



# Greenhouse Gas Inventories - Scope and Purpose

*Simon Eggleston*

Task Force on National Greenhouse Gas Inventories

**ipcc**

INTERGOVERNMENTAL PANEL ON climate change



# UNFCCC Art. 4 Commitments

1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:
  - (a) Develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, **national inventories of anthropogenic emissions by sources and removals** by sinks of all greenhouse gases not controlled by the Montreal Protocol, using **comparable methodologies** to be agreed upon by the Conference of the Parties;

# Emission Inventories

- Enable emissions to be understood:
  - Provide comparable data between countries
  - Give reliable time series
  - Explain link between emissions and activities
- Monitor emissions
  - Progress against targets can be monitored
- Should be transparent
  - Documented so other can understand
  - Reviews increase credibility and reliability

# Emission Inventory Guidelines

- Inventories should be:
  - Transparent – sufficient documentation, reporting
  - Consistent over time
  - Comparable between parties
  - Complete – cover all sources and sinks
  - Accurate – as practical give available resources
- Good Practice assists countries in producing inventories that are accurate in the sense of being **neither over nor underestimates so far as can be judged, and in which uncertainties are reduced as far as possible**

# IPCC

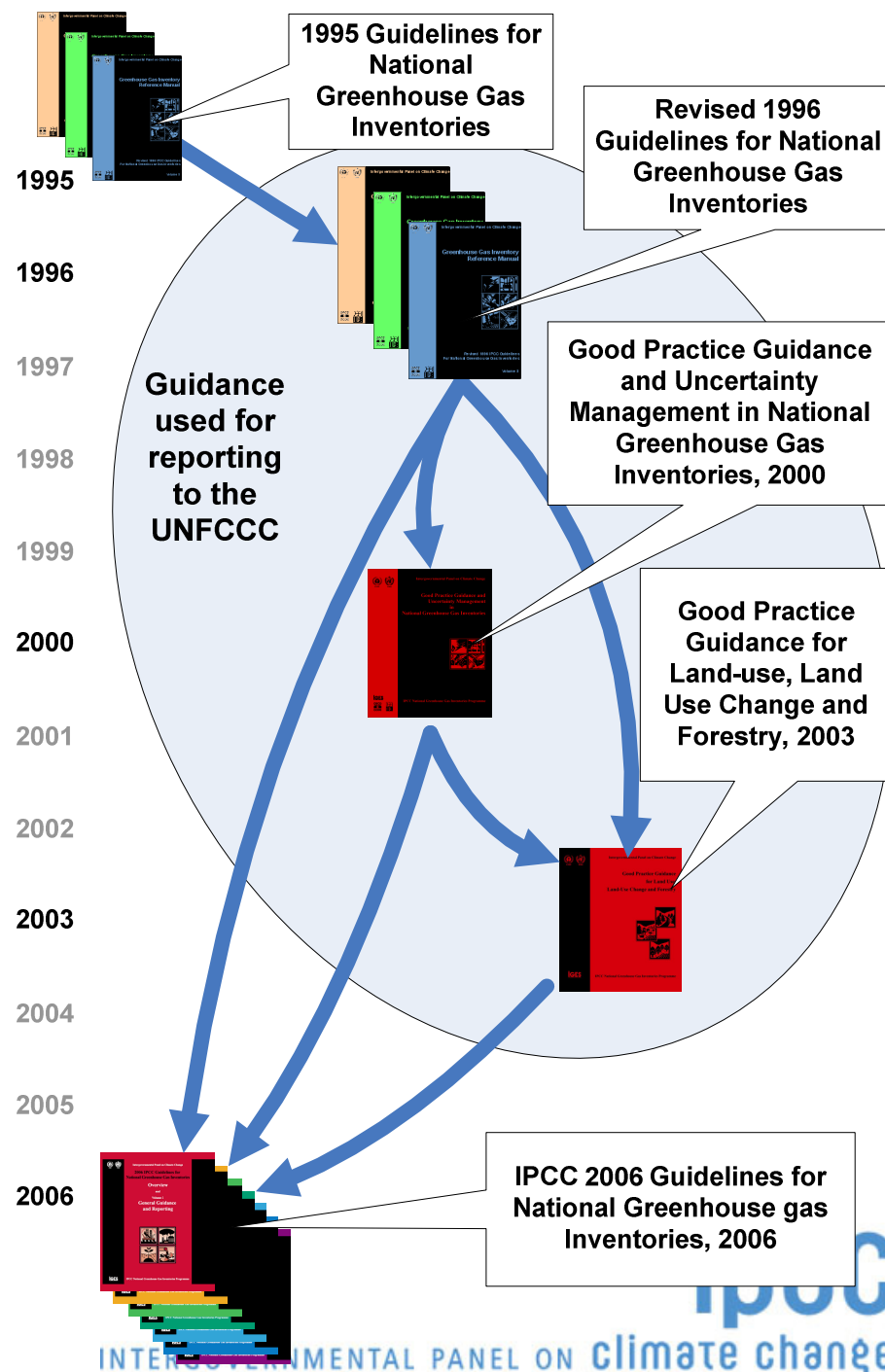
- Established by WMO (World Meteorological Organization) and UNEP (United Nations Environment Programme) in 1988 to;
  - Make periodic assessments of the science, impacts and the socio-economic aspects of climate change and of adaptation and mitigation options to address it;
  - Assess, and develop as necessary, methodologies such as the IPCC Guidelines for National Greenhouse Gas Inventories;
  - Provide, on request, scientific/technical /socio-economic advice to the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and its bodies.

