

# U.S. EPA's GHG Inventory Capacity Building Activities and Lessons Learned



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**USAID**  
FROM THE AMERICAN PEOPLE



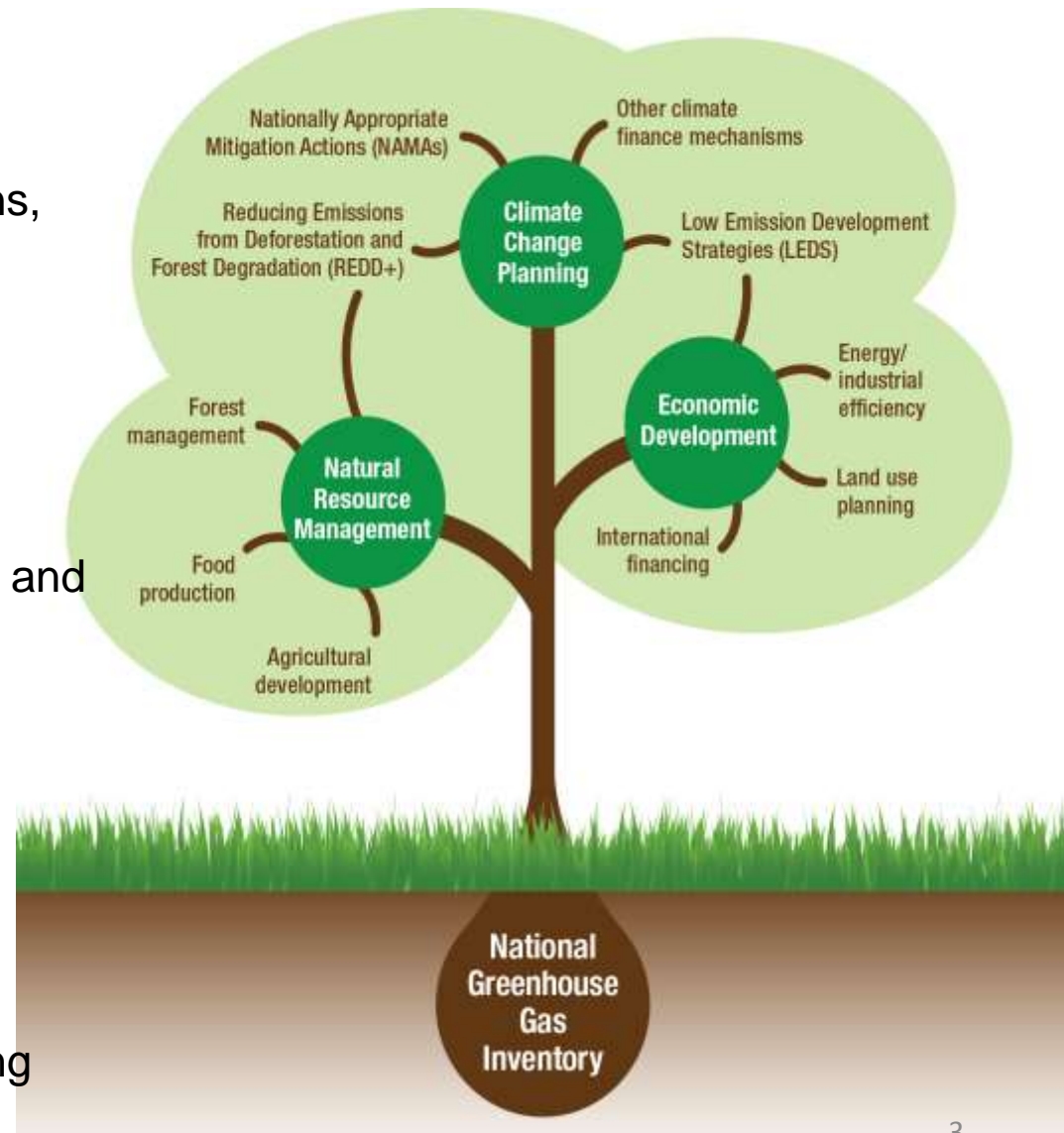
# Overview

- Why compile a national GHG inventory?
- US EPA's GHG inventory capacity building regions and approach
- Tools and how the US EPA can help
- Lessons Learned
- Additional Resources and Links

