



IPCC National Greenhouse Gas Inventories – a Focus on Forests

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REDD+ and the Present State of Negotiations

- Ongoing UNFCCC negotiations
 - Alternatives for REDD+
 - as part of **Nationally Appropriate Mitigation Actions (NAMAs)**
 - MRV, financing, capacity building, technology transfer have to be consistent with those for other NAMAs
 - as an **independent mitigation action** from the forest sector, with its own specific rules and modalities, encompassing the following activities:
 - Reducing emissions from deforestation
 - Reducing emissions from forest degradation
 - Conservation of carbon stocks
 - Sustainable management of forests
 - Enhancement of carbon stocks

REDD+ in the context of the AWG-LCA

- *REDD+ in the facilitating text by the chair of AWG-LCA*
December 2009
- *Decides that the activities undertaken by Parties referred to in paragraph 3 above be implemented in phases, beginning with the development of national strategies or action plans, policies and measures and capacity-building, followed by the implementation of national policies and measures, and national strategies or action plans and, as appropriate, subnational strategies, that could involve further capacity building, technology development and transfer and results-based demonstration activities, and evolving into results-based actions [that shall be fully measured, reported and verified].*
- *Para 3 = reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of carbon stocks*

REDD+ in the context of the AWG-LCA

- *REDD+ in the facilitating text by the chair of AWG-LCA*
December 2009

Requests the SBSTA, at its [xx] session, to develop, as necessary, modalities for [measuring, reporting and verifying] **anthropogenic** forest-related emissions by sources and removals by sinks, forest carbon stocks, forest carbon stocks and forest area changes resulting from the implementation of activities referred to in paragraph 3 above [, and consistent with any guidance for measuring, reporting and verification of nationally appropriate mitigation actions by developing country Parties agreed by the Conference of the Parties], taking into account methodological guidance in accordance with decision 4/CP.15 ...

REDD+ in the context of the COP (SBSTA) and IPCC Guidelines and Guidance

- REDD+
 - Decision 2/CP.13, para 6
 - Encourages the use of the **most recent reporting guidelines as a basis for reporting GHG emissions** from deforestation, noting also that Parties not included in Annex I to the Convention are encouraged to apply the GPG/LULUCF.
 - Decision 4/CP.15, para 1
 - Requests developing country Parties... to take the following guidance into account for activities relating to decision 2/CP.13, and without prejudging any further relevant decisions of the Conference of the Parties, in particular those relating to measurement and reporting:
 - **To use the most recent Intergovernmental Panel on Climate Change guidance and guidelines, as adopted or encouraged by the Conference of the Parties**, as appropriate, as a basis for estimating **anthropogenic** forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes.

... and ***the most recent IPCC guidance and guidelines*** for the purpose of reporting to the UNFCCC

IPCC Guidelines & UNFCCC



- 1996 Guidelines and Good Practice Guidance (GPG)
- 2006 Guidelines
 - GPG 2000 and GPG LULUCF adopted by UNFCCC for producing inventories of greenhouse gases for reporting to the UNFCCC
 - Not yet approved by UNFCCC for use as a whole
 - Accepted by IPCC – they are the authors’ best methodologies available.
 - Annex 1 parties “shall” use the 1996 revised guidelines and GPG
 - However individual methods can be used
 - Non-Annex 1 parties “should” use these guidelines within the 1996/UNFCCC reporting guidelines but GPG is “encouraged”
 - Non-annex 1 countries can use them as they are suitable for all countries regardless of resources and experience

IPCC Guidelines for National GHG Inventories

- IPCC 1996 Revised Guidelines – Land-use change and Forestry (LUCF)
 - Identifies the major sources related to land use
- Good Practice Guidance and Uncertainties Management (2000)
 - Defines good practice and applies it to the Agriculture sector
- Good Practice Guidance for Land Use, Land-use Change and Forestry (GPG LULUCF) (2003)
 - Expanded, covering all carbon reservoirs
- 2006 IPCC Guidelines for National GHG Inventories (2006)
 - Essentially the same as GHG/LULUCF, but integrating Agriculture and LULUCF
 - Provides more default values



IPCC Guidelines & Forests



- Revised 1996 Guidelines – activity based
 - changes in forest and other woody biomass stocks
 - forest and grassland conversion
 - abandonment of ... plantation forests, or other managed lands
 - changes in soil carbon
 - HWP – default HWP pool constant
- GPG LULUCF – land based
 - Lands remaining Forest Lands & Lands converted to Forest Lands
 - 5 Pools for complete coverage
 - Living biomass (above and below ground)
 - Dead Organic Matter (dead wood & litter)
 - Soil Organic Carbon
- 2006 Guidelines
 - As GPG LULUCF with improved emission factors & parameters
 - Includes more detailed methods for HWP without decision on accounting

