- 17: Sectorial report

7 Inventory Year

7.1 Creating inventory year

In order to create one or several GHG inventory year, take the following steps:

- Log in as the system administrator;
- Click on “Create New”;

- The new inventory year is pop up as below screen;;
- Select the year from “top down” list; and
- Click on “Save”.

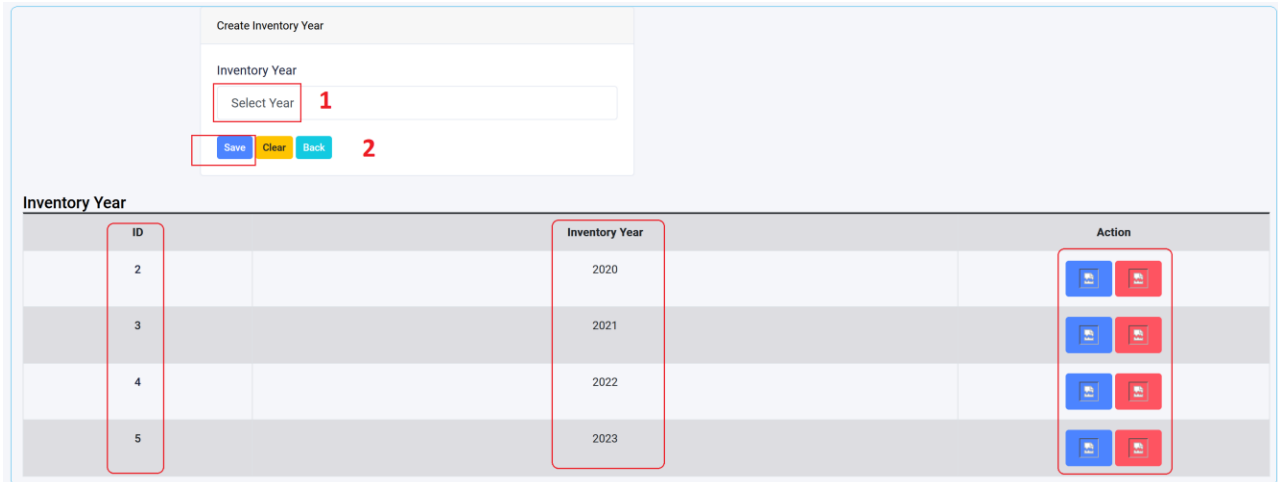


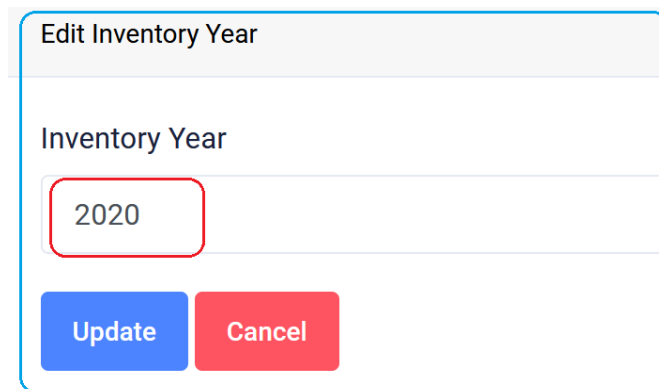


Figure- 18: Inventory Year

Alternatively, an inventory year can be created from back-end system by clicking on “**Inventory Year**”, on the left navigation.

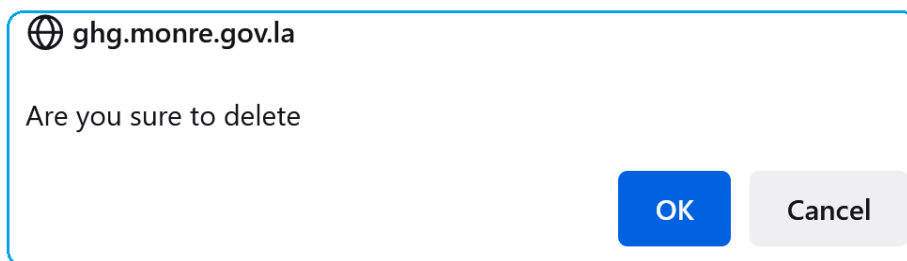
7.2 Editing existing inventory year

The existing data can be edited a inventory year by click () on the right-hand side of the table. Update the information, then press the  button.