ipcc

INTERGOVERNMENTAL PANEL ON climate change

# 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
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG LULUCF)
  - New approach – all lands and C pools
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories
  - Combines Agriculture and LULUCF into AFOLU



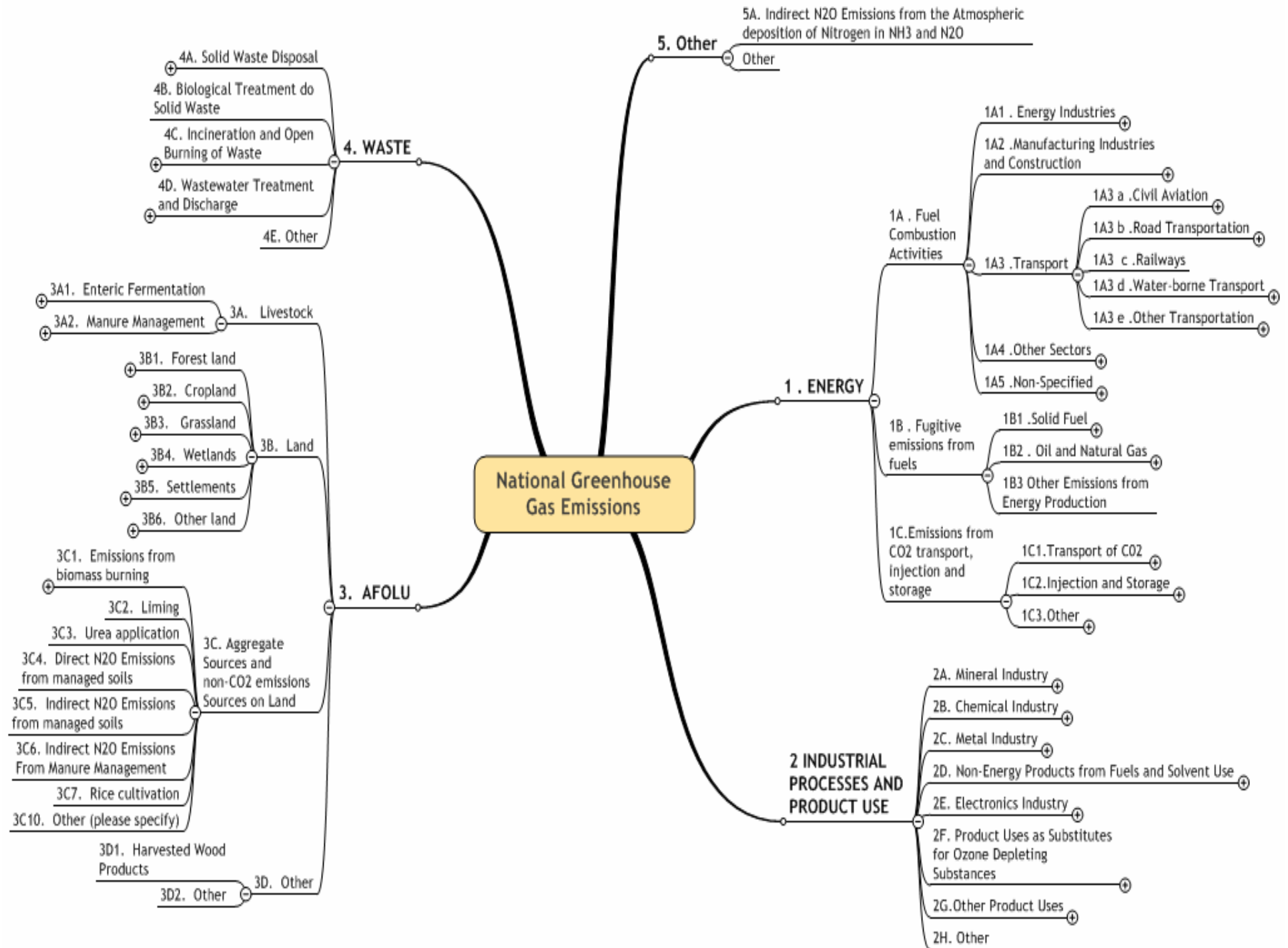
# IPCC Guidelines & UNFCCC

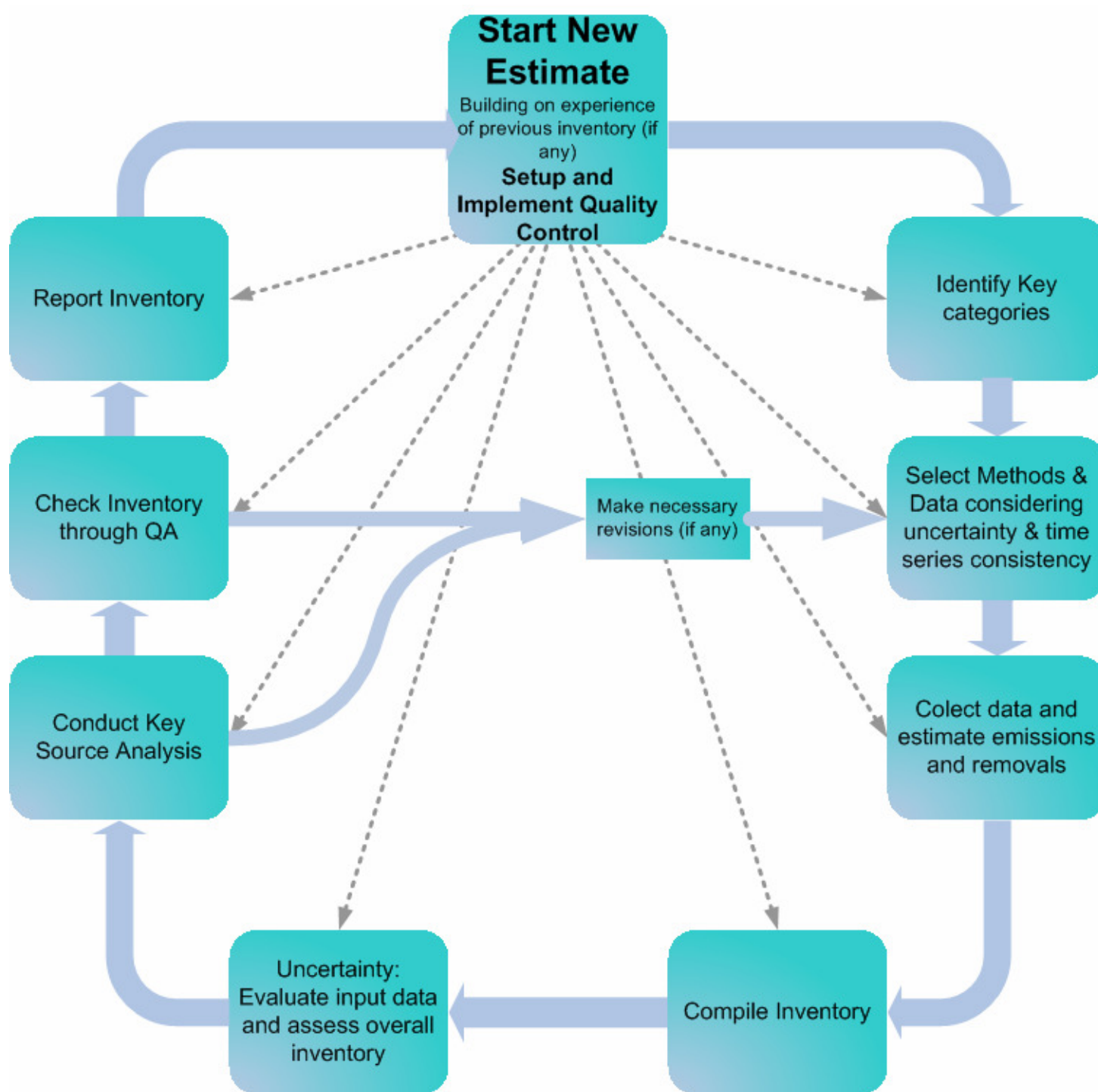
- Annex I Parties “shall” use the Revised 1996 Guidelines and the Good Practice Guidelines (2000 and LULUCF)
- Non-annex I parties “should” use the Revised 1996 Guidelines and are “encouraged” to use the Good Practice Guidelines (2000 and LULUCF)
- The IPCC 2006 Guidelines are currently under consideration by the UNFCCC
  - However some non-annex I parties use them and some annex I parties use their methods.