## Build a Solid Foundation for Low Emission Growth

***“Can’t manage what you don’t measure”***

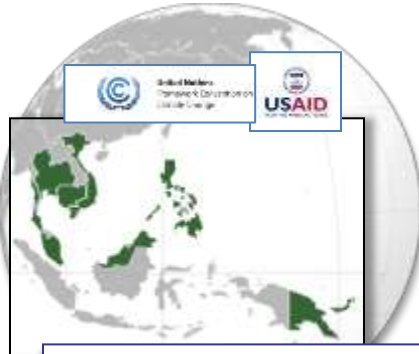
- Understand national GHG emissions, removals and trends
- Identify cost-effective policies and programs to reduce emissions, but enhance climate resiliency
- Meet international obligations and participate in future GHG programs and agreements (UNFCCC reporting)
- Enhance environmental integrity of mitigation options (baselines, BAU emissions/projections, NAMAS, REDD+, and LEDS, etc.)
- Useful indicators for environmental assessment and management, economic development and planning



# Capacity Building Efforts to Date



**Central America** : First regional project. Developed our current approach and designed our tools.  
Phase I: 2004-2007  
Phase II: 2007-2010



**South East Asia**: Currently 6 country project. *Strong partnership with UNFCCC.* Applied the lessons and tools developed in CA. Phase I: 2008-2010. Phase II: 2011-2014.



**Andean Region**: Scoping trips to Colombia, Peru and Ecuador. Initiating work with Colombia. Applying the lessons learned and tools developed for other regions. Phase I: 2012-2015.



**Eastern and Southern Africa**: Currently 8 country project. Apply the lessons and tools developed in other regions. *Strong partnerships with UNFCCC, CD-REDD.* Phase I: 2011-2014.

*EPA leads technical implementation. USAID is key partner in all regions, providing funding and overall planning and implementation support.*



# NA-1 countries have made progress, technical capacity exists, but some challenges remain



**Small teams with limited resources and multiple roles**



**Insufficient records from previous inventories**



**Need for stronger institutional arrangements**



**Incomplete or non-existent activity data**



**Lack of country-specific emission factors**



**Difficulty retaining expertise**

# A Simple Approach to GHG Inventory Capacity Building

- **Goals**

- Assist countries to develop a high quality GHG inventories (transparent, accurate, consistent, complete and comparable), with focus on key sectors, such as Agriculture and Forestry (LULUCF)
- Build solid foundation for more regular reporting and steadily improving inventory quality

- **General approach**

- Improve institutional capacity of a country to establish a sustainable National GHG Inventory System
- Provide technical assistance to apply and improve methods, activity data collection and documentation
- Cannot “train” experts on methods alone—they must *learn by doing*



# Steps for GHG Inventory Capacity Building



## Scoping/select Project GHG Inventory Team

Understand country/regional objectives, **assess institutional arrangements**, select project **coordination team**



## Initial Planning session

Country(s) present current inventories; review inventory system and estimation methodologies; and **identify activity data (AD) gaps**



## Working sessions

Assist with cross-cutting inventory management tasks, assembling AD; **produce inventory** and document the process/results



## Wrap-up Session

Country(s) **present improved inventories** and discuss next steps

## EPA and Country Inventory Team Partnership



**EPA approach designed to support countries along inventory preparation process**



# Capacity Building Tools

## National System Templates

Helps to document, institutionalize and streamline the inventory management process

