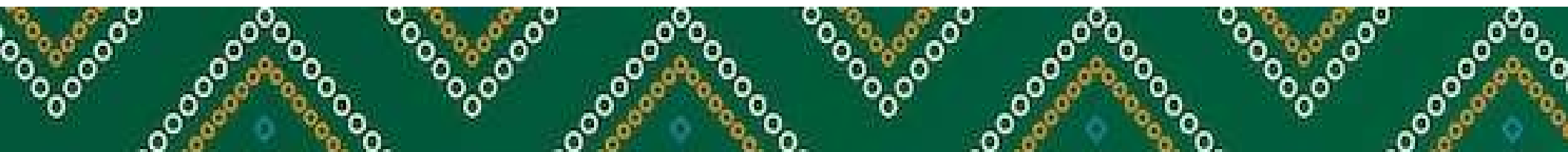


# Overview of the ALU 2006 Software

(Capacity Building Program for Indian Experts on National Greenhouse Gas Inventory Preparation as per Enhanced Transparency Framework Guidelines, 25 April 2024 – 1 May 2024, Indian Institute of Technology Gandhinagar, Gujarat, India)

Leandro Buendia, Consultant



# Reporting Requirements for National GHG Inventory under the Paris Agreement (MPG, 18 CMA.1)

- ✓ shall use the **2006 IPCC Guidelines**; any agreed subsequent version or refinement of the IPCC GL
- ✓ shall report the ff sectors: Energy, IPPU, **Agriculture**, **LULUCF**, and Waste, according to IPCC Guidelines
- ✓ shall transparently explain national methods, data and/or parameters selected
- ✓ shall quantify the uncertainty associated with the emission/removal estimates
- ✓ shall implement and provide information on QA/QC
- ✓ shall use the global warming potential (GWP) values from the **IPCC AR5**, or subsequent values agreed by IPCC
- ✓ shall provide a National Inventory Report (NIR) and the Common Reporting Table (CRT)

## Tracking Progress of NDC under PA (MPG, 18 CMA.1)

- ✓ each Party shall provide a description of each methodology and/or accounting approach, as applicable for target(s), **construction of baselines**, and indicators
- ✓ each party shall identify the indicators that it has selected to track progress towards the implementation of achievement of its NDC under Art. 4 (e.g. **hectares of reforestation** for net GHG emission/removal)
- ✓ each Party shall provide the information for each of the selected indicator for the reference point, levels, **baseline**, base year, or starting point.

...to fulfill these reporting requirements for transparency of reporting National GHG Inventory and for tracking progress of NDC, under the Paris Agreement, one needs to have a **tool to implement the IPCC 2006 Guidelines**, and for implementing the good practice principles of **transparency, accuracy, consistency, completeness, and comparability** (TACCC)...

## The ALU Software as a Tool



- A standalone tool to **implement the IPCC 2006 Guidelines** for GHG Inventory, ONLY for the Agriculture, Forestry, and Other Land Use (AFOLU) sector
- Estimates GHG emission and removals at national, regional, and project levels
- Accommodates Tier 1 and Tier 2 methods as defined by the IPCC 2006 Guidelines
- Allows inventory compilers to integrate GIS spatial data along with national statistics on agriculture and forestry
- Guides user to compile GHG inventory in a transparent, accurate, consistent, complete and comparable (TACCC) manner
- Designed to produce a consistent and complete representation of land use and livestock population for inventory assessment
- Has explicit Quality Control and Quality Assurance (QA/QC) steps

## The ALU Software as a Tool



- Provides a long-term archive of data and results in digital format
- Generates emission and removal reports with associated uncertainty
- Allows to conduct **Mitigation Analysis** to determine the mitigation potential of AFOLU categories
- Developed by the Colorado State University – Natural Resource Ecology Laboratory (NREL), with support from USEPA and USAID
- The **Software and User Manual are FREE** for download at:

Contact Email:  
ALUSupport@nrel.colostate.edu

Web Address:  
<http://www.nrel.colostate.edu/projects/ALUsoftware/>

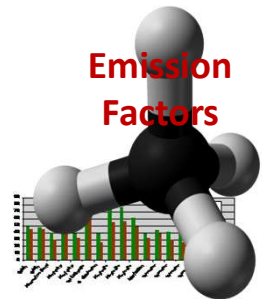
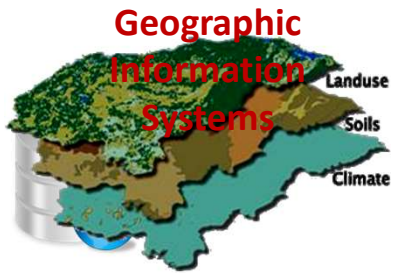
# 4 Modules of the ALU Software

The screenshot displays the ALU Tool software interface, titled "ALU Tool -- IPCC 2006 Guidelines: (Version 6.1.0)". The interface includes a menu bar with "File", "Help", "Data Management", and "Test". The main header features the ALU logo and the text "Agriculture and Land Use National Greenhouse Gas Inventory Software" based on the 2006 IPCC Guidelines. Logos for Colorado State University, USAID, and the Environmental Protection Agency are also present.