# IPCC Guidelines – Scope

- National
  - All **anthropogenic** emissions and removals from territory
- Annual
  - Net **calendar-year** emissions
- All gases covered by Kyoto Protocol & AR4
  - For forests: CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O
- Can be used for other purposes
  - BUT need to consider boundaries, tier used, leakage, displacement and other impacts





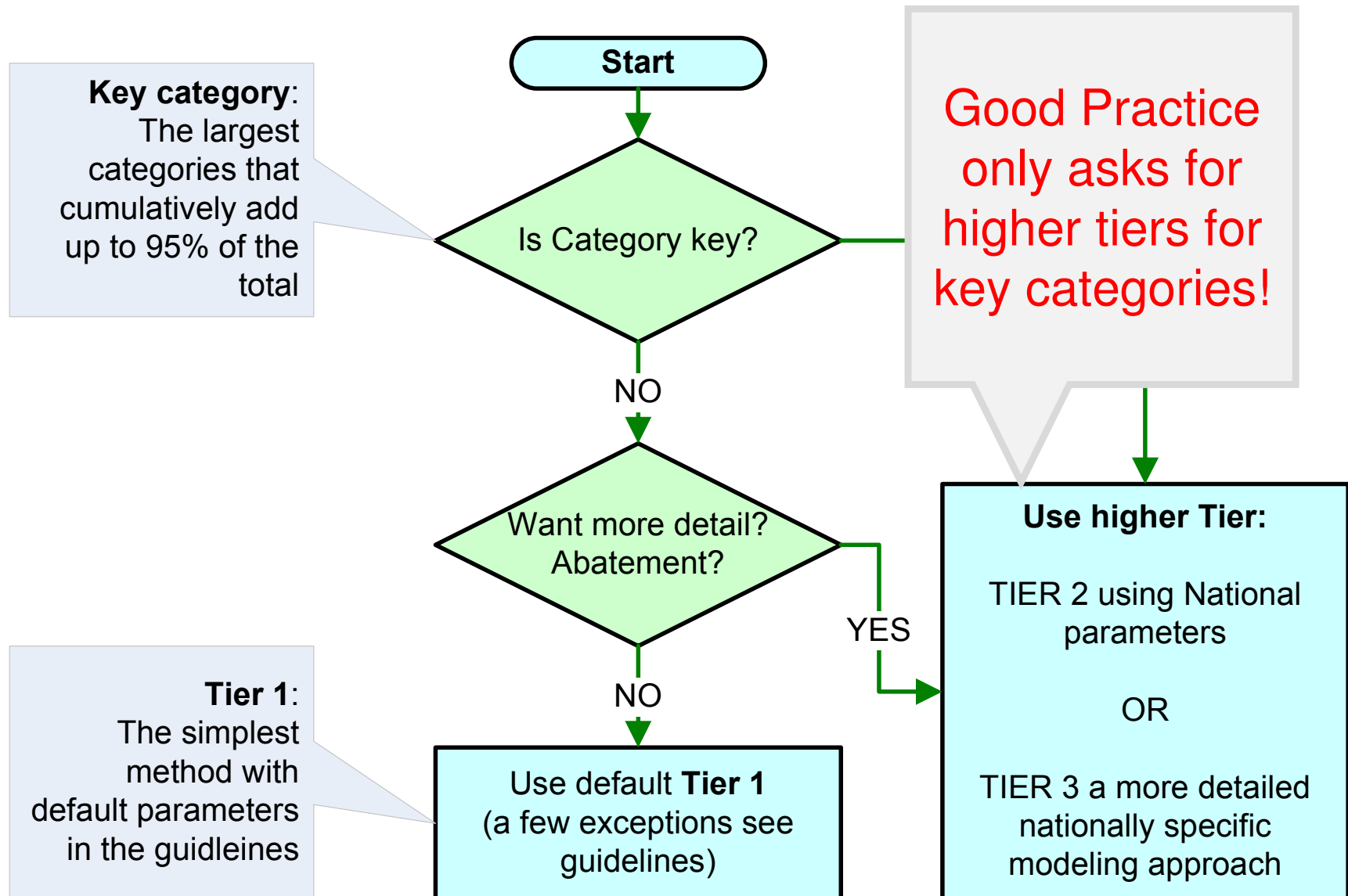