7.3 Deleting existing inventory year

To delete the existing inventory year, click on “  ”, the delete confirmed box is popped up which asking, “are you sure to delete”, then click OK, otherwise click on “Cancel”.



8 Conclusions

National Greenhouse Gas Database Management System (NGHGDMS) is developed by Department of Climate Change (DCC) of Ministry of National Resource and Environment (MoNRE) and supported by Capacity Building Initiative for Transparency Fund (CBIT) via the United Nation Environment Programme(UNEP).

This NGHGDMS system will enable line ministries and agencies to input data into the system in line with their responsibilities identified under institutional arrangements, and the DCC as coordinating agency to manage it, including review the data, clean, and use for analysis. NGHGDMS shall enable Lao PDR to prepare more frequent updates of its inventory data to comply with the new requirements of the Biennial Transparency Reports (BTR).

The NGHGDMS will also utilize the existing data archiving system but will significantly expand its scope to allow for direct GHG emission calculations and QA/QC procedures within the system. It will also be updated it with revised emission factors and activity data as well as files and documents important to the inventory process and will be made permanent. The database system will be a web-based system to enable data input and estimation from the different line ministries.

The NGHGDMS is a web-based application designed to enable Lao PDR to estimate its national GHG inventories according to the UNFCCC guidelines and using the IPCC methodologies, and to report the results in its National Communications (NC) and Biennial Update Reports (BUR).

The End User Manual of the NGHGDMS aims to provide the authorized end-users with instructions on how to manage and use NGHGDMS data and tools to generate report by sectors including Energy, IPPU, AFOLU and Waste. The NGHGDMS data is ongoing and will be updated by DCC, MONRE. It is open and accessible to the public with the link <http://ghg.monre.gov.la>

9Annex

9.1Annex 1: GHG Default Value

- **Fraction of carbon stored for reference approach.**

Bitumen – 1

Coal oils and tars (from coking coal – 0.75

Ethane – 0.8

Gas/Diesel oil – 0.5

LPG – 0.8

Lubricants – 0.5

Naphtha – 0.8

Natural gas – 0.33

- **Conversion factors**

CH₄ volume → CH₄ Gg = 0.67

Conversion factors for energy

From	To	Multiply by
J	TJ	10 ⁻¹²
KJ	TJ	10 ⁻⁹
MJ	TJ	10 ⁻⁶
GJ	TJ	10 ⁻³
TJ	TJ	1
cal	TJ	4.1868 x 10 ⁻¹²
kcal	TJ	4.1868 x 10 ⁻⁹
Mcal	TJ	4.1868 x 10 ⁻⁶
Gcal	TJ	4.1868 x 10 ⁻³
Tcal	TJ	4.1868
kWh	TJ	3.6 x 10 ⁻⁶
MWh	TJ	3.6 x 10 ⁻³
GWh	TJ	3.6
Btu	TJ	1.0551 x 10 ⁻⁹

kBtu	TJ	1.0551 x 10 ⁻⁶
MBtu	TJ	1.0551 x 10 ⁻³
GBtu	TJ	1.0551
toe	TJ	41.868 x 10 ⁻³
ktoe	TJ	41.868
Mtoe	TJ	4.1868 x 10 ⁴
TJ	J	1012
TJ	KJ	109
TJ	MJ	106
TJ	GJ	103
TJ	cal	238.8 x 10 ⁹
TJ	kcal	238.8 x 10 ⁶
TJ	Mcal	238.8 x 10 ³
TJ	Gcal	238.8
TJ	Tcal	238.8 x 10 ⁻³
TJ	kWh	277.8 x 10 ³
TJ	MWh	277.8
TJ	GWh	277.8 x 10 ⁻³
TJ	Btu	947.8 x 10 ⁶
TJ	kBtu	947.8 x 10 ³
TJ	MBtu	947.8
TJ	GBtu	947.8 x 10 ⁻³
TJ	toe	23.88
TJ	ktoe	23.88 x 10 ⁻³
TJ	Mtoe	23.88 x 10 ⁻⁶

