IPCC Guidelines to estimate and report emissions from deforestation

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Outline

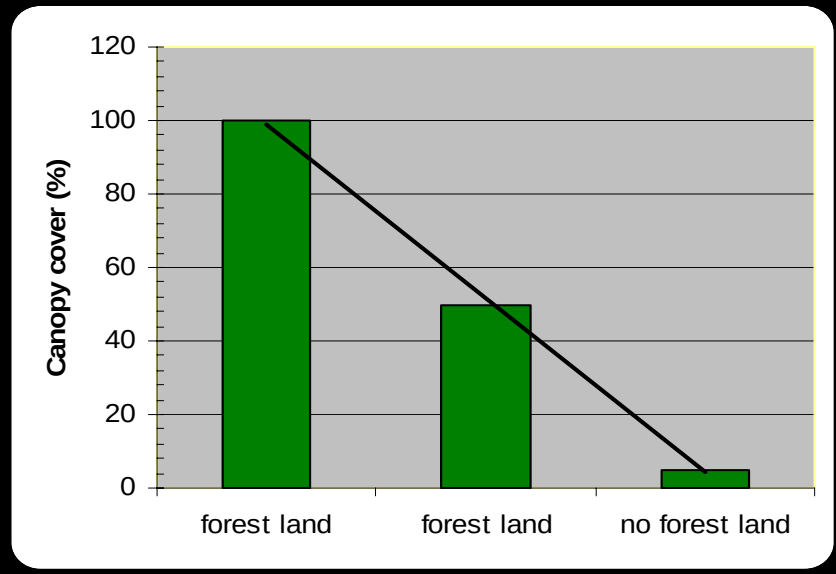
- The concept of D.
- Emissions to measure.
- What the IPCC provides to estimate and report?
- Some conclussions.

IPCC main sources for inventories

- 1. Revised Inventory Guidelines (1997)
- 2. GPG 2000 (uncertaities).
- 3. GPG LULUCF (2003)
- 4. 2006 Guidelines for National GHG Inventories: AFOLU

IPCC and UNFCCC definition of deforestation

- D is the direct human-induced conversion of forest land to non forest land.
- Not every lost of forest cover is D. Only below the parameters of the national definition of forest.



Forest definition in the KP:
Minimum area 0,05 – 1 Ha
Minimum Canopy cover: 10-30%
Minimun tree height: 2 – 5 m

IPCC 2006 GL AFOLU identifies 5 land use conversions that imply Deforestation

- **FL to Cropland**
- **FL to Grassland**
- **FL to Settlement**
- **FL to Wetland**
- **FL to Other lands**
- **(FL remaining FL: No)**

- IPCC provides metodologies and factors for each of these conversions.

What the IPCC GL requiere, in escence for D is:

- 1) National Forest definition (according to the parameters defined by the KP)
- 2) Choice of ACTIVITY DATA (areas)
- 3) Choice of Emission and Removals factors.

- AD x ERF x GWP = CO2 eq

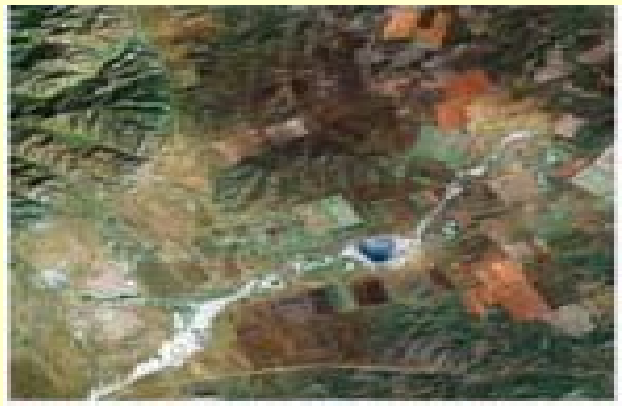
- IPCC GL provide methods to do this consistently.

