

Task Force on Inventories

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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

UNEP

IPCC National Greenhouse Gas Inventory Programme

## AFOLU in the IPCC 2006 Guidelines

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THIRD INFORMAL DIALOGUE ON LULUCF  
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## Outline of Presentation

- Evolution of Guidelines from 1996 to 2006
  - Guidelines have developed and improved as knowledge and experience increases
- Some basics
  - Basic principals and ideas remain unchanged
  - Major change is from 1996 Guidelines to LULUCF
    - 1996 Guidelines focus on main processes, LULUCF focus on all land-use types.
    - Changes from LULUCF to 2006 Guidelines (AFOLU) are small
- Specific improvements between AFOLU (2006) and GPG LULUCF

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# Evolution of IPCC Guidelines for National Greenhouse Gas Inventories

Revised 1996 Guidelines ⇔ 2006 Guidelines  
LUCF ⇔ LULUCF ⇔ AFOLU

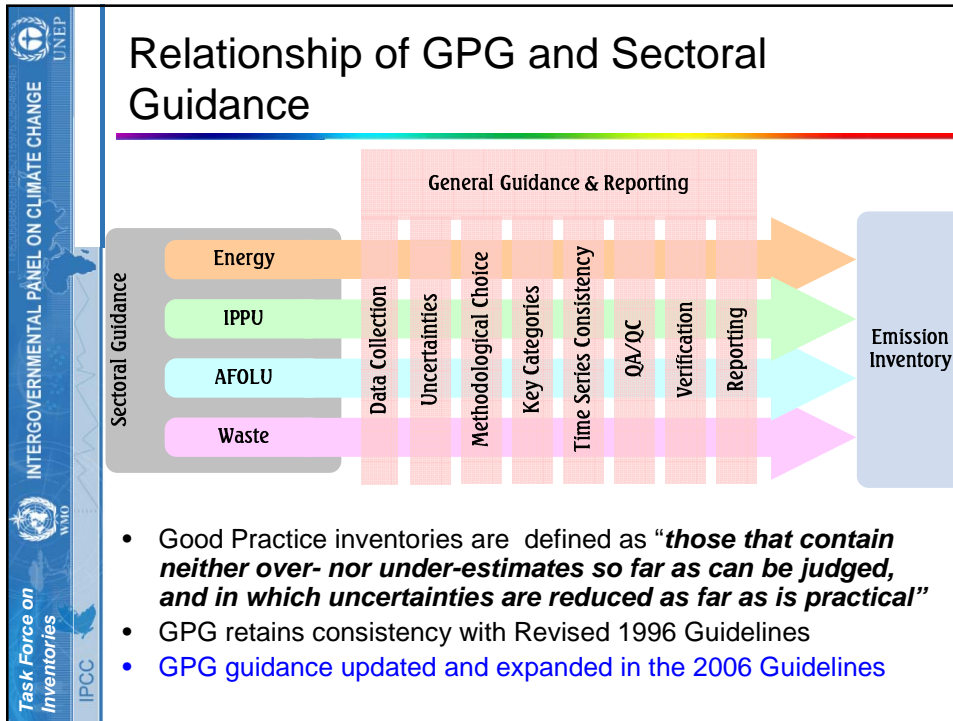
## History

- Revised 1996 Guidelines approach – Land-Use Change and Forestry (LUCF)
  - Identifies major likely land use sources
- 2000 Good Practice Guidance and Uncertainty Management
  - Defines GPG and applies it to Agriculture
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG LULUCF)
  - Expanded Guidance covering all carbon pools
  - Guidance on the representing Land Areas
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories
  - Now Agriculture, Forestry and Other Land Use (AFOLU)
  - Essentially the same as to GPG LULUCF but integrating Agriculture and LULUCF sectors
  - Extended default values & some improved methods