The interface is divided into several sections:

- Current Database, User, Country and Inventory Year:** Shows "Database: Philippines 2010\_ALU...", "User: Leandro", "Country: Philippines", and "Year: 2010". Each has a corresponding "Set" button.
- Module I: Specify Activity Data:** Contains "Primary Activity Data" (with "Enter Primary Data" button) and "Secondary/Supporting Activity Data" (with "Enter Secondary Data" button).
- Module II: Enter Emission/Stock Factors:** Contains an "Enter Factors" button.
- Module III: Calculate Emissions/Stocks:** Contains a "View Calculations" button.
- Quality Assurance/Quality Control:** Contains a "Conduct QA/QC" button.
- Emissions Reports:** Contains an "ALU" logo.
- Module IV: Mitigation Analysis:** Contains a "Conduct Analysis" button.
- Data Completion Status:** Includes dropdown menus for "Source Category", "Source Subcategory", "Equation Group", and "Category", all currently showing "-- Select A Source Category Above --". It also includes a "Completion Status by Region" section for "Year: 2010" with a "Region" dropdown and a "Select Above to display Region Status for Current Year." instruction.
- Buttons:** "Quit Application", "Reset", and "Go To Next Step" are located at the bottom.

# How the ALU Software works?



Land Use/  
Livestock  
Data

National  
Agriculture  
and  
Forestry  
Statistics

IPCC  
Defaults  
or  
Country-  
Specific



STEP 1					
Vegetation types	A Area Converted Annually (kha)	B Biomass Before Conversion (t dm/ha)	C Biomass After Conversion (t dm/ha)	D Net Change in Biomass Density (t dm/ha) D = (B - C)	E Annual Loss of Biomass (kt dm) E = (A x D)
Tropical Moist, Short Dry Season	tropical broadleaf forest	1717.219	20	8	20606.628
Tropical Moist, Short Dry Season	tropical broadleaf forest - shifting cultivation	10.191	5	0	50.955
<b>Subtotals</b>		1727.41			20657.583

**Documentation text:**  
 Grassland is not included here because Approach 2/3 land use data are required in ALU for reporting stock changes for grassland conversion (if applicable).  
 Annual Loss of Biomass includes above-ground and below-ground woody biomass and herbaceous biomass loss through deforestation, shifting cultivation, and conversion of grassland.  
 Column C is zero for shifting cultivation because it is assumed that all biomass is removed.

**Generates detailed reports in a TACCC way and thus support PA - ETF**

# Documentation function in Support of ETF

The screenshot displays the ALU software interface. A window titled "ALU: Notes" is open, showing a text editor with the following content:

Country/Year: Philippines / 2010

1. Assumption on coconut fuelwood: Estimated based on 4 million ha of coconut area; with fuelwood productivity of 2 t/ha/yr or equivalent to 8 million metric tonnes of fuelwood per year (see Bensel and Remedios, 2002. Using wood density of 0.5 tonne dm per m3 (see IPCC 2003 Table 3A.1.9-2), the estimated fuelwood volume equals 16 million cubic meter of coconut fuelwood.

2. Assumption on coconut wood removal: Based on the study by Pabuyaon et al. 2009 "The Philippines Policy on Coconut Cutting"; assuming 1 standing coconut tree is equal to 1 cubic meter of wood, and that the average cutting of coconut trees is 625,878 trees. Hence, coconut removal in 2010 is estimated at 625,878 cubic meter.

3. Assumption on Fuelwood Removal from Forest Land of 35,460,000 m3 is taken from the Philippines Forestry Outlook Study 2009.

4. Assumption on Wood Removal from Forest Land of 2,102,450 m3 is taken from "FMB internal study on "Determining the Supply and Consumption of Wood in the Philippines Using Roundwood Equivalent Analysis (2014); based on the compiled data from Philippines Statistics Authority (PSA), DPWH, and other relevant agencies. This will be reflected in the wood removal for "Forest Land Converted to Cropland".

4. Fuelwood partially collected from Grassland of 4 million cubic meter is based on 2 million hectares of grassland area with the fuelwood productivity potential of 1 tonne/ha/yr and biomass dry matter weight of 0.5 tonne per m3. Source: Bensel, T.G. and Elizabeth M. Remedios (2002). Woodfuel consumption and production in the Philippines: a desk study, "FAO Bangkok, unpublished report.