- **Emission factors**

Ozone precursors and SO₂ from oil refining – Crude oil throughput

NO_x = 0.06

CO = 0.09

NMVOC = 0.62

SO₂ = 0.93

Ozone precursors and SO₂ from oil refining – Catalytic cracker throughput

NO_x = 0.2

CO = 42.6

NMVOG = 0.6

SO₂ = 1.5

NMVOG emissions from storage and handling – Crude oil throughput

Secondary seals = 0.2

Primary seals = 0.7

Fixed Roof = 4.9

SO₂ from Sulphur Recovery Plants – 139 kg/t

- **CKD correction factor = 1.02**
- **Methane Correction Factor (MCF)**
 - Managed — 1.0
 - Unmanaged – deep ($\geq 5\text{m}$) — 0.8
 - Unmanaged – shallow ($< 5\text{m}$) — 0.4
 - Methane Correction Factor — 0.6
- **Inventory time period** (*for Cropland remaining Cropland – Carbon stock change – Mineral soils*) = **20 years**

9.2 Annex 2: Global Warming Potentials (GWP) for CO₂ Equivalent

Greenhouse gas	Chemical formula	1995 IPCC GWP
Carbon dioxide	CO ₂	1
Methane	CH ₄	21
Nitrous oxide	N ₂ O	310
HFC-23	CHF ₃	11,700
HFC-32	CH ₂ F ₂	650
HFC-41	CH ₃ F	150
HFC-43-10mee	C ₅ H ₂ F ₁₀	1,300
HFC-125	C ₂ HF ₅	2,800
HFC-134	C ₂ H ₂ F ₄	1,000
HFC-134a	CH ₂ FCF ₃	1,300
HFC-152a	C ₂ H ₄ F ₂	140
HFC-143	C ₂ H ₃ F ₃	300
HFC-143a	CF ₃ CH ₃	3,800
HFC-227ea	C ₃ HF ₇	2,900
HFC-236fa	C ₃ H ₂ F ₆	6,300
HFC-254ca	C ₃ H ₃ F ₅	560
Perfluoro methane	CF ₄	6,500
Perfluoro ethane	C ₂ F ₆	9,200
Perfluoropropape	C ₃ F ₈	7,000
Perfluoro butane	C ₂ F ₁₀	7,000
Perfluorocyclobutane	c-c ₄ F ₈	8,700
Perfluoro pentane	C ₅ F ₁₂	7,500
Perfluoro hexane	C ₆ F ₁₄	7,400
Sulphur hexafluoride	SF ₆	23,900

9.3 Annex 3: AFOLU Land type manager

9.3.1 Land Forest

Land Use Subcategory	Climate region	Soil type	Ecosystem type	Continent type	Species	Age class(yr)	Natural forest/plantation	Growing stock level(m ³ /ha)	Carbon fraction of aboveground forest biomass (tonne C/tonne d.m.)	Ratio of below-ground biomass to above -ground biomass@(t root d.m./t shoot d.m.)	Biomass conversion and expansion factor for wood and fuelwood removal (BCFE)(t/m ³)	Above-ground biomass in forests (t d.m./ha)	Above-ground biomass growth in plantation/natural forest(t d.m./ha/yr)	Reference soil organics carbon (SOC) stock (t C/ha)	Litter carbon stocks of mature forest (t C/ha)	Relative stock change factor (FLU, FMG, FI)
Bamboo/ບາໂມ ໂ ບໍ່ ງ	<i>Tropical Moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Tropical moist deciduous forest</i>	<i>Continental</i>	<i>Other Broadleaf</i>	<20 y	<i>Natural forest</i>	<10	0.47	0.2	10	180	9	47	2.1	1
Coniferous forest /ບາໃບ ຕຂັ້	<i>Tropical Moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Tropical moist deciduous forest</i>	<i>Continental</i>	<i>Pinus</i>	<20 y	<i>Natural forest</i>	<10	0.47	0.24	4.44	180	2	47	5.2	1
Dry dipterocarp forest/ບາໂຄກ	<i>Tropical Moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Tropical moist deciduous forest</i>	<i>Continental</i>	<i>Other Broadleaf</i>	>20 y	<i>Natural forest</i>	<10	0.5	0.2	10	180	2	47	0	1
Evergreen Forest/ບ່າງຂຽງ ວ ຕະຫຼອດປີ	<i>Tropical Moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Tropical moist deciduous forest</i>	<i>Continental</i>	<i>Other Broadleaf</i>	<20 y	<i>Natural forest</i>	<10	0.47	0.24	10	180	2	47	2.1	1