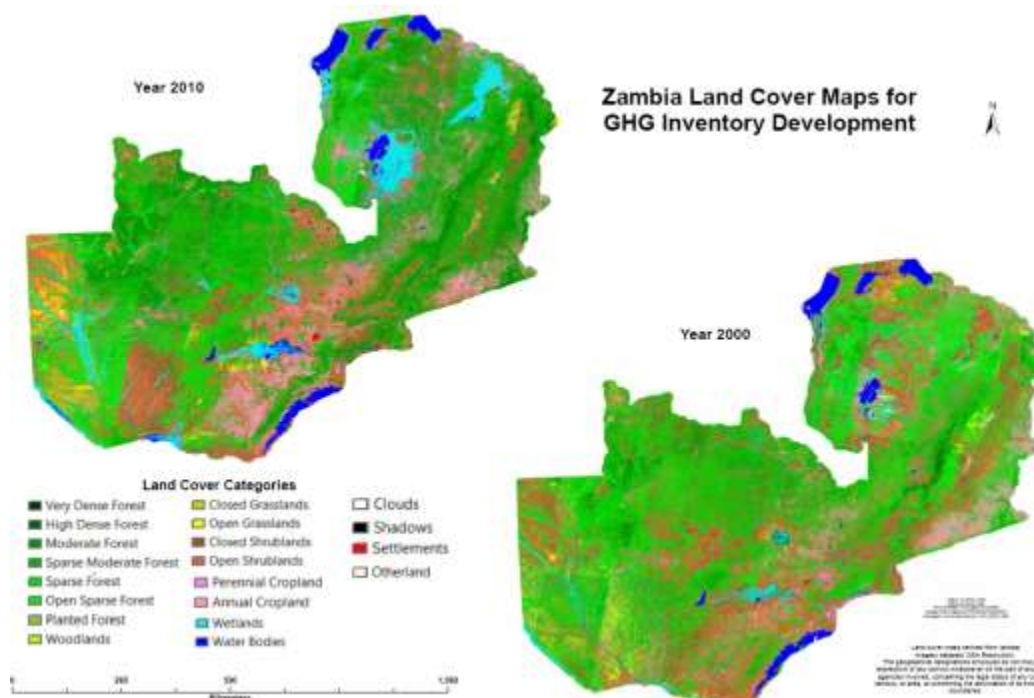


## ALU Tool

Helps to compile AD, perform calculations, implement QA/QC procedures and produce reports

- **Developing accurate and consistent land use maps has been a major focus of recent EPA assistance, in particular the ESA project**
  - Lack of good quality maps and land use/conversion data is a key obstacle for many countries in preparing a complete and consistent representation of their land base as required by the IPCC Guidelines.

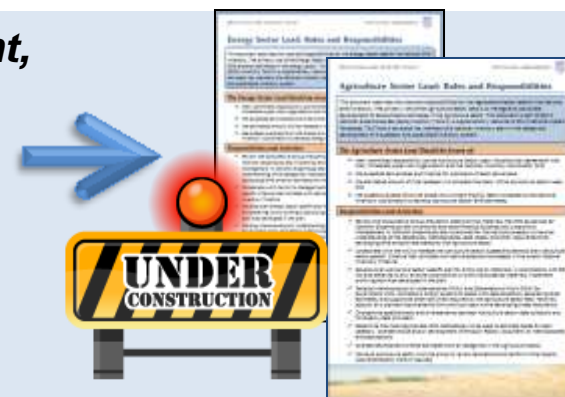
## MAPPING LAND-COVER FOR GENERATING LAND USE CHANGE



Source: Prof. F.D. Yamba. (2013) Zambia's Inventory Management System and Contribution of the Project to the System including the use of Satellite Imagery. [Power Point Slides]. Copy provided by UNFCCC, slides presented at UNFCCC Side Event June 7, 2013.