IPCC 2006 (AFOLU) provides methodologies for two principal conversions of Forest land

From/To	Grassland	Cropland
Forest land	Chapter 2: Generic Methodologies applicable to multiple Land-use categories. Chapter 3: Consistent representation of lands. Chapter 4: Forest Land prior to conversion. Chapter 6: Grassland; 6.3 Land Converted to Grassland.	Chapter 2: Generic Methodologies applicable to multiple Land-use categories. Chapter 3: Consistent representation of lands. Chapter 4: Forest Land prior to conversion. Chapter 5: Cropland; 5.3 Land converted to Cropland

ACTIVITY DATA

Measuring and monitoring deforested areas to obtain AD is the first task: refer to 2006 IPCC GL AFOLU Chapter 3.



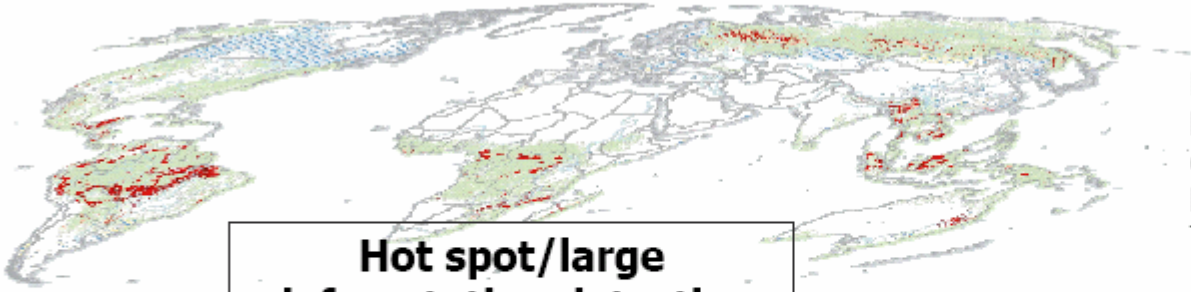
- Traditional forest inventories are of limited utility, because they are often focused on forests of commercial value, or are out of date. In addition cost is very high.

- Forest inventories need to be complemented with RS data.

Utility of optical sensors (Source:GTOS)

Sensor resolution	**Examples of sensors**	**Utiliy**	**Cost**
Very high (< 5m)	IKONOS Quickbird	Validation over small areas of results from coarser resolution	Very high
High (10-60m)	Landsat, SPOT, etc.	Primary tool for D	Low/medium (historical) medium/high (recent)
Medium (250-1000m)	Modis, SPOT vegetation	Identify large clearings, and locate “hospots”	Low or free

Global observations

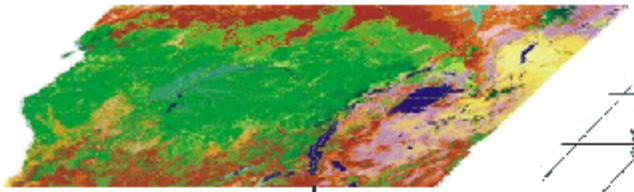


MODIS/MERIS-type sensors
Deforestation (<10-20 ha)
(intra-) annual
Hot spots of forest change
Top-down standards

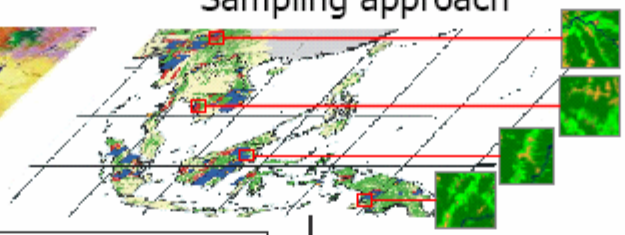
Hot spot/large deforestation detection

Regional/national observations

Wall-to-wall mapping



Sampling approach



Landsat/Spot-type sensors
Deforestation (<0.5-1 ha)
(inter-)annual
Regionally-tuned forest degradation mapping
Bottom-up flexibility

Change in forest area and density

Fine-scale/in-situ observations

Estimation of carbon emissions

Nat./Reg. forest inventories
In-situ/plot data
Targeted remote surveys
FAO statistics
Models relating forest change to carbon emissions
IPCC-LULUCF / AFOLU