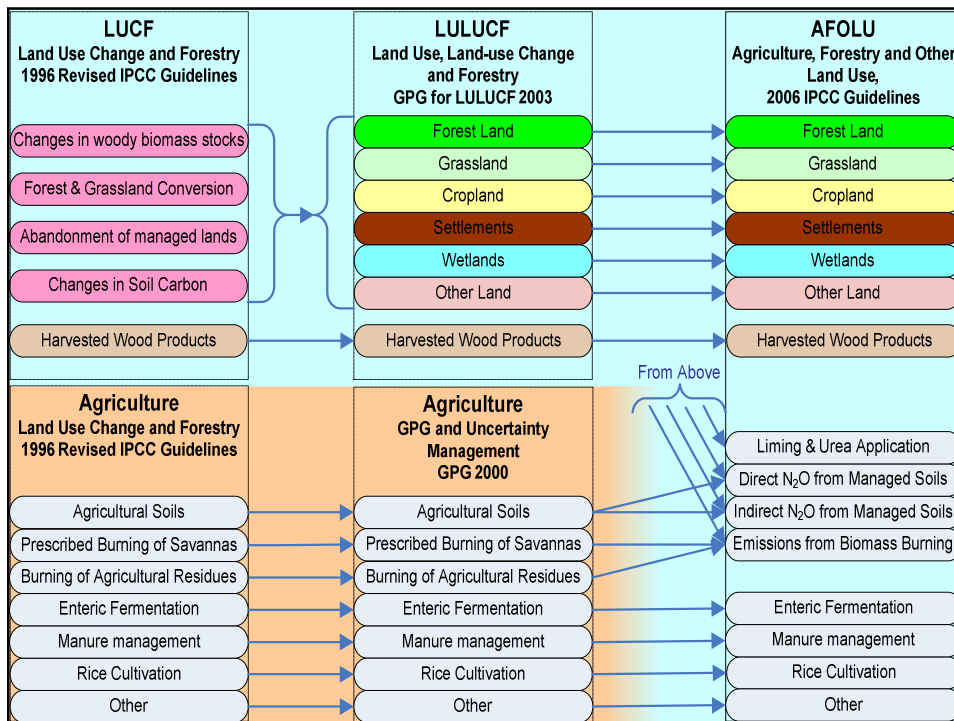
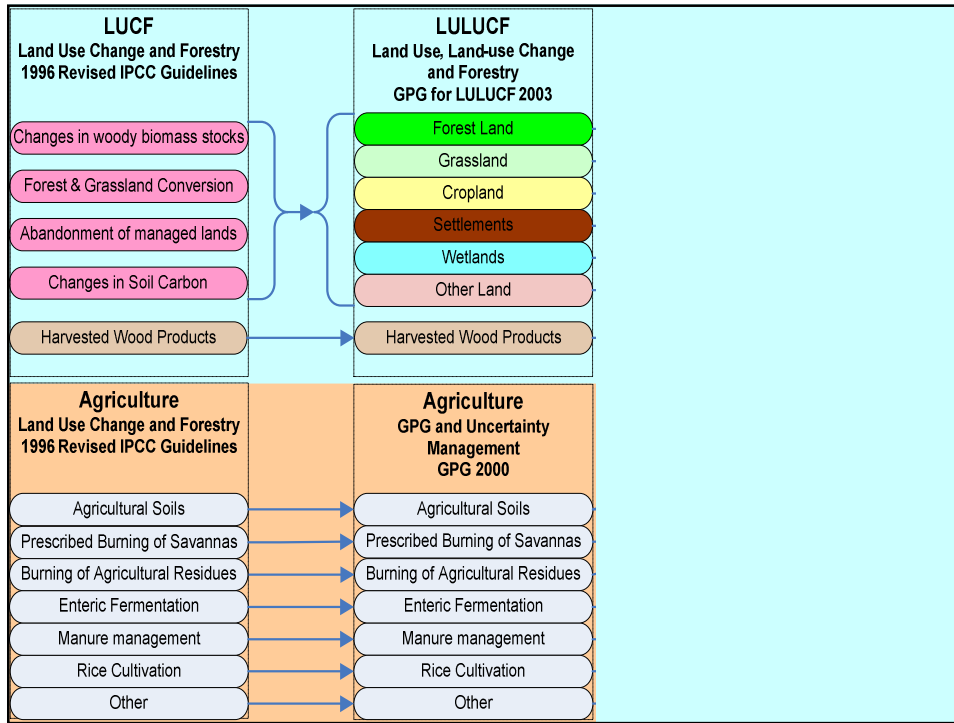
Timeline of IPCC Guidelines:

- 1995: 1995 Guidelines for National Greenhouse Gas Inventories
- 1996: Revised 1996 Guidelines for National Greenhouse Gas Inventories
- 2000: Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000
- 2003: Good Practice Guidance for Land-use, Land Use Change and Forestry, 2003
- 2006: IPCC 2006 Guidelines for National Greenhouse Gas Inventories, 2006