# National Systems

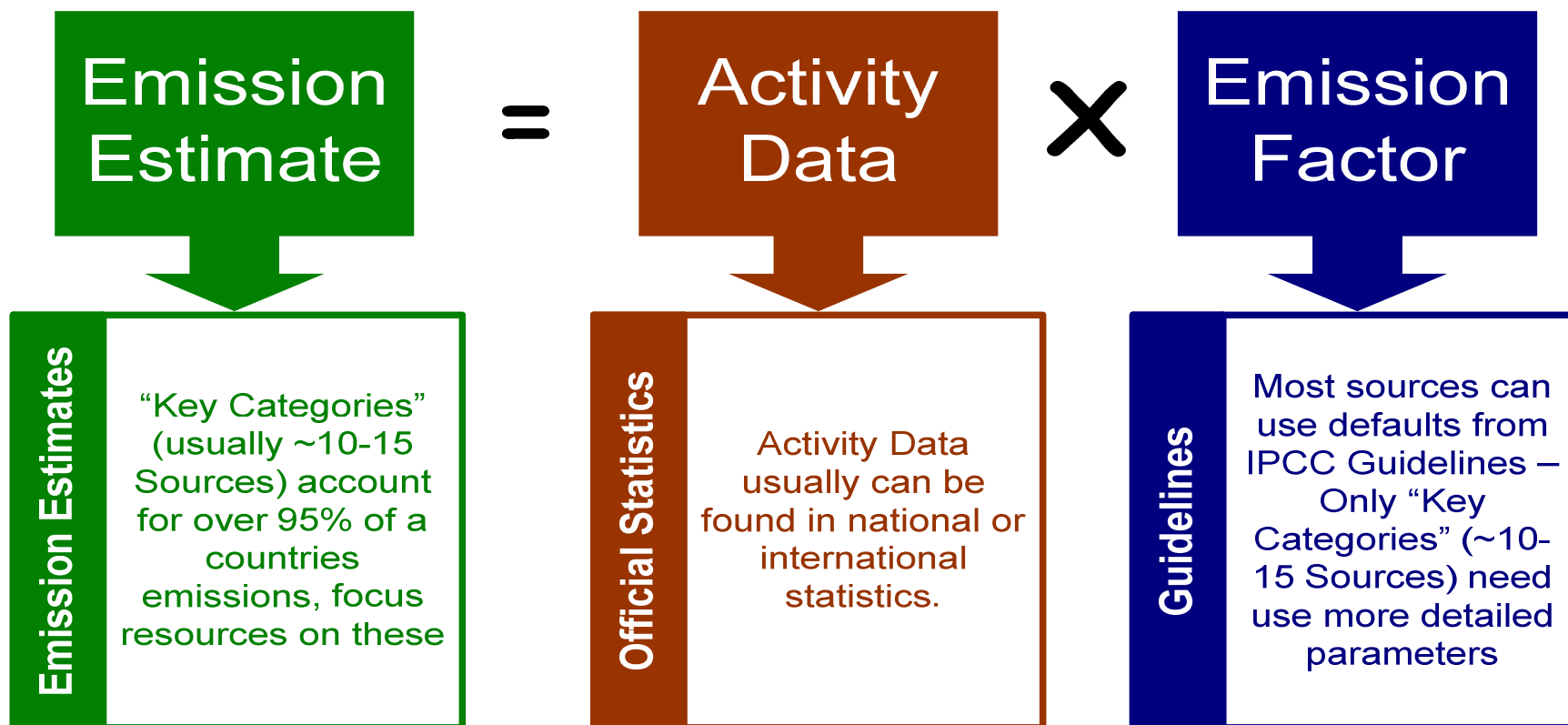
“Should be designed and operated to enable Parties included in Annex 1 to consistently estimate anthropogenic emission by all sources and removals by all sinks of all GHGs, as covered by the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and IPCC good practice guidance, in accordance with relevant decisions of the COP and/or COP/MOP”