Some recent conclussions by GOFC

Reducing emissions from deforestation

- Several party submission to SBSTA emphasize importance of remote sensing:
  - *i.e. EU, CfRN, Bolivia, Indonesia, Norway, Thailand, Vanuatu*
- EU submission to SBSTA (23.Feb. 07):
  - *very likely that both remote sensing + ground-based data will be needed*
  - *by 2012 activities to improve monitoring and reporting capacity required*
- UNFCCC Cairns REDD workshop report:
  - *"remote sensing is viewed as an important and verifiable method for monitoring forest area and forest cover and their changes"*
  - *"couple with ground-truthing and reliable carbon stock inventories"*
- GOFC-GOLD working group (2 GTOS submissions to SBSTA):
  - *Satellite monitoring is the only objective approach in developing countries*
  - *Forest changes can be monitored with confidence for assessing and comparing historical and future rates of deforestation*
  - *Consensus technical guidance on current and future EO capabilities for monitoring deforestation*

GOFC-GOLD

Second Task: Estimation of C stock changes and emissions

CHOICE OF FACTORS

- Multiple factors are requiered:
  - E.g. Growth, BEF, Density of the wood, EF
- To develop national data requires field work.
- If no data are available at national or local level, IPCC default values may be used, choossing a Tier 1 approach. But uncetaities may be high.
- RS is not yet available to determine biomass stocks.

Estimation of C stock changes in IPCC GL

- Conversion of forest land to grassland or cropland means often an abrupt change in biomass.

- IPCC GL proposes a 2 phase approach:
  - 1) Δ C at the year of conversion
  - 2) Gains and losses of C during a transition period (other 19 years) (0 in Tier 1).

To estimate C stock change at conversion IPCC provides Equations, e.g.:

EQUATION 2.16
INITIAL CHANGE IN BIOMASS CARBON STOCKS ON LAND CONVERTED TO ANOTHER LAND CATEGORY

$$\Delta C_{CONVERSION} = \sum_i \{(B_{AFTER_i} - B_{BEFORE_i}) \bullet \Delta A_{TO\_OTHERS_i}\} \bullet CF$$

Where:

$\Delta C_{CONVERSION}$ = initial change in biomass carbon stocks on land converted to another land category, tonnes C yr^{-1}

B_{AFTER_i} = biomass stocks on land type *i* immediately after the conversion, tonnes d.m. ha^{-1}

B_{BEFORE_i} = biomass stocks on land type *i* before the conversion, tonnes d.m. ha^{-1}

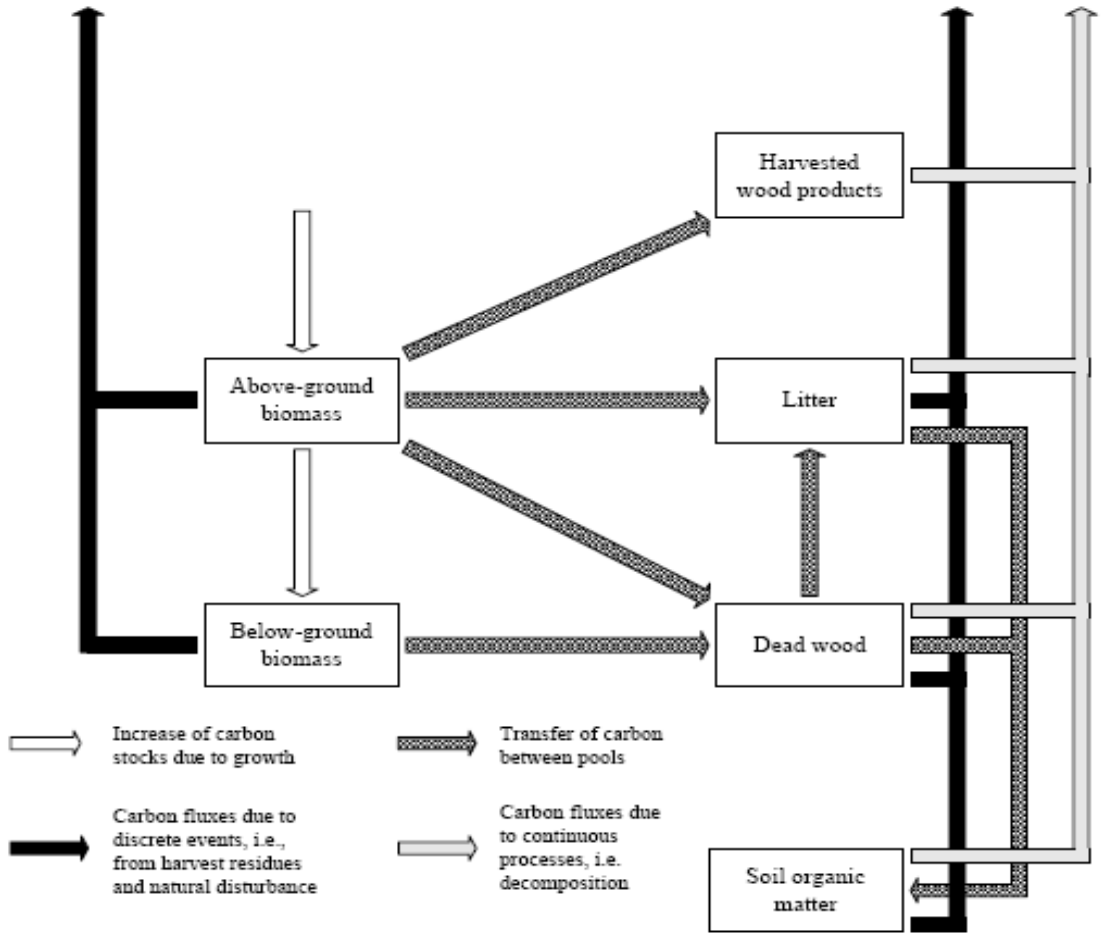
$\Delta A_{TO\_OTHERS_i}$ = area of land use *i* converted to another land-use category in a certain year, ha yr^{-1}