## 1) Institutional Arrangements Toolkit (*Under Development, available end of year*)

- Example MoU for data providers
- Sample TORs for sectoral experts/reviewers
- Budget templates
- Timeline templates



## 2) Key Category Analysis (KCA) Tool: Enables a country to determine the most important emissions categories and identify areas for improving estimates and moving to higher Tier IPCC methods (consistent with 2006 GL)



## 3) Providing technical assistance on methods, activity data collection, and documentation.

- **Activity Data Assessment Questionnaires**  
Helps assess a country's activity data availability, gaps and needs, (Energy, Agriculture/LULUCF, Waste, etc.)
- **Agriculture, Land-Use (ALU) Data Workbooks**  
ALU data workbooks facilitate data collection and organization for entry into calculation tools



- **Developing a high quality inventory is not** easy—but we all know there are many reasons to do it!
- A dedicated Regional/National Project Coordinator to oversee day-to-day activities is essential
- GEF funding is necessary to complement EPA technical assistance
  - Enables countries to engage experts to supplement limited human resources
- Initial emphasis on **institutional arrangements is necessary** to support **data** needs to calculate emissions now and in future for UNFCCC reporting (NC and BUR)
  - EPA’s Developing a National Inventory Systems Template Workbook is useful and provides a foundation for planning and designing a national GHG inventory system, in particular institutional arrangements
    - Facilitates effective organization and management of GHG inventory; but dedicated effort is required
    - Promotes transparency, accuracy, consistency, completeness, and comparability (IPCC Good Practice)
    - Does not solve all problems, but helps create “institutional memory” or continuity
    - Reduces future costs/effort
    - Applicable at national or sub-national level
    - **Mentoring support** is required to apply/translate templates from “paper system” to functional components of national inventory system to support UNFCCC reporting

- Inventory teams ***learn by doing***, not by just training
  - Hands-on one-on-one work using the country data is necessary to truly enhance technical capacity
- Emphasis should also be on ***activity data***
  - Must work with the country to help them overcome barriers with data collection (e.g. facilitating discussions with data providers, designing expert knowledge surveys, etc.)
- Each country is unique—***flexibility*** is important
  - Regional meetings facilitate exchange of expertise, inventory management strategies
  - Bilateral assistance is important to engage all relevant experts to effectively support the country-specific inventory process (e.g. institutional arrangements, data gaps, etc.)
- A ***sustained, long-term effort*** is necessary for success
- ***Dedication*** from the National Inventory team is crucial!

- **Download fact sheets on benefits of national GHG inventories, EPA capacity building activities, and preparing land use land cover maps from the EPA Website [www.epa.gov/climatechange/capacitybuilding](http://www.epa.gov/climatechange/capacitybuilding)**

**Capacity Building for National GHG Inventory Systems in Developing Countries**  
Program Fact Sheet

**Overview**

EPA assists developing countries, Non-Annex I countries under the United Nations Framework Convention on Climate Change (UNFCCC), expand their capacity to estimate and track their greenhouse gas (GHG) emissions. A high quality GHG inventory is an essential tool for planning mitigation activities, projecting future emissions, and identifying sectors for emission reduction projects. An inventory is also a core element of National Communication reports to the UNFCCC.

EPA has developed a capacity-building framework designed to help countries build sustainable GHG inventory management systems, and also provides technical support for developing GHG emission and sink estimates for agriculture, forestry, and other sectors. This work complements activities that non-Annex I countries are taking under the UNFCCC.

Through this capacity-building program, EPA is partnering with the U.S. Agency for International Development (USAID), the UNFCCC, and other partners and donors to provide technical assistance to various regions and countries. Current activities are with country partners in Southeast Asia and Eastern and Southern Africa.

**EPA's Approach to Building Sustainable National Inventory Systems**

The foundation for EPA's approach to assisting developing countries in building their capacity to produce high-quality national GHG inventories is based on lessons learned over 15 years of working alongside developing country experts in many regions around the world, in addition to leading development of the U.S. national GHG inventory.