*FCCC/CP/2001/13/Add13, Decision 20.CP.7 Annex 1 Art 9*

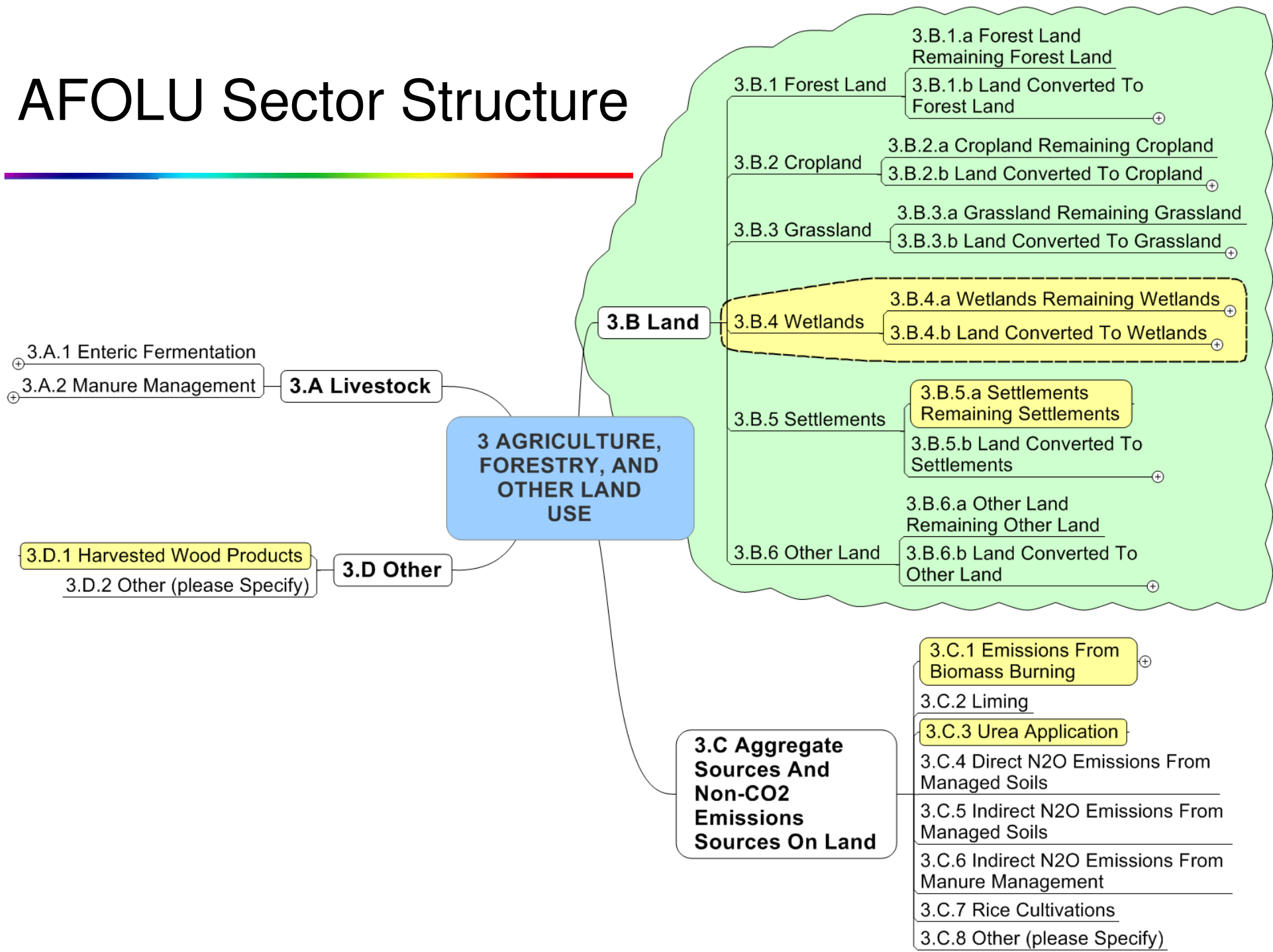
# Tiers and Key Categories



# Basic Method



# AFOLU Sector Structure



# Method - CO<sub>2</sub>, all Land Uses

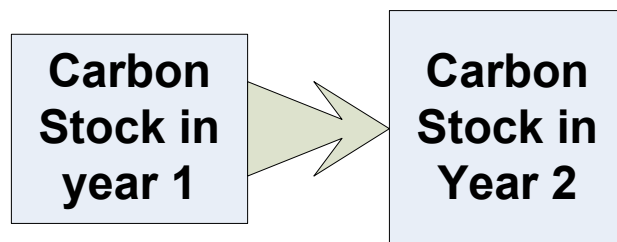
- There are large uncertainties in estimating fluxes of CO<sub>2</sub>.
- Direct measurements are extremely difficult (small differences of large numbers) and inherent heterogeneity.
- A practical first order approach is to make assumptions about effects of land use change on carbon stocks and the subsequent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