CF = carbon fraction of dry matter, tonne C (tonnes d.m.)$^{-1}$

i = type of land use converted to another land-use category

Conversion often results in the transfer of a portion of the carbon from one pool to another (matrix).

Figure 2.1 **Generalized carbon cycle of terrestrial AFOLU ecosystems showing the flows of carbon into and out of the system as well as between the five C pools within the system.**



Calculation steps

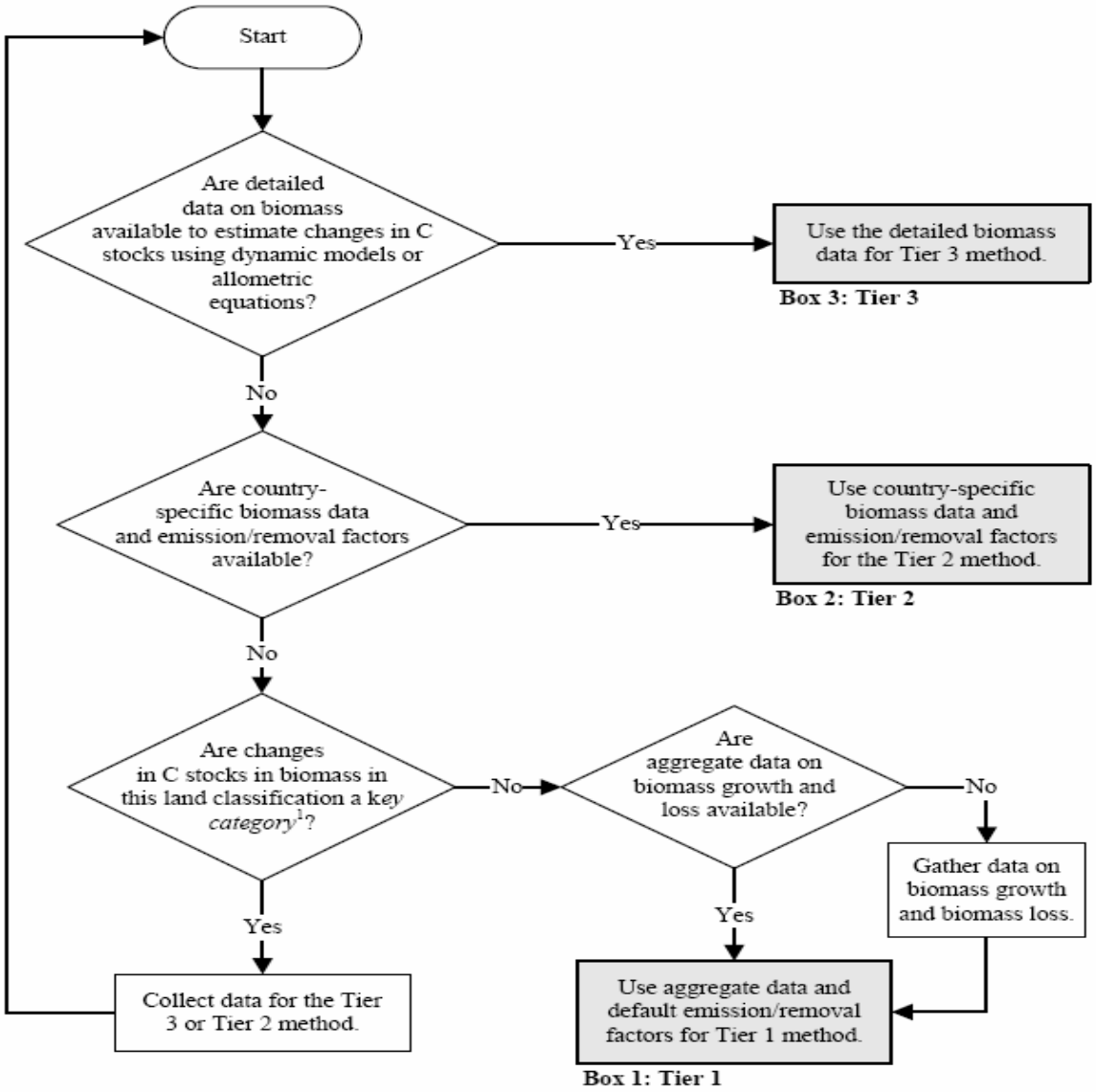
- 1) Determine category of land conversion to be used: e.g. FL to GL
- 2) Determine type of conversion and management (e.g. Logged tropical forest to cattle pastures).
- 3) Determine C stocks per Ha in the 5 C pools:
  - AB, BB, DW, L and SOC