Guidance used for reporting to the UNFCCC



<p style="text-align: center;"><b>LUCF</b> Land Use Change and Forestry 1996 Revised IPCC Guidelines</p> <p style="text-align: center;">Changes in woody biomass stocks</p> <p style="text-align: center;">Forest &amp; Grassland Conversion</p> <p style="text-align: center;">Abandonment of managed lands</p> <p style="text-align: center;">Changes in Soil Carbon</p> <p style="text-align: center;">Harvested Wood Products</p>	
<p style="text-align: center;"><b>Agriculture</b> Land Use Change and Forestry 1996 Revised IPCC Guidelines</p> <p style="text-align: center;">Agricultural Soils</p> <p style="text-align: center;">Prescribed Burning of Savannas</p> <p style="text-align: center;">Burning of Agricultural Residues</p> <p style="text-align: center;">Enteric Fermentation</p> <p style="text-align: center;">Manure management</p> <p style="text-align: center;">Rice Cultivation</p> <p style="text-align: center;">Other</p>	



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## Why integrate Agriculture & LULUCF?

- *The emissions from both sectors have been integrated into this new framework in order to resolve inconsistencies and avoid double counting:*
  - Removes the somewhat arbitrary distinction between these categories in the previous guidance, and promotes consistent use of data between them, especially for more detailed methods.
  - Makes consistent the treatment of gases in the Agriculture and LULUCF Sectors and so allows for more consistent treatment of land conversions;

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## Some Unchanging Basics

Underlying approach remains unchanged

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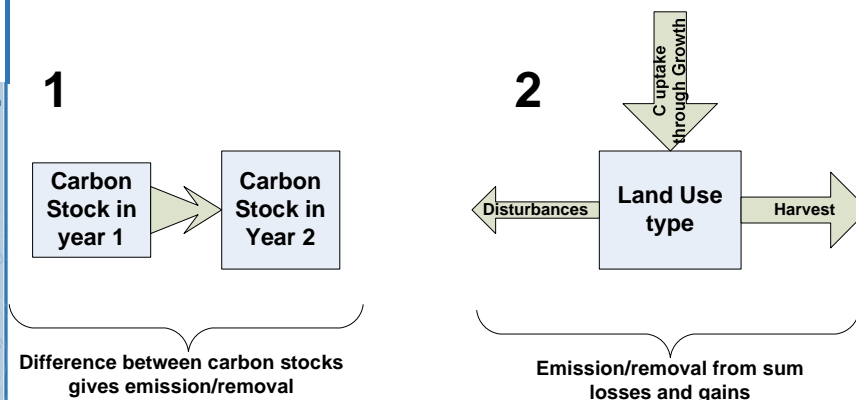
## General Method

- There are large uncertainties in estimating fluxes of CO<sub>2</sub>.
- Direct measurements are extremely difficult (small differences of large numbers) and inherent heterogeneity.
- A practical first order approach is to make assumptions about effects of land use change on carbon stocks and the subsequent biological response to a given land use.

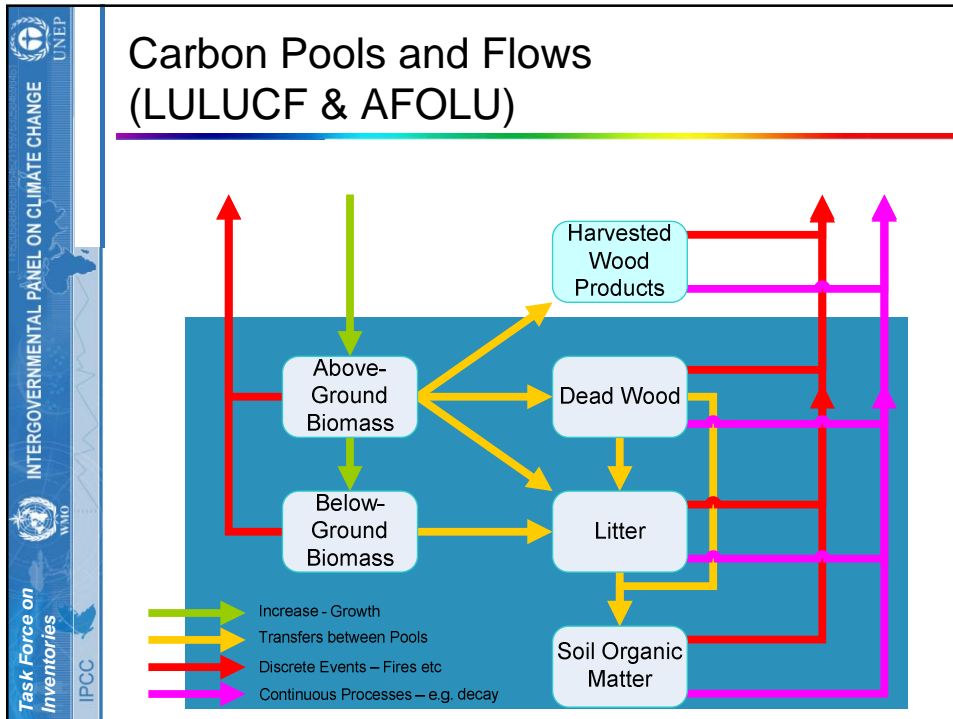
**Flux of C assumed = changes in carbon stocks in existing biomass and soils.**