Estimating Carbon Stock Changes

1996 Guidelines, through the GPG LULUCF to the 2006 Guidelines & AFOLU

General Method

- There are large uncertainties to estimate CO₂ fluxes.
- Direct measurements are extremely difficult and have an inherent variability.
- ✓ A practical, first order approach is to make hypothesis on the effects of land-use change in the carbon stocks and the biological response subsequent to a given land use.

C Flux = change in carbon stock in the biomass and soil

Remains general approach from 1996 Guidelines, through the GPG LULUCF to the 2006 Guidelines & AFOLU

LUCF

Land Use Change and Forestry
1996 Revised IPCC Guidelines

Changes in woody biomass stocks

Forest & Grassland Conversion

Abandonment of managed lands

Changes in Soil Carbon

Harvested Wood Products

Agriculture

Land Use Change and Forestry
1996 Revised IPCC Guidelines

Agricultural Soils

Prescribed Burning of Savannas

Burning of Agricultural Residues

Enteric Fermentation

Manure management

Rice Cultivation

Other

LUCF

Land Use Change and Forestry
1996 Revised IPCC Guidelines

Changes in woody biomass stocks

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Changes in Soil Carbon

Harvested Wood Products

LULUCF

Land Use, Land-use Change and
Forestry
GPG for LULUCF 2003

Forest Land

Grassland

Cropland

Settlements

Wetlands

Other Land

Harvested Wood Products

Agriculture

Land Use Change and Forestry
1996 Revised IPCC Guidelines

Agricultural Soils

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Other

Agriculture

GPG and Uncertainty
Management
GPG 2000

Agricultural Soils

Prescribed Burning of Savannas

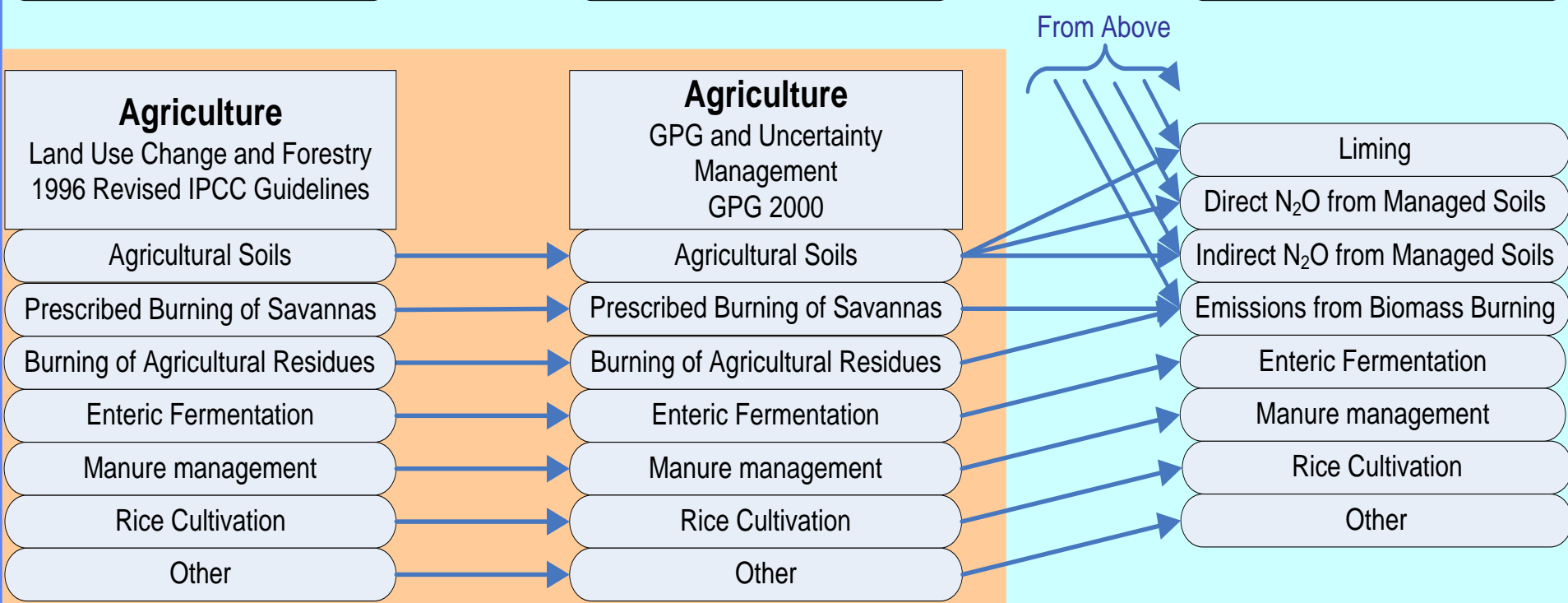
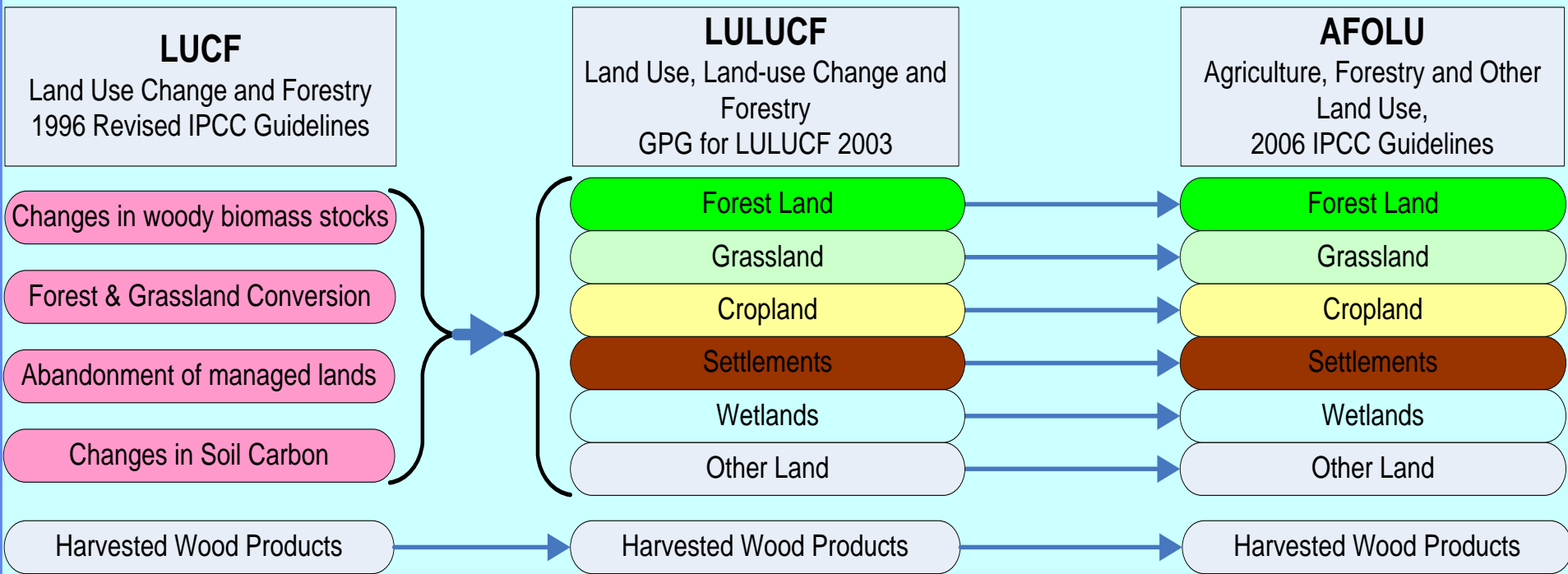
Burning of Agricultural Residues

Enteric Fermentation

Manure management

Rice Cultivation

Other



GPG LULUCF

- Land use categories:

- ❖ Forest land

- ❖ Grassland

- ❖ Settlements

- ❖ Agriculture

- ❖ Wetlands

- ❖ Other land

**Forest
Degradation**

- Provides methodologies to estimate emissions/removals for land remaining in the same land category and land converted to other land use