Plantation forest ປາບຫູ	Tropical Moist, Short Dry Season	Low Activity Clay Mineral	Tropical moist deciduous forest	Continental	Eucalyptus	<20 y	Plantation forest	10-20	0.47	0.24	4.44	180	9	47	2.1	1
Mixed coniferous and broadleaves/ ປາປະສົມ ໃບເຂັ້ມ ແລະ ໃບໃຫຍ່	Tropical Moist, Short Dry Season	Low Activity Clay Mineral	Tropical moist deciduous forest	Continental	Other Broadleaf	<20 y	Natural forest	<10	0.47	0.24	10	180	2	47	2.1	1
Mixed deciduous forest/ປາໃບເຂັ້ມປະສົມ	Tropical Moist, Short Dry Season	Low Activity Clay Mineral	Tropical moist deciduous forest	Continental	Other Broadleaf	<20 y	Natural forest	<10	0.47	0.2	1.39	280	7	47	5.2	1
Regeneration forest/ປາຟ່ານ ື້ວ ຟຸດ	Tropical Moist, Short Dry Season	Low Activity Clay Mineral	Tropical moist deciduous forest	Continental	Other Broadleaf	<20 y	Natural forest	10-20	0.5	0.2	4.44	180	9	47	2.1	1

9.3.2 Cropland

Land Use Subcategory	Climate region	Soil type	Perennial crop/annual crop	Above-ground biomass(t d.m./ha)	Cropland type	Reference organic carbon (SOC) stock(t C/ha)	Harvest/Maturity cycle(yr)	Biomass carbon loss(L)(t C/ha/yr)	Biomass accumulation rate(G)(t C/C/ha/yr)	Carbon fraction of dry matter(t C/t d.m.)	Relative stock change factor
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											Land use (FLU)	Tillage (FMG)	Input (FI)
Agriculture plantation/ດພີປທຸຜົງ ກະສິກໍາ	<i>Tropical moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Perennial crop</i>	45	All perennials	47	8	21	2.6	0.5	0.48	N/A	0.92
Other agriculture ດພີ ກະສິກໍາ ອື່ນໆ	<i>Tropical moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Annual crop</i>	10	N/A	47	N/A	N/A	N/A	0.5	1	1	1
Rice paddy/ທຸງື່ອນ ນາ	<i>Tropical moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Annual crop</i>	10	N/A	47	N/A	N/A	N/A	0.5	1	1	1
Upland crop/ດພີປທຸ ເຂດເນພີສຽງ	<i>Tropical moist, Short Dry Season</i>	<i>Law Activity Clay Mineral</i>	<i>Annual crop</i>	10	N/A	47	N/A	N/A	N/A	0.5	1	1	1

7.3.3 Grassland

Land Use Subcategory	Climate region	Soil type	Vegetation type	Reference soil organic carbon(SOC) stock (t C/ha)	Relative stock change factor			Herbaceous biomass stocks present on land(t d.m./ha)	Woody biomass stocks present on land(t d.m./ha)	Herbaceous biomass stocks after conversion form other land use(t d.m./ha)	Woody biomass stocks after conversion form other land use(t d.m./ha)	Carbon fraction of dry matter for herbaceous miomass(t C t d.m.)	Carbon fraction of dry matter for woody biomass(t C/t d.m.)
Grassland	Tropical Moist, Short Dry Season	Law Activity Clay Mineral	Tropical		Land use (FLU)	Management (FMG)	Input	16.1	0	16.1	0	0.47	0.47
Savannah													
Scrub	Tropical Moist, Short Dry Season	Law Activity Clay Mineral	Tropical moist deciduous forest	Continental	Pinus	<20 y	Natural forest	<10	0.47	0.24	4.44	180	2

7.3.4 Wetland

<i>River</i>													
<i>Swamp</i>													
<i>Urban areas</i>													

