



Forest GHG inventories reporting under UNFCCC

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Forest reporting under the Convention

- **Within Annex I Parties GHGs inventories under the UNFCCC**
 - GHGs inventory: LULUCF sector (yearly)
 - Supplementary information: Article 3.3. and 3.4 activities (for 2008-2012 inventory years) and Article 6 forest projects (2008-2012, yearly)
- **Within Non Annex I Parties**
 - Afforestation and Reforestation CDM projects (project base)
 - GHGs inventories as part of their National Communications (irregular periods)



Background

- **Articles 4.1 and 12.1 of the Convention:**
 - Communicate to the Conference of the Parties (COP) a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHG) not controlled by the Montreal Protocol, to the extent its capacities permit
- Decisions of the COP for **Parties not included in the Annex I of the Convention:**
 - Guidelines for preparation of National Communications (**Decision 10/CP.2**) – 1996
 - Guidelines for preparation of National Communications (**Decision 17/CP.8**) – 2002 (*new guidelines*)
 - Decisions on work of the Consultative Group of Experts (Decisions 8/CP.5, 31/CP.7 and 3/CP.8)



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Principles and UNFCCC Guidelines for GHG national inventories

Principles: Transparency, consistency, comparability, completeness and accuracy

- 1996 IPCC Guidelines for National Greenhouse Gas Emission Inventories
- IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (GPG for Land Use, Land-use Change and Forestry adopted for its use in COP-9)
 - Its use is recommended for non-Annex I Parties:
 - Detailed and transparent presentation of inventory data (uncertainties analysis and key sources assessment)
 - Quality control / Quality assurance
- Use of Table 1 and Table 2 contained in the annex to 17/CP.8
 - Provision of the worksheets and sectoral tables of the 1996 IPCC Guidelines is recommended (electronic and hard copy format)



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Guidelines for NC (Decision 17/CP.8)

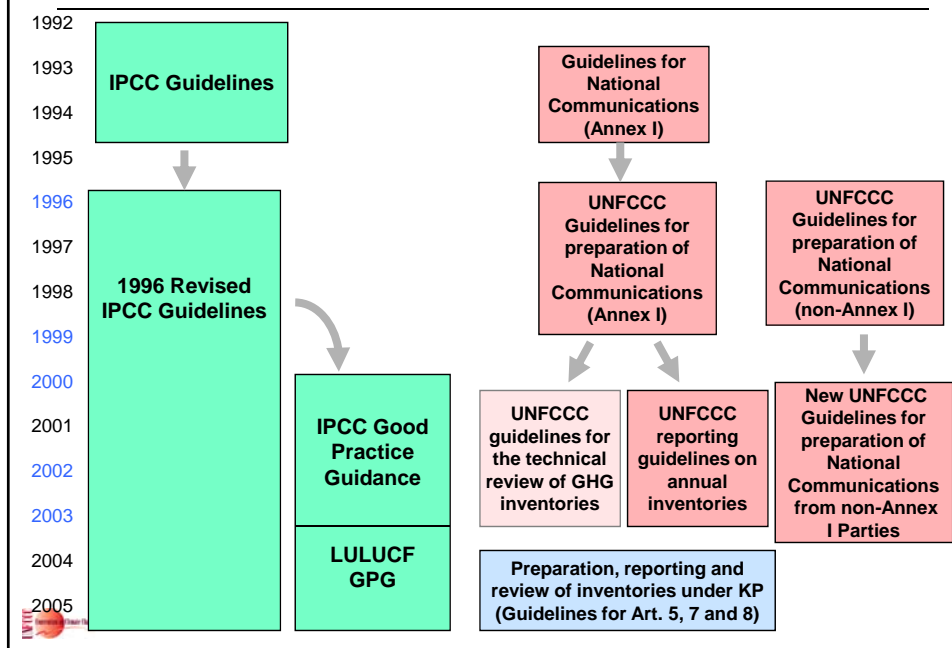
IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories (GPG)

- ✓ GPG provides useful guidance for **selecting** appropriate estimation methods (different tiers), emission factors and activity data
- ✓ It helps in selecting appropriate methods in quantifying and analysing **uncertainty**, in determining **key categories**, in **recalculating** emissions data, and in setting up **quality assurance / quality control** plans
- ✓ The use of the **GPG for LULUCF** is encouraged for non-Annex I Parties, as appropriate and to the extent possible (Decision 13/CP.9)



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UNFCCC and IPCC Guidelines



Definitions...