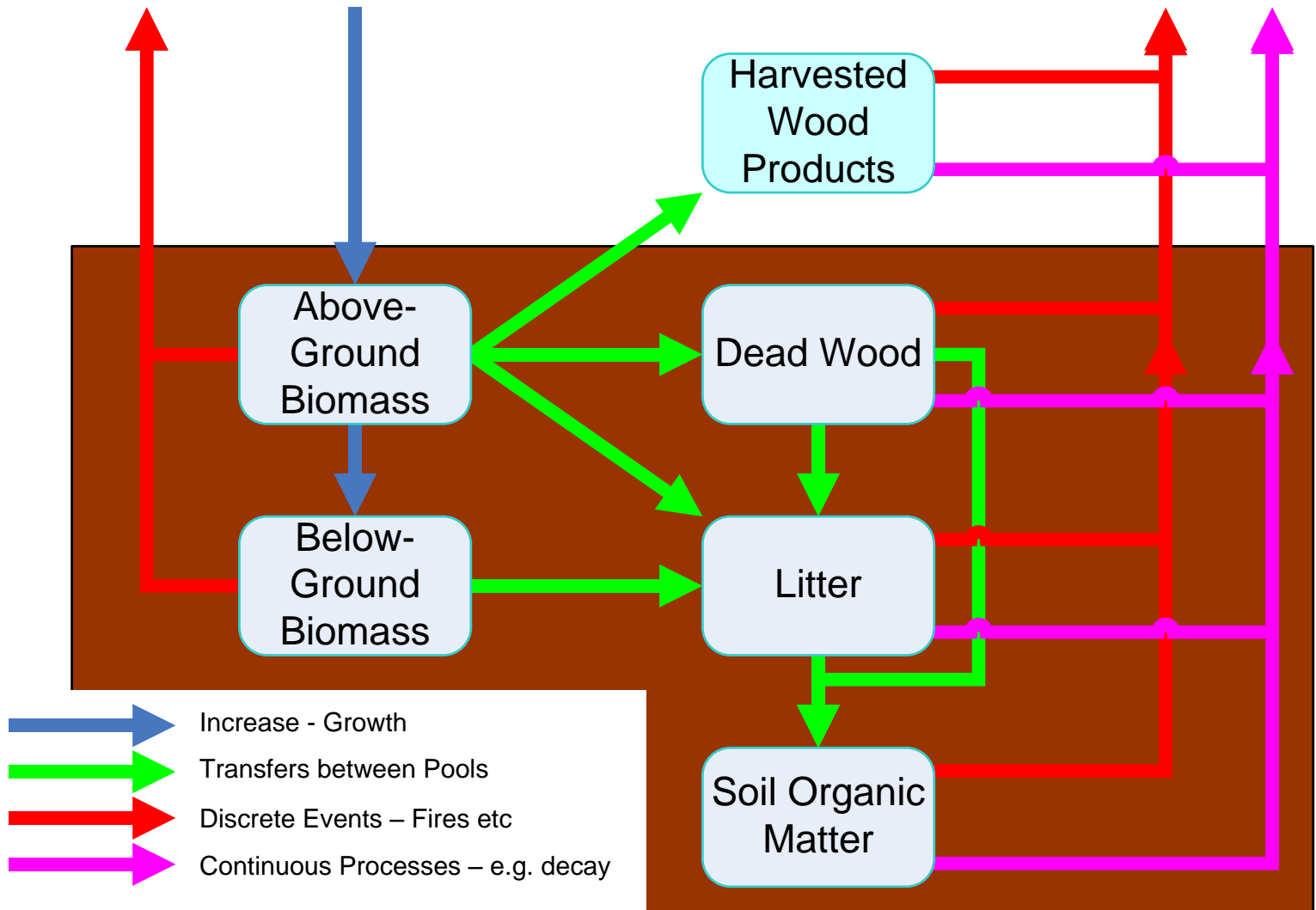
Deforestation

- Provides estimates for all emissions/removals in managed land

- Used as a proxy for **anthropogenic** emissions/removals

- Includes emissions from fires outside managed land if it is followed by a land-use change.

Reservatórios de Carbono e Fluxos



Emissions from Forests

$$Emission = \Delta C_{biomass} + \Delta C_{Dead\ Organic\ Matter} + \Delta C_{soils}$$

- Treats living biomass, dead organic matter and soils separately.
- The default method assumes that there is no net change in Harvested Wood Products - HWP
 - This implies instantaneous oxidation and emissions

Land Representation

- **Approach 1** identifies the total area for each land-use category individually,
 - But does not provide detailed information about the area change between categories
 - It is not spatially explicit.
- **Approach 2** introduces a follow up of changes between land-use categories.
- **Approach 3** expands Approach 2, identifying changes in land use in an spatially explicit way.