- Note: Carbon stocks in HWP, landfills etc. Some Carbon emitted as CH<sub>4</sub>, CO etc.
- Remains general approach from 1996 Guidelines, through the GPG LULUCF to the 2006 Guidelines & AFOLU

## Estimating Carbon Stock Changes



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



- Managed Land – a proxy for anthropogenic
- *Managed land is used in these guidelines as a proxy for identifying anthropogenic emissions by sources and removals by sinks.*
    - use of managed land as a proxy for anthropogenic effects was adopted in the *GPG-LULUCF* and is consistent with the *Revised 1996 Guidelines*.
  - Managed land is land where human interventions and practices have been applied to perform production, ecological or social functions.
    - All land definitions and classifications should be specified at the national level, described in a transparent manner, and be applied consistently over time.
    - However, it is *good practice* for countries to quantify, and track over time, the area of unmanaged land so that consistency in area accounting is maintained as land-use change occurs.

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## Why Managed Land as a Proxy?

- The preponderance of anthropogenic effects occurs on managed lands and, from a practical standpoint, the information needed for inventory estimation is largely confined to managed lands.
- By definition, all direct human-induced effects on greenhouse gas emissions and removals occur on managed lands only.
- While local and short-term variability in emissions and removals due to natural causes can be substantial the natural 'background' of greenhouse gas emissions and removals by sinks tends to average out over time and space. This leaves the greenhouse gas emissions and removals from managed lands as the dominant result of human activity.

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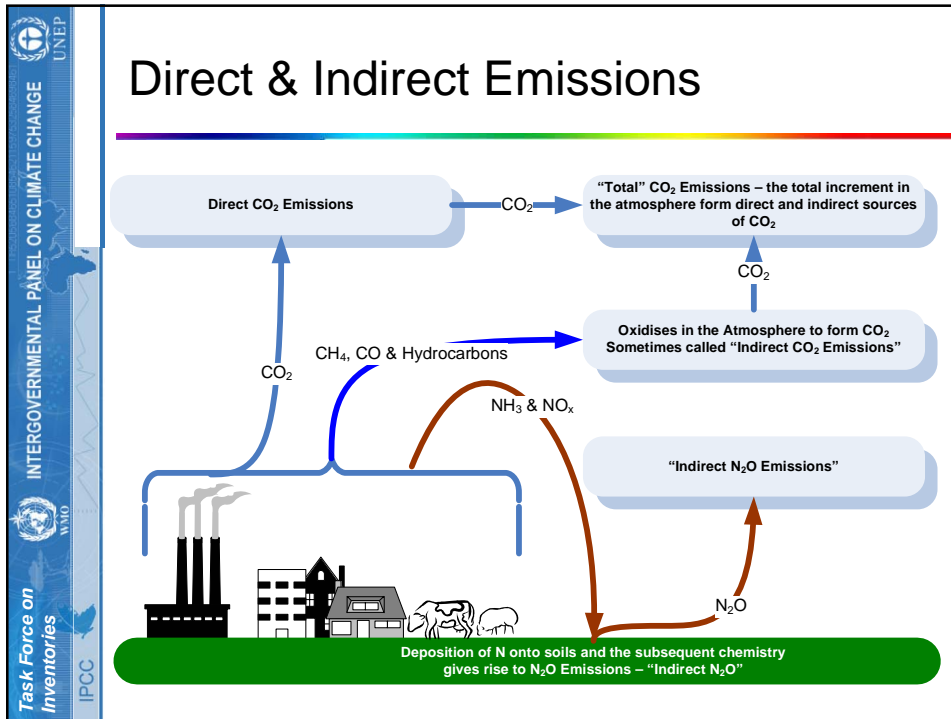
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## Differences between LULUCF and AFOLU