EPA's capacity-building activities focus on assisting countries to produce a national GHG inventory report, mainly for the agriculture, forestry, and other land use (AFOLU) sectors, although the Agency also provides inventory assistance with other sectors. The two complementary areas of technical assistance provided to developing countries include:

- Improving the institutional capacity of a country to establish a sustainable system for producing regular national GHG inventories.
- Providing technical assistance in methods, activity data collection, and documentation.

**Technical Assistance**

EPA provides tools and technical assistance in these areas, including:

- Working with inventory compilers to document their national inventory systems in the pre-defined National System Templates, which facilitates identification of key gaps and areas for targeted assistance.
- Collaborating with countries to obtain and process high-quality satellite data and aerial imagery needed to implement IPCC land-use methodologies.
- Training country experts on the ALU (Agriculture and Land-Use) software tool, enabling countries to estimate emissions and removals from all AFOLU categories.

**National Greenhouse Gas Inventories**  
A Foundation for Low Emission Development

**Preparing Land Use Land Cover Maps for use in Greenhouse Gas Inventories**

Requirement for developing a national greenhouse gas (GHG) inventory for the Land Use, Land-Use Change and (LULUC) sector, when using guidelines developed by the Intergovernmental Panel on Climate Change (IPCC), is to use an consistent representation of a country's land base, categorized into the following air land use: cropland, grassland, settlements, woodland and other lands. This document outlines some of the key steps for to consider when developing and using land use/land cover (LULC) maps for their GHG inventory.

**Considerations in Developing Land Use Land Cover Maps**

**Identify and evaluate existing spatial datasets (e.g., land use maps, aerial photographs, satellite data, and remote map products).** Relevant spatial data sets will typically take the form of either existing classified map products or raw remote sensing data. Following review of these data sets, inventory compilers must then decide whether to create maps internally from the raw data or use existing map products. There are tradeoffs with each path. Processing raw remote sensing images into LULC maps can require significant time, expertise, computing power, and funding. Obtaining and using existing map products may also require significant funding, provide location schemes that are not compatible with IPCC guidance or national policies, and require extensive accuracy assessments and modifications. Key questions to consider when evaluating existing spatial datasets are:

**Access** – Are the data readily accessible and available for use by the inventory team (e.g., if another agency or ministry houses the needed data, can they share it)? The inventory team should also make note of accessing these spatial datasets for the future. New reporting requirements (biennial update reports (BUR)) will require that new maps are needed every two years consistent and easily obtainable; data will help ensure the capacity to create these maps.

**Spatial coverage** – Is consistent data available for the entire country? Specific regions of countries are often mapped, but not the entire country. This region-specific data can serve as ancillary data inputs for map accuracy assessments, but is not sufficient for developing a complete and consistent representation of the national land base for a GHG inventory.

**Time Series** – Are consistent data available for each year that is required for reporting? More than one year will be needed to estimate land use change and obtain the national 30 land use conversion categories (e.g., cropland/woodland to cropland, forest/other converted to grassland). In addition, it is not possible to estimate changes in soil C stocks using the methods developed by the IPCC without at least two years of inventory data.

**Consistent nomenclature** – Are the maps covering the time series developed from similar data sources? Two maps from different time steps can differ due to lack of consistency or errors, differences in the land use classification methodology, or variable spatial resolution. These map differences can interfere with efforts to accurately estimate the land use conversions and carbon stock changes that are occurring on the ground. General recommendations for maximum map scale or pixel resolution is 1:100,000 scale or 30m pixel resolution. These thresholds will be critical for mapping of the small landholding sizes and resulting mosaic of multiple land uses, such as small fragmented by subsistence farmers in developing countries.