- **Source** – Any process or activity that releases a GHG (such as CO₂ and CH₄) into the atmosphere. A carbon pool can be a source of carbon to the atmosphere if less carbon is flowing into it than is flowing out of it.
- **Sink** – Any process, activity or mechanism that removes a GHG from the atmosphere. A given pool can be a sink for atmospheric carbon if during a given time interval more carbon is flowing into it than is flowing out of it.



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Definitions...

- **Activity data** – Data on the magnitude of human activity, resulting in emissions/removals taking place during a given period of time (e.g., data on land area, management systems, lime and fertilizer use).
- **Emission factor** – A coefficient that relates the activity data to the amount of chemical compound, which is the source of later emissions. Emission/removal factors are often based on a sample of measurement data, averaged to develop a representative rate of emission or removal for a given activity level under a given set of operating conditions.
- **Removal factor** – Rate at which carbon is taken up from the atmosphere by a terrestrial system and sequestered in biomass and soil.



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Default Categories in IPCC 1996GL

5A. Changes in **forest and other woody biomass stocks** due to

- commercial management
- harvest of industrial roundwood (logs) and fuelwood
- establishment and operation of forest plantations
- planting of trees in urban, village and non-forest locations

5B. Forest and grassland conversion

- the **conversion of forests** and grassland to pasture, cropland etc. can significantly change C-stocks in vegetation and soil

5C. Abandonment of cropland, pasture, **plantation forests**, or other managed lands

5D. CO₂ emissions and removals from soils

- cultivation of mineral soils
- cultivation of organic soils
- liming of agricultural soils



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GPG2003 LULUCF Land-use Categories and Methods

- GPG2003 adopted two major advances over IPCC 1996GL, namely:
 - *Three hierarchical tiers of methods*
 - they range from use of default data and simple equations to use of country-specific data and models to accommodate national circumstances
 - *Land-use-category-based approach for organizing methodologies*
- **land-use categories:** Adopted six land categories to ensure consistent representation, covering all geographic areas of a country.
 - *Forest land, cropland, grassland, wetland, settlements and others*
- Each land-use category is further disaggregated to reflect the past and the current land use
 - *Forest land remaining forest land*
 - *Lands converted to forest land*



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CO₂ Pools, Non-CO₂ Gases and Sources of Non-CO₂ Gases (for all land categories)

- **CO₂ emissions and removal are estimated for all the C-pools namely:**
 - Above-ground biomass
 - Below-ground biomass
 - Soil organic carbon
 - Dead organic matter and woody litter
- **Non-CO₂ gases estimated include:**
 - CH₄, N₂O, CO and NO_x
- **Sources of non-CO₂ gases:**
 - N₂O and CH₄ from forest fires
 - N₂O from managed (fertilized) forests
 - N₂O from drainage of forest soils
 - N₂O and CH₄ from managed wetland
 - Soil emissions of N₂O from land-use conversion



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Reporting of GHG Inventory in the LULUCF Sector – GPG2003 (Annex I)