Calculation steps

- 4) Determine C fractions.
- 5) Calculate: C before conversion – C after conversion.
- 6) If biomass is burned when clearing, calculate emissions of non- CO2 GHG produced (N2O and CH4).

Tier selection is requiered

Figure 2.2 **Generic decision tree for identification of appropriate tier to estimate changes in carbon stocks in biomass in a land-use category.**



Tiers and Key Sources

- Tier 1 is a very simple approach accepted to estimate emissions from conversion of FL.

- BUT if FL is a key source it is good practice to minimise uncertainties using Tier 2 or 3.

Inventories and data on D in non Annex I countries

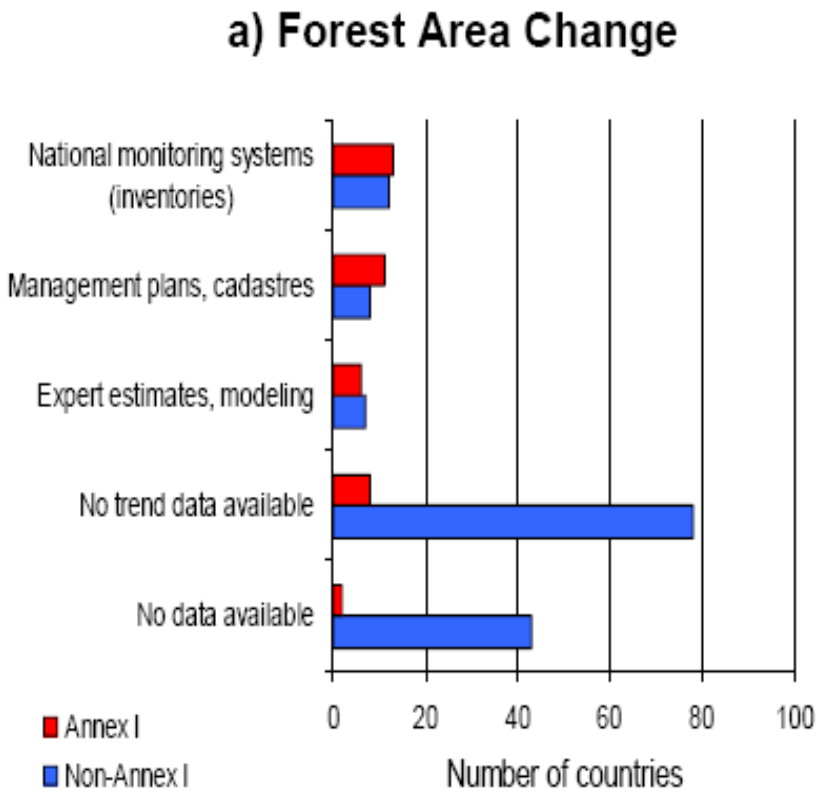
Important differences between reporting requieremtes