- **Receive technical assistance on GHG inventories** from the EPA :  
<http://www.epa.gov/climatechange/EPAactivities/internationalpartnerships/capacity-building.html>
- Download the **Agriculture and Land Use (ALU) National GHG Inventory software**: <http://www.nrel.colostate.edu/projects/ALUsoftware/>
  - Contains recent updates and demonstration videos!
- **Apply for financial support** from the Global Environment Facility for:
  - National Communications: [http://www.thegef.org/gef/CC\\_direct\\_access](http://www.thegef.org/gef/CC_direct_access)
  - Biennial Update Reports:  
[http://www.thegef.org/gef/guideline/biennial\\_update\\_reports\\_parties\\_UNFCCC](http://www.thegef.org/gef/guideline/biennial_update_reports_parties_UNFCCC)
- **Participate in training** from the UNFCCC Consultative Group of Experts:  
[http://unfccc.int/national\\_reports/non-annex\\_i\\_natcom/cge/items/2608.php](http://unfccc.int/national_reports/non-annex_i_natcom/cge/items/2608.php)
- Download the **UNDP NC Support Program handbook**, *Managing the National Greenhouse Gas Inventory Process*: <http://ncsp.undp.org/document/managing-national-greenhouse-gas-inventory-process>

# EPA is also coordinating with other USG Initiatives with a component on GHG inventories

- LEAD – Low Emission Asian Development



- Focus on LEDS implementation and development, including GHG Inventories

- 12 Countries: Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Papua New Guinea, Philippines, Thailand, Vietnam

- <http://www.lowemissionsasia.org>

- SilvaCarbon



- Focus on improve monitoring of forest and terrestrial carbon

- Partner Countries: Colombia, Peru, Ecuador, Gabon, Vietnam,
- Regional: Congo Basin, SE Asia

- <http://www.silvacarbon.org/>

- EC-LEDS (Enhancing Capacity for Low Emission Development Strategies)

- Focus on LEDS implementation and development, including GHG Inventories

- Over 20 countries including Albania, Bangladesh, Colombia, Costa Rica, Gabon, Indonesia, Kenya, Macedonia, Mexico, Moldova, the Philippines, Serbia, and Vietnam





**Thank you for  
your attention!**

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**U.S. EPA Inventory Preparation Tools**