Greenhouse gas source and sink categories	IPCC guidelines	Net CO ₂ emissions / removals ⁽¹⁾	CH ₄	N ₂ O	NO _x	CO
		(Gg)				
5. Total Land-Use Categories						
5.A. Forest Land						
5.A.1. Forest Land remaining Forest Land	5A					
5.A.2. Land converted to Forest Land	5A, 5C, 5D					
5.B. Cropland						
5.B.1. Cropland remaining Cropland	5A, 5D					
5.B.2. Land converted to Cropland	5B, 5D					
5.C. Grassland						
5.C.1. Grassland remaining Grassland	5A, 5D					
5.C.2. Land converted to Grassland	5C, 5D					
5.D. Wetlands ⁽²⁾						
5.D.1. Wetlands remaining Wetlands	5A, 5E					
5.D.2. Land converted to Wetlands	5B, 5E					
5.E. Settlements ⁽²⁾						
5.E.1. Settlements remaining Settlements	5A					
5.E.2. Land converted to Settlements	5B, 5E					
5.F. Other Land ⁽²⁾						
5.F.1. Other Land remaining Other Land	5A					
5.F.2. Land converted to Other Land	5B, 5E					
5.G. Other (please specify) ⁽²⁾						
Harvested Wood Products ⁽²⁾						

Use of IPCC 2003GPG mandatory for Annex I



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Reporting of GHG Inventory in the LUCF Sector – IPCC 1996GL (Non Annex I)

LUCF categories	CO ₂ emissions	CO ₂ removal/uptake	CH ₄	N ₂ O	CO	NO _x
5A. Changes in forest and other woody biomass stocks						
5B. Forest and grassland conversion						
5C. Abandonment of croplands, pastures, plantation forests, or other managed lands						
5D. CO ₂ emissions and removals from soils						
5E. Others						
TOTAL						

Use of IPCC 2003GPG encouraged but not mandatory for Non Annex I



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REPORTING ASSOCIATED TO LULUCF

GHG inventory in biological sectors such as LULUCF is characterized still by:

- *methodological limitations*
- *lack of data or low reliability of existing data*
- *high uncertainty*



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Forest reporting under the Convention – Status of reporting

- Gaps on reporting the forest sector still exist on Annex I reporting
- Many Annex I Parties still use Tier 1 for reporting the forest categories under the UNFCCC
- Five pools not always reported, DOM and SOC the less reported ones
- Uncertainties not always reported



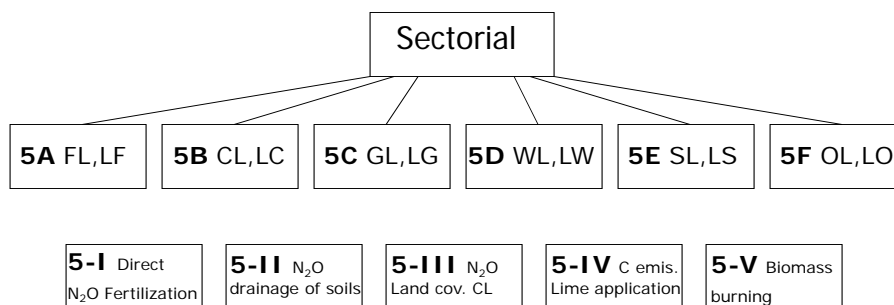
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Steps to shift to GPG...

- Select appropriate tier level for key land categories and sub-categories, non-CO₂ gases and carbon pools, based on key category analysis as well as resources available for the inventory process
- Assemble required AD, depending on tier selected, from regional, national and global databases
- Collect EF/RF, depending on tier selected, from regional, national and global databases, forest inventories, national greenhouse gas inventory studies, field experiments and surveys and use of EFDB
- Select method of estimation (equations), based on tier level selected, quantify emissions/removals for each land-use category, carbon pool and non-CO₂ gas.
- Estimate uncertainty
- Adopt QA/QC procedures and report results
- Report GHG emissions and removals using the reporting tables
- Document and archive all information use