Approach 1

Land-Use	Land Area Mha		
	Initial	Final	Net Change
Forest land total	18	19	1
<i>Forest land (Unmanaged)</i>	<i>5</i>	<i>5</i>	<i>0</i>
<i>Forest land zone A</i>	<i>7</i>	<i>4</i>	<i>-3</i>
<i>Forest land zone B</i>	<i>6</i>	<i>6</i>	<i>0</i>
<i>Afforestation</i>	<i>0</i>	<i>4</i>	<i>4</i>
Grassland total	84	82	-2
<i>Unimproved grassland</i>	<i>65</i>	<i>63</i>	<i>-2</i>
<i>Improved grassland</i>	<i>19</i>	<i>19</i>	<i>0</i>
Cropland total	31	29	-2
Wetlands total	0	0	0
Settlements total	5	8	3
<i>Existing Settlements</i>	<i>5</i>	<i>5</i>	<i>0</i>
<i>New Settlements</i>	<i>0</i>	<i>3</i>	<i>3</i>
Other land total	2	2	0
Balancing term	0	0	0
TOTAL	140	140	0

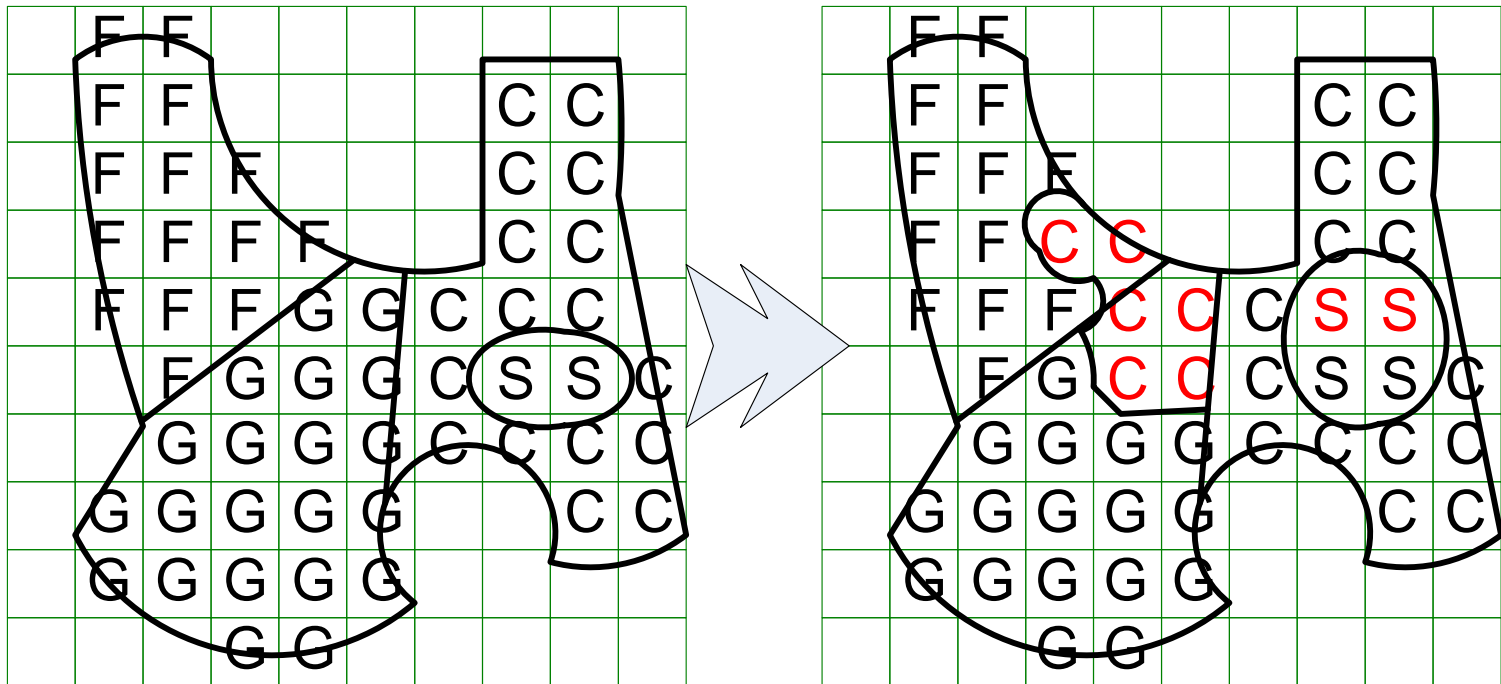
Approach 2

Generates a land-use transition matrix between time t_1 (initial) and t_2 (final). For REDD+ activities, only the first column (forest land converted to other land uses) and/or row (land converted to forest land) may be necessary, depending on the REDD+ activity being considered.