Incremental Improvements and clarifications





- ## Direct & Indirect Emissions
- The 2006 Guidelines make it clear that "CO<sub>2</sub> Emissions" are the direct emissions in that year of all carbon emitted as CO<sub>2</sub>, i.e. excluding any carbon emitted in other forms (e.g. CH<sub>4</sub>, CO, NMVOC, particulates ...) even though this may be converted in the atmosphere to CO<sub>2</sub> after emission
    - Over all, the previous guidelines were ambiguous on this
    - Some **Tier 1** methods in (e.g. in Energy) assume that direct carbon emission = total carbon as CO<sub>2</sub> emission (uncertainties in this assumption are much smaller than other sources of uncertainties in Tier 1).
    - This has implications for land-use emissions, particularly fires.
  - In the GPG LULUCF Indirect N<sub>2</sub>O is only reported for NO<sub>x</sub> and NH<sub>3</sub> from some agricultural sources.
    - In addition the 2006 Guidelines ask for indirect emissions of N<sub>2</sub>O from
      - manure management
      - all other non-agricultural sources of NO<sub>x</sub> and NH<sub>3</sub> to be estimated **IF** complete inventories of NO<sub>x</sub> and NH<sub>3</sub> are available

## Fires

- GPG LULUCF
  - All fires on managed land considered (1996 GL suggested prescribed burning only).
  - Fires on un-managed land should not be reported UNLESS they are followed by a land use-change
  - Where methods do NOT capture removals by re-growth then CO<sub>2</sub> from natural disturbances should not be reported (1996 GL suggest reporting only non- CO<sub>2</sub> gases, as carbon emission balanced by re-growth).
  - Non-CO<sub>2</sub> emissions from agricultural crop residue and savannah burning fires reported under Agriculture
- 2006 GL - AFOLU
  - All fires on managed land should be reported
  - Annual emission reported except where annual CO<sub>2</sub> emissions and removals are equivalent – e.g. some grasslands and burning of agricultural residues
  - Improved and more consistent methodological guidance
  - Emissions from fires reported separately (in 3.C.1) from other land use emissions (in 3.B)

## Harvested Wood Products

- Now a chapter in 2006 Guidelines
  - previously an appendix “basis for future methodological development”
- Currently, there is no decision under the UFCCC on which approach to use to report these emissions and/or removals
  - approaches differ in the allocation between wood producing and consuming countries, and what processes (atmospheric fluxes or stock changes) they focus on
- The IPCC has not selected any of the proposed approaches. Instead it:
  - Provides methods to estimate 5 underlying parameters based on the assumption of first order decay
  - Provides a spreadsheet to estimate HWP that is based on FAO data for each country
  - Allows optional linkage with the waste sector spreadsheet for decay of HWP in landfill sites.
  - Gives help on combining these parameters to estimate any of the proposed approaches

## Wetlands

		Peat Land		Flooded Land	
		LULUCF	AFOLU	LULUCF	AFOLU
Wetlands Remaining Wetlands	CO <sub>2</sub>	Appendix	YES	Appendix	IE <sup>1</sup>
	CH <sub>4</sub>		Negligible	Appendix	Appendix
	N <sub>2</sub> O	Appendix	YES	Appendix	IE <sup>2</sup>
Land Converted to Wetlands	CO <sub>2</sub>	YES	YES	YES	YES <sup>3</sup>
	CH <sub>4</sub>	<sup>4</sup>	Negligible	Appendix	Appendix
	N <sub>2</sub> O	Appendix <sup>4</sup>	YES	Appendix	IE <sup>2</sup>