..... **All documented in the NIR**

Reporting Requirements Annex I CRF for LULUCF



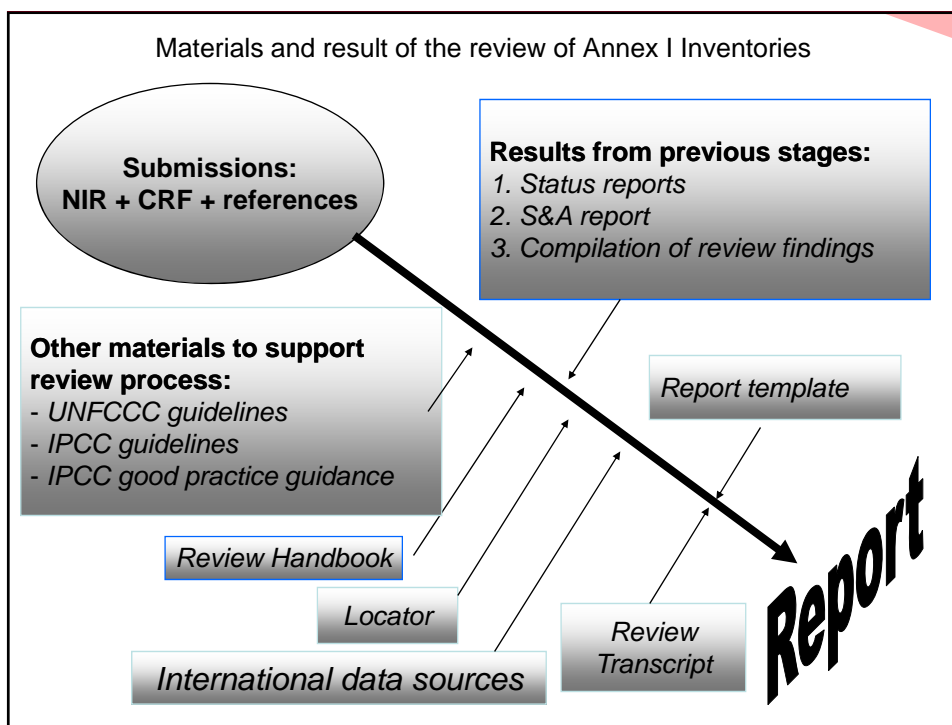
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Comparison - IPCC 1996GL and GPG2003

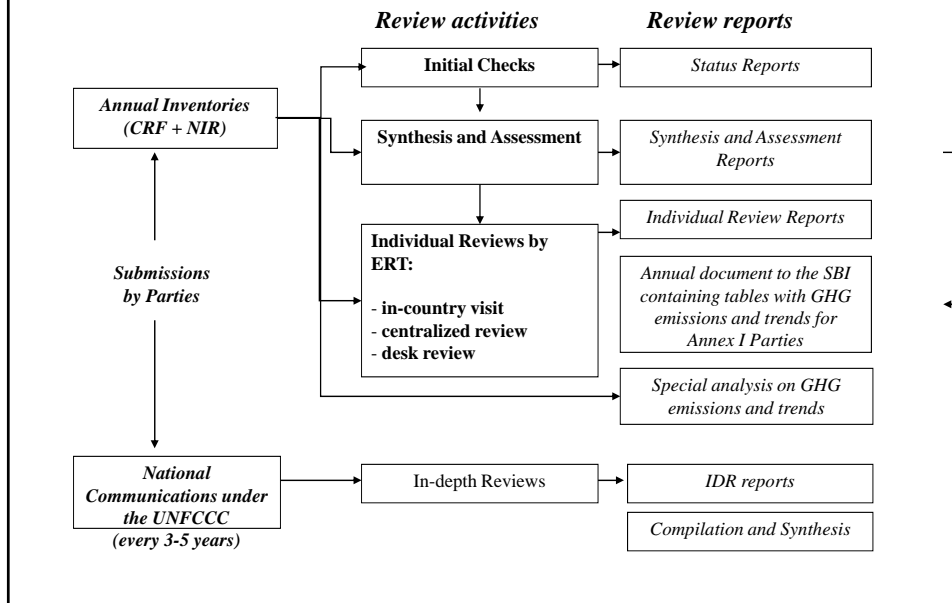
GPG2003	IPCC 1996GL
i) Land category based approach covering forest land, cropland, grassland, wetland, settlement and others	i) Approach based on four categories namely 5A to 5D (refer to Section 5.1) All land categories not included such as coffee, tea, coconut etc. Lack of clarity on agro-forestry
ii) These land categories are further sub divided into; <ul style="list-style-type: none"> land remaining in the same use category 1. other land converted to this land category 	ii) Forest and grassland categories defined in 5A and 5B
iii) Methods given for all carbon pools; AGB, BGB, dead organic matter and soil carbon and all non-CO ₂ gases	iii) Methods provided mainly for aboveground biomass and soil carbon. <ol style="list-style-type: none"> Assumes as a default that changes in carbon stocks in dead organic matter pools are not significant and can be assumed to be zero, i.e. inputs balance losses. Similarly, belowground biomass increment or changes are generally assumed to be zero
iv) Key source/sink category analysis provided for selecting significant <ul style="list-style-type: none"> land categories sub-land categories C-pools CO₂ and non-CO₂ gases 	iv) Key source/sink category analysis not provided
v) Three tier structure presented for choice of methods, Activity Data and Emission Factors	v) Three tier structure approach presented but its application to choice of methods, AD and EF not provided
vi) Biomass and soil carbon pools linked	vi) Changes in stock of biomass and soil carbon in a given vegetation or forest type not linked