**<http://www.epa.gov/climatechange/EPAactivities/internationalpartnerships/capacity-building.html>**

# Extra Slides

**We have taken key elements of the IPCC and UNFCCC guidance and condensed them**



**...into an easy-to-use  
National Template Workbook**



Institutional Arrangements



Source-by-Source Background Document



Description of QA/QC Procedures



Description of Archiving System



Key Category Analysis



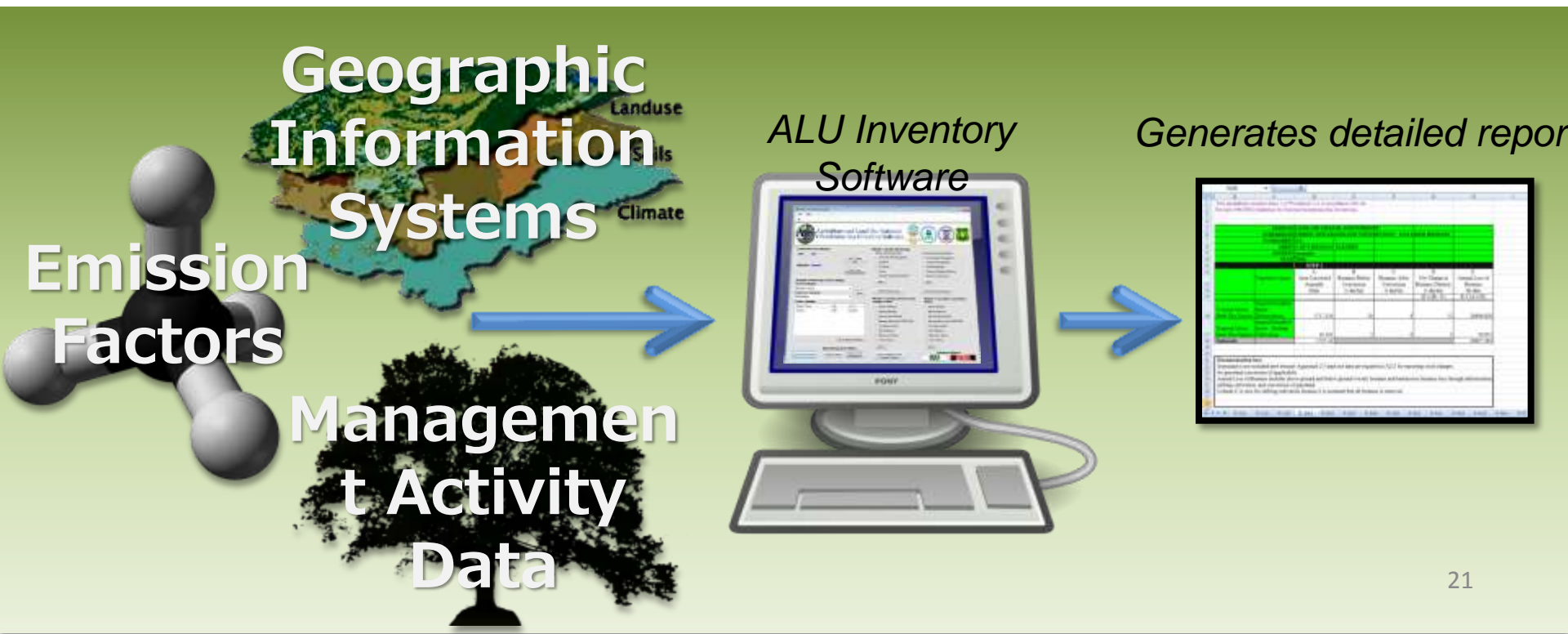
National Inventory Improvement Plan



- Based on inventory systems developed in concert with other countries
- **Each template becomes a chapter of the National Inventory**
- Each template provides documentation of critical building blocks

# Agriculture and Land Use (ALU) Software

- Estimates emissions and removals for Agriculture and LULUCF through a user-friendly interface
- Based on IPCC methods (1996 GL, GPG & 2006 GL)
- IPCC Tier 1 and 2 approaches
- Produces emission reports and archives inputs and calculations




# ALU Software – main screen

ALU Tool (Version 2.1.1.0)

File Help



**Agriculture and Land Use National Greenhouse Gas Inventory Software**



**Current User and Database**

User: **test** Add / Change User

Database: **example I** Create New / Change Database

**Available Sessions by Source Category:**

Source Category: Biomass C Stocks

Subsource Category: Deforestation Reset

**Current Sessions:**

Session Name	Year	Go To:
example	2000	Complete

Go To Next Data Entry

**Module I: Specify Activity Data**

Primary Data Specification

- Land Use and Management
- Livestock
- N Fertilizer
- Liming
- Sewage Sludge Amendments

Select

QA/QC Primary Data

Secondary Data Specification

- Crop Residue Management
- Livestock Management
- Rice Management
- Savanna/Grassland Burning
- Biomass Carbon Loss

Select

QA/QC Secondary Data

**Module II: Specify Emission/Stock Change Factors**

- Enteric Methane
- Manure Methane
- Manure Nitrous Oxide
- Biomass Burning Non-CO2 GHG
- Soil Nitrous Oxide
- Rice Methane
- Biomass C Stocks
- Soil C Stocks

Select

QA/QC Emission/Stock Change Factors

**Module III: Inventory Calculations QA/QC**

- Enteric Methane
- Manure Methane
- Manure Nitrous Oxide
- Biomass Burning Non-CO2 GHG
- Soil Nitrous Oxide
- Rice Methane
- Biomass C Stocks
- Soil C Stocks

Select

**Data Management Utilities**

Quit Application Session Status Session & File Management

**Emissions Reports**