### Notes:

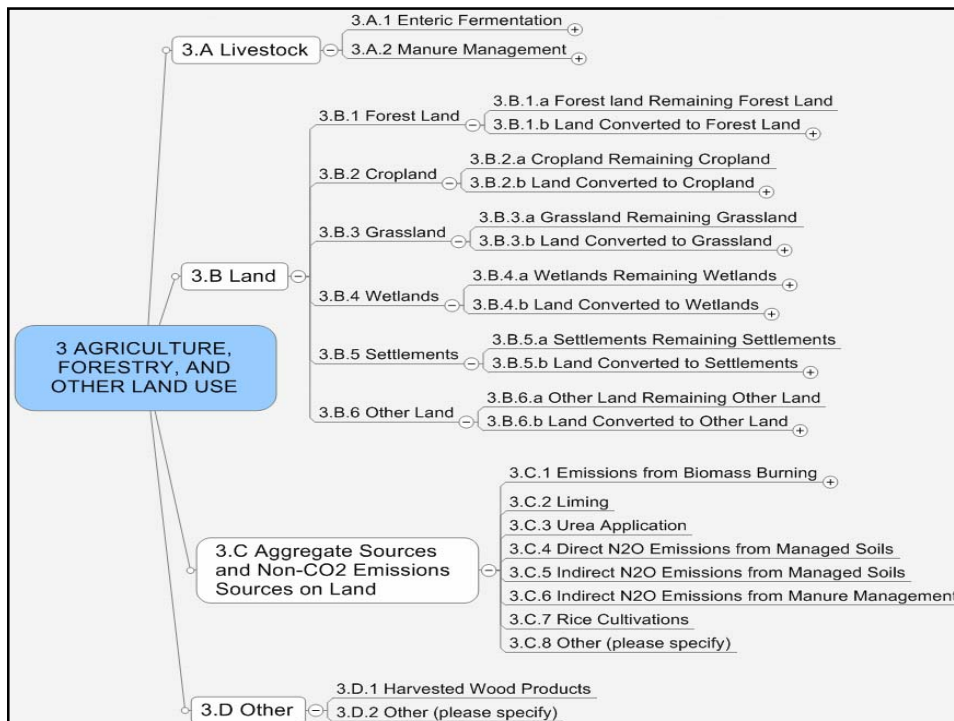
1. CO<sub>2</sub> is assumed to be covered by carbon stock changes for upstream
2. Included in indirect N<sub>2</sub>O estimates from run-off and waste water
3. Additional material is included in an appendix
4. Drainage and re-wetting of forest soils is discussed in an appendix




## Settlements remaining Settlements

- Methods available:
  - 1996 Guidelines
    - Not covered
  - GPG-LULUCF
    - Only an Appendix 3a.4 “Basis for future Methodological Development”
  - AFOLU
    - Now a chapter (Vol 4, Section 8.2) so to be included in *Good Practice Inventories*

## AFOLU – Appendices: Basis for future methodological work




- CO<sub>2</sub> Removals in Residual Combustion Products (Charcoal)
- CO<sub>2</sub> Emissions from lands converted to permanently flooded Land
- CH<sub>4</sub> Emissions from Flooded Land




  
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## Reporting in AFOLU compared to LULUCF/1996 Revised Guidelines

- ❖ Sectors reallocated
  - ❖ “Enteric Fermentation – Poultry” – report under other (if any)
  - ❖ “Manure Management” – report by animal type only
  - ❖ “Agricultural Soils” & “CO<sub>2</sub> Emissions and Removals from Soils” – now 3.C.2 Liming, 3.C.3 Urea Application, 3.C.4 Direct N<sub>2</sub>O Emissions from Managed Soils
- ❖ Fires previously reported under “Forest and Grassland Conversion”, “Field Burning of Agricultural Residues” and “Prescribed Burning of Savannas” now reported under 3.C.1:
  - ❖ 3.C.1.a Biomass Burning in Forests
  - ❖ 3.C.1.b Biomass burning in Crop Lands
  - ❖ 3.C.1.c Biomass burning in Grassland
  - ❖ 3.C.1.d Biomass Burning in all other land
- ❖ New categories
  - ❖ 5.A Indirect N<sub>2</sub>O Emissions from the Atmospheric Deposition of Nitrogen in NO<sub>x</sub> and NH<sub>3</sub>
  - ❖ 3.C.3 Urea application
  - ❖ 3.D.1 HWP


  
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## Summary

- ✓ **Basic methodological approach continued from 1996 Guidelines, GPG LULUCF to 2006 Guidelines AFOLU:**
  - Stock changes ⇒ Emissions/Removals
    1. Inputs (e.g. growth) - outputs (e.g. decay, harvest)
    2. Total Stock at end minus Total stock at beginning
- ✓ **GPG LULUCF & AFOLU consider all carbon pools**
  - Improved completeness implies both more accurate and reliable results and increased data needs
- ✓ **The AFOLU Guidance in the 2006 Guidelines maintains the basic structure, definitions and methods of the GPG LULUCF**
  - Improved guidance in some areas
  - More and improved default data
  - Integration of Agriculture reduces chance of double counting or omissions – some simplification of categories
  - Do not pre-empt accounting choices - all the information needed is retained
  - Mapping between the GPG LULUCF classification and the AFOLU classification is straightforward.
  - Effort and data requirements much the same as for LULUCF



Thank you

Guidelines in all UN languages  
can be downloaded from  
<http://www.ipcc-nggip.iges.or.jp>