Key Activity Data Required for GPG2003 and IPCC 1996GL

GPG2003	IPCC 1996GL
FOREST LAND i) Area of forest land remaining forest land <ul style="list-style-type: none"> Disaggregation according to climatic region, vegetation type, species, management system, age etc. ii) Area of other land category converted to forest land <ul style="list-style-type: none"> Disaggregation as mentioned above iii) Forest area affected by disturbances iv) Forest area undergoing transition from state (i) to (j) v) Area of forest burnt vi) Total afforested land derived from cropland/grassland vii) Area of land converted to forest land through <ul style="list-style-type: none"> natural regeneration establishment of plantations 	Category 5A to 5D i) Area of plantation/forests ii) Area converted annually iii) Average area converted (10-year average) iv) Area abandoned and regenerating <ul style="list-style-type: none"> 20-years prior to year of inventory 20-100 years prior to the year of inventory v) Area under different land use/management systems and soil type <ul style="list-style-type: none"> during year-t (inventory year) 20-years prior to year-t vi) Area under managed organic soils
CROPLAND, GRASSLAND, WETLAND ETC. <ul style="list-style-type: none"> Similar categorization as above 	



Review process of annual GHG inventories under the Convention



Consideration of national GHG inventories of Non Annex I Parties

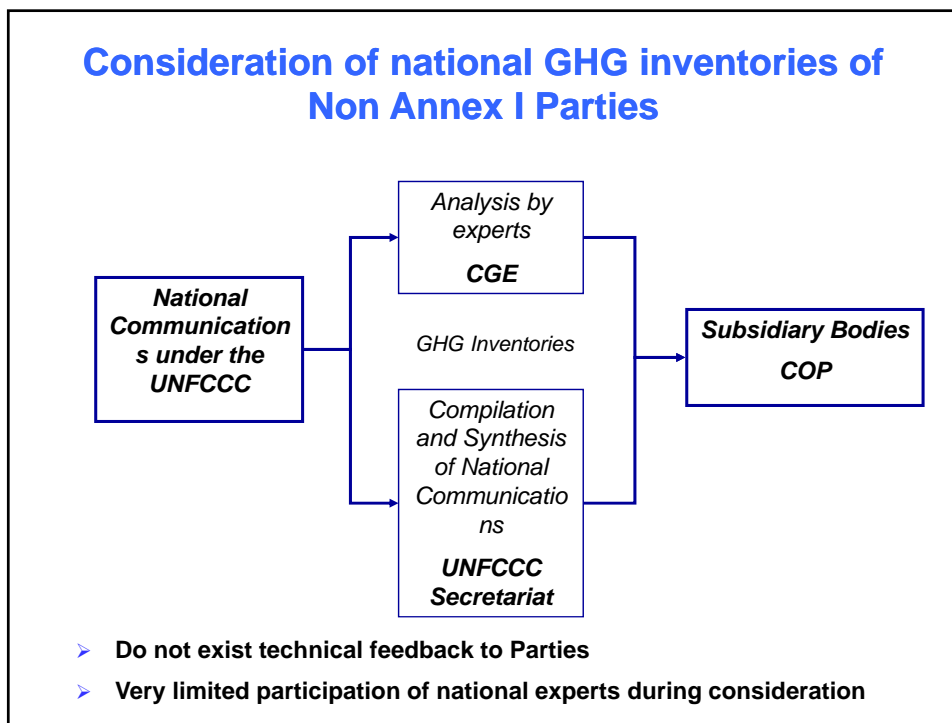


Table 3.4. Comparison of methods to estimate carbon stocks at national to regional scales.

Data products/scale	Strengths	Weaknesses	Degree of confidence
