LEAF Technical Training on Forest Carbon Stratification and Historical Emissions Estimations for Lam Dong, Vietnam

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IPCC approaches for Activity Data
Overview

• IPCC framework
  • Overview
  • Approaches
  • Tiers
• IPCC approaches for Activity Data
  • Non-spatial country/ province statistic
  • Maps, survey
  • Interpretation of RS data
• Module AD-D
Land use and land-use change
IPCC framework

• IPCC is the leading international body for the assessment of climate change, established by the UNEP and WMO in 1988.
• IPCC provides rigorous and balanced scientific information to decision makers.
• IPCC WG III assesses options for mitigating climate change with main focus on energy, transport, buildings, industry, agriculture, FORESTRY and waste management.
IPCC: FORESTRY sector

• IPCC provides a framework of the fundamental steps for estimating carbon emissions and removals from changes in forest lands that can be used to guide the development of RL and MRV
  
  o 2003 IPCC Good Practice Guidance for Land Use, Land –Use Change and Forestry
  
  o 2006 IPCC Guidelines for national Greenhouse Gas Inventory, Vol. 4 Agriculture, Forestry and Other land Use
IPCC framework for defining REDD+ activities

- **Deforestation** = forests converted to non-forest lands (cropland, grassland, settlements, other)
- **Forest degradation** = loss in carbon stocks of forest remaining forest
- **Sustainable forest management** = change in carbon stock of forest remaining forest
- **Forest carbon stock enhancement** =
  - gain in carbon stocks of forest remaining forest
  - other lands converted to forest land
UNFCCC & IPCC guidance principles with respect to RL

• **Transparency** - assumption and methods used to develop RLs are clearly and fully described
• **Completeness** - with respect to relevant pools and activities
• **Consistency** - with accepted standards for carbon accounting
• **Comparability** - allow for comparison among countries/provinces
• **Accuracy** - bias must be avoided and uncertainty must be reduced
• **Conservativeness** - should be applied to address large uncertainties in emission and removal estimates
IPCC GPG refers to:

• **Approaches** for representation of land area (*2003 IPCC GPG*, Ch. 2)
  - Activity data (measure of extent of activity)

• **Tiers** for estimating GHG emissions and removals (*2003 IPCC GPG*, Ch. 3.1)
  - Emission factors (GHG emissions/removals per unit activity)

Both are hierarchical, from basic/default to country-specific

• Levels can be mixed

• Approaches and Tiers are not interrelated
### Three IPCC Approaches

#### Approaches for Activity Data: Area change

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic land use data – statistical data (e.g. FAO) allowing for net change estimation in forest area</td>
</tr>
<tr>
<td>2</td>
<td>Survey of land use and land-use change - based on maps, surveys, and other national statistical datasets</td>
</tr>
<tr>
<td>3</td>
<td>Geographically explicit land use data - interpretation of remote sensing data, sampling or wall-to-wall mapping - only approach to use for Deforestation</td>
</tr>
</tbody>
</table>
IPCC Approach 1: Basic land use data

- Basic approach
- Uses datasets prepared for other purposes
- Can lead to double counting

Example of Approach 1

<table>
<thead>
<tr>
<th>Time 1</th>
<th>Time 2</th>
<th>Land use change (Time2 – Time1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F = 18</td>
<td>F = 19</td>
<td>Forest land = +1</td>
</tr>
<tr>
<td>G = 84</td>
<td>G = 82</td>
<td>Grassland = -2</td>
</tr>
<tr>
<td>C = 31</td>
<td>C = 29</td>
<td>Cropland = -2</td>
</tr>
<tr>
<td>W = 0</td>
<td>W = 0</td>
<td>Wetland = 0</td>
</tr>
<tr>
<td>S = 5</td>
<td>S = 8</td>
<td>Settlements = +3</td>
</tr>
<tr>
<td>O = 2</td>
<td>O = 2</td>
<td>Other = 0</td>
</tr>
<tr>
<td>Sum = 140</td>
<td>Sum = 140</td>
<td>Sum = 0</td>
</tr>
</tbody>
</table>

Table adapted from 2003 IPCC GPG, Table 2.3.1 (unit = Mha)
IPCC Approach 2: Survey of land use and land–use change

• Approach 2
  o includes information on changes between categories
  o requires information on initial and final land-use category, as well as the unchanged area per category
• The input data may or may not be spatially explicit
• Land use classes can be divided (e.g. forest consist of unmanaged and managed forest, etc.)
• Output is land-use change matrix
IPCC Approach 2: Survey of land use and land-use change