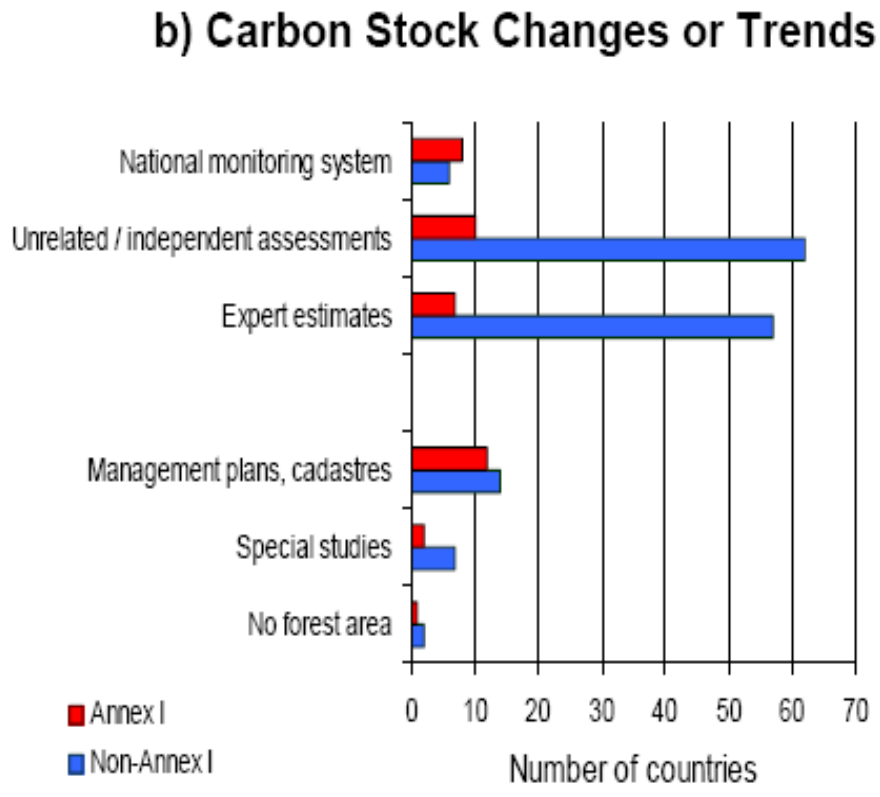
Annex I	Non Annex I
- Targets. - Rquierement to use IPCC GL - Emissions from LULUCF not included in the AA. - Lands to repot ARD are identified in 1990 to 2005 to report till 2012. - Report every year (15 years accumulated) based o IPCC Guidelines, using CRF, reviewed annually by UNFCCC ERT	- No targets - No requeirement to report in a standarized manner, including CRF. - No need to report annually. - No Review by UNFCCC ERT. - Few National Comuncatiosn and inventorie submitted by Countries (1, or 2)

Few inventories in Non Annex I countries. But many preparing 2nd National Communication.

Country	Deforested area, average 200-2005, kHa	Inventory submission
1. Brasil	3,10	1990. 1994
2. Indonesia	1,87	1990, 1994
3. Sudan	0,59	1995
4. Myanmar	0,47	NA
5. Zambia	0,45	1994
6. Tanzania	0,41	1990, 1994
7. Nigeria	0,41	1994
8. DR Congo	0,32	1994
9. Zimbabwe	0,31	1994
10. Venezuela	0,29	1999
Top 10	8,22	

Weak data availability on forest area change and C stock changes in most non-Annex I countries





Source (Braatz 2007; Wilkie 2006)

Some conclussions

- Giving value to environmental services (REDD) requieres adequate and consistent methods to measure.
- There has been much progress in the last decade producing methodologies, reflected in IPCC GL:
  - there are confident tools to determine and represent areas deforested at national and subnational level, with different degree of resolution, from the early 90´s. Trends can be determined.
  - There are robust methodologies to estimate emissions and removals from different C pools and non-CO2 gases, butg depending on the availability of data teh uncertainties can be high.
- Projecting emissions from past D is more challenging.