Final \ Initial	Forest land (Unmanaged)	Forest land (Managed)	Grassland (Rough grazing)	Grassland (Improved)	Cropland	Wetlands	Settlements	Other land	Final area
	Forest land (Unmanaged)	5							
Forest land (Managed)		10	1	2	1				14
Grassland (Rough grazing)		2	56						58
Grassland (Improved)			2	22					24
Cropland					29				29
Wetlands						0			0
Settlements		1	1		1		5		8
Other land								2	2
Initial area	5	13	60	24	31	0	5	2	140
NET change	0	+1	-2	0	-2	0	+3	0	0

Approach 3

Generates a transition matrix similar to that from Approach 2 but the land-use changes are identified in a spatially explicit way (georeferenced).



UNFCCC and IPCC

- Recognizes that further work may need to be undertaken by the [Intergovernmental Panel on Climate Change](#), in accordance with any relevant decisions by the Conference of the Parties.

Recent IPCC Expert Meetings



- **Managed Land** Sao Paulo (2009)
 - Currently no general alternative to the use of “managed land” as a proxy for identifying anthropogenic emissions - Possible alternatives need further scientific development and subsequent assessment
- **Use of FAO Data** Rome (2010)
 - Produced guide to Use of FAO data in LULUCF/AFOLU
- **Uncertainties & Validation** Utrecht (2010)
 - Developed Q&A on uncertainty analysis for web site
- **“Extra Detail”** Sydney (August 2010)
 - Will look at use of “Tier 3” models and source measurements, how these can be integrated into inventories, and their validation, verification, reporting and documentation

Recent Meetings - National Forest GHG Inventories: A Stock Taking - Yokohama (2010)

- Identified areas where additional guidance may be useful:
 - Design of forest monitoring systems
 - inventory design, stratification (particularly in dynamic landscapes) , sampling, pools and accuracy/uncertainty assessment;
 - Combination of ground based inventories with remote sensing and modeling approaches;
 - Use of remote sensing data in forest GHG inventories
 - stratification, change assessment and use of remote sensing methods for biomass estimation;
 - Guidance on selectively logged forests.
 - Data on emission factors and parameters have improved since the 2006 Guidelines were finalised (EFDB)
 - e.g. Biomass (Conversion and) Expansion Factors (BEF/BCEF), and emission factors for peat lands.

EFDB – Emission Factor Database

The screenshot shows a web browser window titled "Find EF - Results". It displays a search interface with a search bar and a list of results. The results are organized into a table with columns for "EF ID", "EF Name", "EF Unit", "Year", "Category", "Technology/Process", "Emission Factor", "Sector/Process", "Emission Factor", "Unit", "Year", "Source of Data", and "Status". The table contains several rows of data, including entries for "Coal Energy" and "Natural Gas Energy".

- A library of up-to-date emission factors and other parameters
 - Either new data or appropriate for national or regional conditions
 - For both 1996, GPG or 2006 Guidelines
- Data is checked by Editorial Board to be:
 - Robust, Applicable & Documented
 - Users select appropriate data for their national circumstances
- Improvements
 - Data meetings focusing on a specific topic/area
 - Additional resources from TSU to support the Editorial Board and develop EFDB
 - Review of interface to make it easier to use for forest and other land use data

UNFCCC

- To establish, according to national circumstances and capabilities, robust and transparent national forest monitoring systems and, if appropriate, sub-national systems as part of national monitoring systems that:
 - (i) Use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;
 - (ii) Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities;
 - (iii) Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties.

Some of the potential REDD+ issues

- Difficulty to factor out natural and indirect effects in carbon stocks and non-CO₂ GHG emissions from those that are direct human-induced.
- Forest degradation needs to be better understood
 - changes in carbon stocks
 - can result from an increased harvesting rate that not necessarily will lead to forest degradation
 - process that leads to an irreversible ability of the forest to recover its original carbon stocks
 - intensive, non-authorized selective logging activities
 - frequent and intense wildfires

Some of the potential REDD+ issues

- How to differentiate long-term changes in carbon stock due to policies/measures/actions implemented on forests from effects due to interannual variability
- How to treat changes in carbon stocks and/or GHG emissions from “*force majeure*”
- Definitions
 - Country specific and consistent with reporting to other agencies (e.g., FAO)
 - Standardized (e.g., forest definition for CDM project activities)