Example of land-use change matrix using Approach 2

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>G</th>
<th>C</th>
<th>W</th>
<th>S</th>
<th>O</th>
<th>Final Sum (Time 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>G</td>
<td>2</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Initial Sum (Time 1)</strong></td>
<td>18</td>
<td>84</td>
<td>31</td>
<td>5</td>
<td>2</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td><strong>NET Change (Time 2-Time 1)</strong></td>
<td>+1</td>
<td>-2</td>
<td>-2</td>
<td>0</td>
<td>+3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: F= Forest land, G=Grassland, C=Cropland, W= Wetland, S=Settlements, O= Other ; Units = Mha

Table adapted from 2003 IPCC GPG, Table 2.3.5

IPCC Approach 3: Geographically explicit land use data

• Approach 3 is simple conceptually, but data intensive to implement
• It requires sampling of the target area either as grid cells (raster data) or as polygons (vector data)
• The use of remotely sensed images and RS techniques enables for full coverage
• Uncertainty is linked to the interpretation of the RS data
• The output is land use change matrix, with associated uncertainty
Winrock developed REDD+ Guidance Series

Modular framework of key elements for estimating historical emissions for RL and MRV development

Reference Level

Future Projection of Emissions

Sum Emissions

Emissions from Deforestation

Deforestation Activity Data

Deforestation Emission Factors

Emissions from Forest Degradation

Forest Degradation Activity Data

Forest Degradation Emission Factors

Emission Reduction from Forest Enhancement

Forest Enhancement Activity Data

Forest Enhancement Emission Factors

Stratification

Driver Analysis

KEY

Final Outcome

Intermediate outcome

Technical input

Policy decision
What are Activity Data (AD)?

What definition for AD is the most accurate?

A) AD = land cover maps

B) AD = area of land forest cover change

C) AD = measure of the extent of activity
Units of AD

Deforestation
  • Area of gross deforestation per year: ha

Forest degradation
  • From logging activities: ha yr\(^{-1}\)
  • From fuel wood collection: m\(^3\) yr\(^{-1}\)

Forest enhancement
  • Tree planting: ha yr\(^{-1}\)
Activity Data for Deforestation Module (AD-D)

What does Module AD-D provide?
• Provides guidance for estimating the Activity Data (AD) for deforestation using previously developed spatially explicit datasets.
• Estimates gross deforestation, reported on annual basis (ha yr\(^{-1}\))

What skills are essential to use Module AD-D?
• Understanding of spatial data
• Experience with spatial analysis

What are the required inputs?
• A land cover maps
• Forest carbon stratification map
• The post deforestation land use classes
Module AD-D: Methods and Procedures

- Steps for estimating AD for deforestation using land cover maps derived from RS data

**STEP 1:** Create forest cover map for Time 1 of the time period

**STEP 2:** Identify forest change

**STEP 3:** Identify post-deforestation land use and forest carbon strata for the forest change

**STEP 4:** Report AD for deforestation
STEP 1: Create forest cover map for Time 1 of the time period
STEP 2: Identify forest change
STEP 3: Identify post-deforestation land use and forest carbon strata for the forest change
### Activity Data for Deforestation Module (AD-D) Methods and Procedures

#### STEP 4: Report AD for deforestation

<table>
<thead>
<tr>
<th>Post deforestation land use class (Driver of deforestation)</th>
<th>Carbon stratum</th>
<th>AD per time period</th>
<th>2000-2005</th>
<th>2005-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture (Driver of deforestation - Agriculture)</td>
<td>A</td>
<td></td>
<td>265</td>
<td>163</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td></td>
<td>246</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td></td>
<td>237</td>
<td>307</td>
</tr>
<tr>
<td>Bare land (Driver of deforestation - Mining)</td>
<td>A</td>
<td></td>
<td>487</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
<td>218</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td></td>
<td>1018</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td></td>
<td>143</td>
<td>43</td>
</tr>
</tbody>
</table>
Summary

• AD should be developed to comply with the IPCC guidance using one of the three approaches
  • For Lam Dong – we are using approach 3
• IPCC principles (transparency, completeness, consistency, comparability, accuracy, conservativeness) should apply
• Guidance for development of AD exist – IPCC GPG (2006), Winrock Technical Guidance Series: Module AD-D
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