- Obligation to report yearly have favoured improvement processes in Annex I Parties. In these countries FL are mainly reported in the category FL remaining FL.
- Most D is located in non-Annex I countries.
- Non-Annex I countries do not have obligation to present inventories yearly, subject to UNFCCC reviews.
- So there is little experience and learning by doing and lack of national data in most of these countries reporting D.
- Brasil and India are two countries that have implemented systems to report D and developed data and capacities. (Perú, Bolivia, Indonesia have uses RS to estimate D area.This experience could be transfered to other countries.

- Some lessons we draw from Brasil inventory:
  - EF provided by IPCC may not reflect national realities.
  - RS produced the AD needed: area deforested.
  - Availability of national data is crucial to minimize uncertaities. But producing this information was costly, and requiered finantial, human and institutional capacities.
  - Due to the characteristics of the brazilian forests, it was necesary to identify different biomes and develop databases and GIS by biome.
  - Some pools (BB and SOC) were complex to include.

- Where D is a Key Source the simple methods of Tier 1 are not consistent with IPCC GL, and this can be the case of many coutries where D is important.
- The consequence is that these countries may need technology trasfer, capacity building and finantial suppport to to report D (and enter in REDD mechanisms).

In summary: the simple rationale behind actual and BL estimations of emissions from D is:

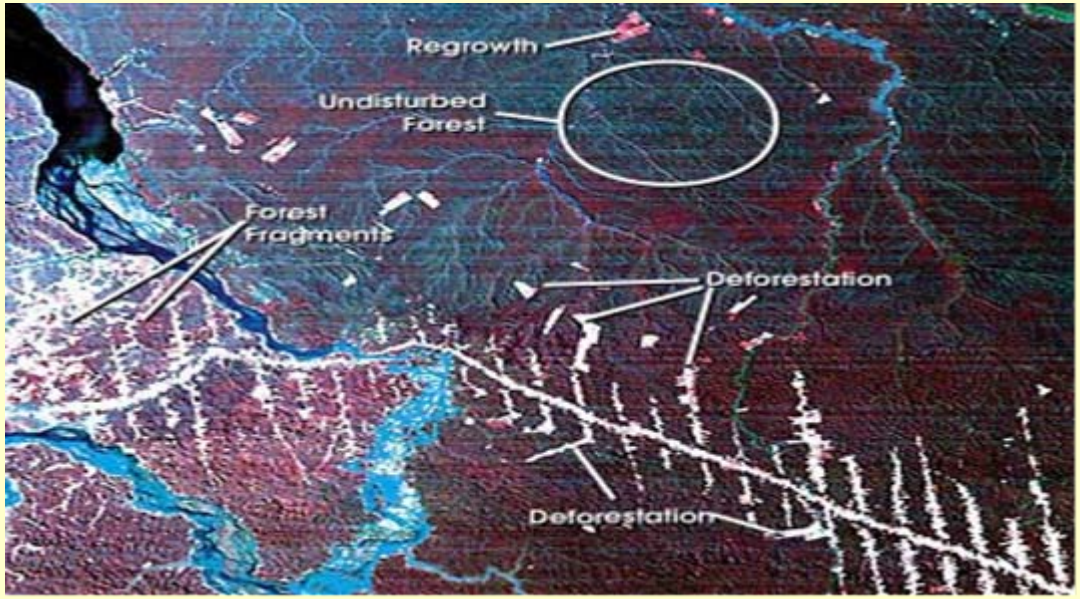
Area converted to non forest land(AD) x Emissions&Removals/area unit.

But high quality data are needed to obtain confident results (that could lead to tradable credits).

Reccomendations by GTOS (Rome 2006) look very pertinent

- Develop pilot projects to gain experience establishing national and sub-national D monitoring systems.
- Compile existing satellite imagery.
- Assess national capacities and support capacity building.
- Continue to build forest inventory databases to link forest area/C density

To measure and report emissions of what we see in the image the problem is not lack of methods.



Merci !!!!