5. Wood Removals or harvested in Grassland Remaining Grassland, assumed equal to zero since it is already part of the fuelwood removal in grassland.

Buttons at the bottom of the notes window include: Export Notes to Text File, Export Notes To PDF File,  Open File After Export is Complete, Save & Close.

The main window shows a table with the following data:

Category	Area (ha)	Percent (%)
Remaining Forest Land	6791545	22.98
Converted to Forest Land	3629250	12.28
Remaining Cropland	12442299	42.1
Converted to Cropland	47287	0.16
Remaining Grassland	4988741	16.88
Remaining Wetlands	857071	2.9
Remaining Settlements	709300	2.4
Remaining Other Lands	88663	0.3

Summary statistics: 29554156 (Area), 100 (Percent). Buttons include: Status: +, Validate, Update Area from Percent, Back, Continue, Quit Application, Reset, Go To Next Step.



# Mitigation Analysis

ALU Tool -- IPCC 2006 Guidelines: (Version 6.1.0)

File Help Data Management Test ALU 6.1.0.4

ALU Mitigation: Mitigation Analysis Dashboard

Country: **Philippines** Hide Guide

**Mitigation Analysis:** **Reforestation**

**Baseline Year:** 2010

**Projection Year:** 2030

Select / Change Projections for Assessment Types:

**Business-As-Usual (BAU) Projection:** Change BAU Projection

Projection Set

**Mitigation Projection:** Change Mitigation Projection

Projection Set

Enter/View Notes

Edit Current Analysis

Change Mitigation Analysis

Exit Mitigation & Return to Main Form

**Select Next Step:**

Work on Baseline Inventory  
Work on Business-As-Usual Projection  
Work on Mitigation Projection  
Estimate Mitigation Potentials

**Go To Selected Next Step**

**A Mitigation Analysis Requires:**

- A completed Inventory Session
- A Business-As-Usual (BAU) Projection
- A Mitigation Projection

**STEPS TO SET-UP A MITIGATION ANALYSIS:**

- 1) Set / Create BAU & Mitigation Projections
  - Options Include:
  - a) Create a projection by copying from an Inventory
  - b) Copy a projection from another Mitigation Analysis
  - c) Use / select an existing projection
  - d) Create a blank projection, populate data in Step 2
- 2) Modify / populate data for each Projection
  - The ALU Interface is used to modify / populate projection data, like a regular Inventory Session:
  - a) Modify BAU Projection data
  - b) Modify Mitigation Projection data
- 3) Run the Mitigation Analysis
  - Each emission source to be analyzed must be complete in the Inventory Session & in each projection before proceeding

**NEXT:** Use options below to modify data & return to this form to run Mitigation Analysis

**Quit Application** Reset Go To Next Step

# Mitigation Analysis Example: Reforestation

Mitigation Analysis: **Reforestation Project**

Baseline Year: **2016**

Projection Year: **2030**

Select Total or Individual Source:

**Total Greenhouse Gas Mitigation Potential**

Carbon Dioxide (CO2) Emissions from Carbon Stock Changes

Additional Information:

Global Warming Potential Source: **IPCC WG1 AR5 (2013)**

[View Values](#)

Note: Sources are converted to CO2 Equivalents using Global Warming Potentials (GWP).  
Click 'View Values' to See the GWP values used.  
A positive (+) CO2 Equivalent value is an emission to the atmosphere.  
A negative (-) CO2 Equivalent value is a net sequestration of CO2.  
To view detailed emission values, click 'Generate Report'.

Emission Results:

Source	CO2 Equivalent (Gg/yr)
Carbon Dioxide (CO2) Emissions from Carbon Stock Changes	-841.50
<b>Total CO2 Equivalent</b>	<b>-841.50</b>

# Mitigation Analysis Example: Reforestation

**Mitigation Analysis:** [Reforestation Project](#)

**Baseline Year:** 2016

**Projection Year:** 2030

**Select Total or Individual Source:**

Total Greenhouse Gas Mitigation Potential  
[Carbon Dioxide \(CO2\) Emissions from Carbon Stock Changes](#)

**Additional Information:**

**Global Warming Potential Source:** [IPCC WG1 AR5 \(2013\)](#)

[View Values](#)

**Emission Results:**

Source	Business-As-Usual Projection C Stock Change (Gg/yr)	Mitigation Projection C Stock Change (Gg/yr)	Mitigation Potential CO2 Equivalent (Gg/yr)
Biomass C Stock Change: Gain-Loss Method	10390.85	10620.35	-841.50
<b>Total</b>	10390.85	10620.35	-841.50

# Let us start using the ALU Software to estimate emissions and removals from the AFOLU sector in India...

1. Create a database
2. Set user
3. Set country/region
4. Set year (e.g. 2019)