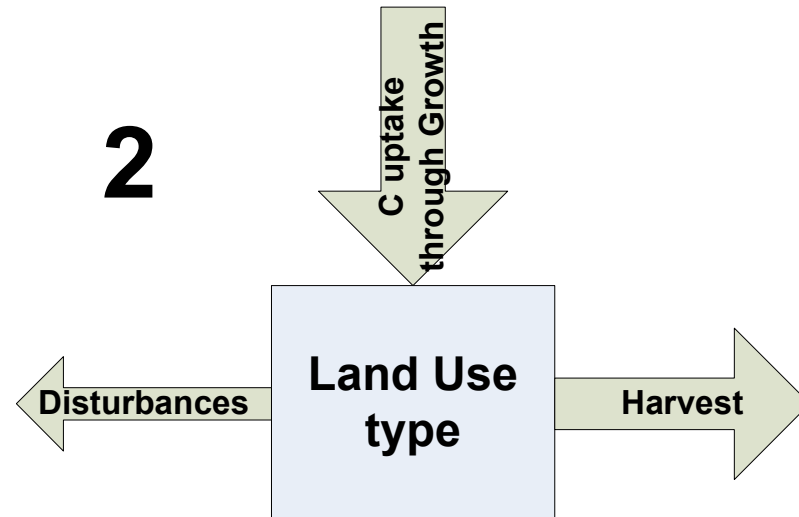
# Estimating Carbon Stock Changes

1



Difference between carbon stocks gives emission/removal

2

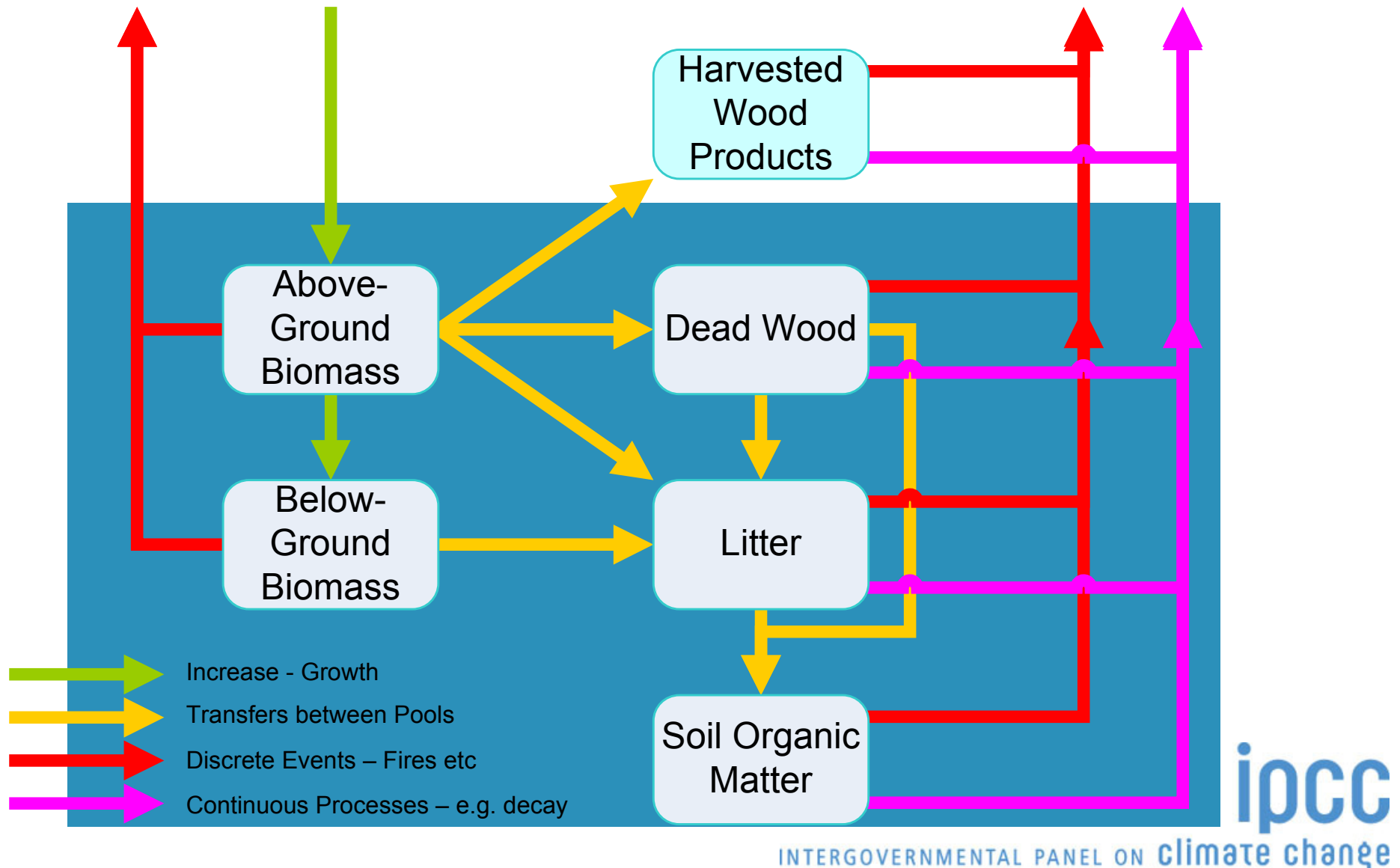


Emission/removal from sum losses and gains

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



# Carbon Pools and Flows (LULUCF & AFOLU)



# Land Use Data Needed

## “Emission Factors” and Other Parameters

- Conversion Factors such as:
  - Carbon content of wood
  - Conversion of above ground biomass to total biomass
  - Growth rates
- Guidelines have default values for different regions and ecosystems
- Country-specific data tend not to change annually

## “Activity” Data

- Data about the scale of activity:
  - Areas of forests
  - Areas converted
  - Areas undergoing types of management
  - Amounts Harvested
- Either from ground surveys, forest inventories or satellite data
- These change annually

# Gaps in Available Data

- Annual data may not be available so guidelines allow extrapolation
- In National inventories, only key categories need country-specific factors
  - IPCC can be used if resources limited and also to provide initial estimates for key category analysis
  - If estimates are for forests alone more country specific data may be needed to ensure accuracy
  - An incremental approach can build-up datasets over time
  - Focus on main sources
  - Inventory development should be incremental from year to year

# Summary

- IPCC Guidance is aimed at national, annual estimates
- IPCC Guidance is adopted by UNFCCC as it provides estimates that are:
  - Consistent between parties (annual and time series)
  - Transparent and understood
  - Takes account of resources and capacity
  - Provides common understanding
  - The best available default globally consistent methods
- AFOLU is not a major change from LULUCF in the 2003 GPG
  - To estimate forest emissions alone, need to consider higher tier methods
- Methods take account of limited resources
- Inventory development should be incremental from year to year – not a “one off”