Traditional forest inventories—rarely national and usually regional in developing countries.	High confidence in data if updated frequently, statistically well-designed and adhere to commonly accepted standards.	May be out of date. Often focused on forests of commercial value and trees of commercial size and species. Need factors to convert volume to biomass stocks. Can be costly to implement.	Depends on age of inventory and if updated—low (at national scale) to high (at local scale) confidence based on date of inventory and spatial coverage.
Forest inventory with additional data on canopy cover and related to high resolution RS data; update biomass stocks with new fine resolution RS data.	Commercial forest inventory data may already be available.	Often focused on forests with commercial value and trees of commercial size and species. Can be costly to implement.	Medium confidence.
FAO data –by country and region.	Wide availability and based on country reports.	Default data based on forest inventories of varying scales and age or on expert opinion. Converted from volume to biomass using general factors from different sources. No standards in place.	Low to medium confidence depending on age and scale of inventory and conversion factors used to convert to biomass.
Compilation of plots measured for academic or other research interests.	Data available at little to no cost from the literature.	Not sampled from population of interest. No sampling standards in place. Generally too few plots to produce estimates with high precision.	Low confidence.

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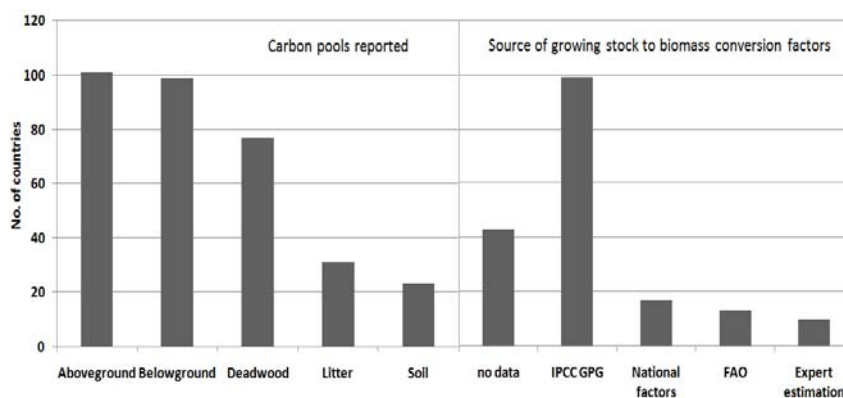


Figure 2.3: Summary of data for five different carbon pools reported (left) and information sources used by 150 non-Annex I countries to convert growing stocks to biomass (right) for the FAO FRA 2005 (FAO 2006, countries may have used multiple sources for the conversion process).

UNFCCC. TP/2009

Thank you



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