# Thank you

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

Task Force on National Greenhouse Gas Inventories



**ipcc**  
INTERGOVERNMENTAL PANEL ON climate change

2006 IPCC Guidelines Category		Revised 1996 Guidelines & GPG LULUCF	
Name	Category	Category	Name
Enteric Fermentation	3.A.1	4.A	Enteric Fermentation
Manure Management	3.A.2	4.B	Manure Management
<i>These categories only include CO<sub>2</sub></i>	Forest Land	3.B.1	5.A (CO <sub>2</sub> Only)
	Grassland	3.B.2	5.B (CO <sub>2</sub> Only)
	Crop Land	3.B.3	5.C (CO <sub>2</sub> Only)
	Wetlands	3.B.4	5.D (CO <sub>2</sub> Only)
	Settlements	3.B.5	5.E (CO <sub>2</sub> Only)
	Other Land	3.B.6	5.F (CO <sub>2</sub> Only)
Biomass Burning in lands	3.C.1.a	Included in 5.A	Biomass Burning in Forestlands
Biomass Burning in Crop Lands ( <i>Note 1</i> )	3.C.1.b	4.F	Burning of Agricultural Wastes
		Included in 5.C	Biomass Burning in Crop Lands (Other)
Biomass Burning in Grasslands ( <i>Note 1</i> )	3.C.1.c	4.E	Burning
		Included in 5.B	Biomass Burning in Grasslands (Other)
Biomass Burning in All Other Lands	3.C.1.d	Included in 5.D, 5.E, 5.F	Biomass Burning in Wetlands, Settlements and Other Lands

2006 IPCC Guidelines Category		Equivalent Category in the Revised 1996 Guidelines PLUS GPG LULUCF	
Name	Category	Category	Name
Liming	3.C.2	5.A to 5.F	Liming
Urea Application	3.C.3	IE	Urea Application
Direct N <sub>2</sub> O Emissions from Managed Soils	3.C.4	4.D.1	Direct Soil Emissions
		4.D.2	And Paddock Manure
		Included in 5.A, 5.D, 5.E, 5.F	Direct N <sub>2</sub> O Emissions from N fertilisation in Forest Land And Other
Indirect N <sub>2</sub> O Emissions from Managed Soils	3.C.5	4.D.3	Indirect Emissions
Indirect N <sub>2</sub> O Emissions from Manure Management	3.C.6		
Rice Cultivations	3.C.7	4.C	Rice Cultivations
Other	3.C.8	4.D	Other sources of CH <sub>4</sub> and N <sub>2</sub> O on Land
HWP	3.D.1	5.G	HWP
Other	3.D.2	4.G	Other
		5.G (minus HWP)	Other

## **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



