

The IPCC 2006 Guidelines and their evolution from the Revised 1996 Guidelines

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Introduction

- Guidelines have evolved from 1996 to 2006
 - Have developed and improved as knowledge and experience increases
- Development of Good Practice Guidance (GPG) a major step forward
 - Complete, consistent, comparable, transparent, and accurate inventories taking account of available resources
 - Major change was from 1996 LUCF to GPG LULUCF
 - 1996 Guidelines focus main processes, LULUCF & AFOLU focus on all land-uses.
 - This increase in completeness and accuracy also increases data & resource needs.
 - In contrast, changes from LULUCF to 2006 Guidelines (AFOLU) are small
- 2006 Guidelines [2.5 years work, 250 authors]
 - Have 4 sectors to reduce double counting or omissions and improve transparency and completeness
 - Have improved methods and default data
 - Cover more greenhouse gases and give methods for more sectors
 - Have integrated good practice guidance for clarity and ease of use
 - Require similar resources to implement as the 1996 Guidelines plus the two volumes of GPG
 - Does not pre-empt accounting choices - all the information needed is retained
 - The best globally applicable methods



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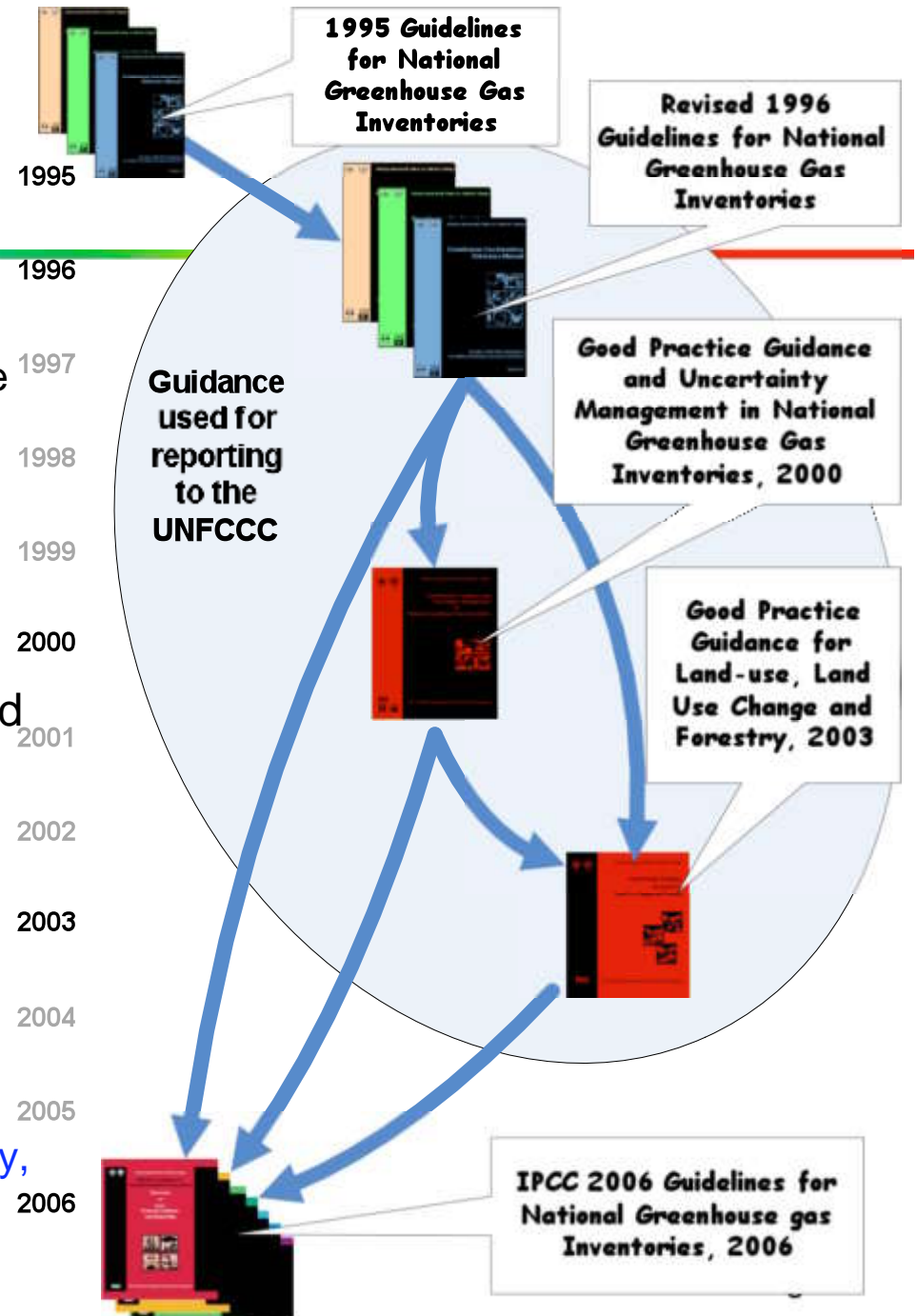
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History

- Revised 1996 Guidelines
 - Land-Use Change and Forestry (LUCF) identifies major land use processes
- 2000 Good Practice Guidance and Uncertainty Management
 - Defines GPG for sectors except LUCF
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG LULUCF)
 - Expanded guidance covering all pools
 - Land-based not process-based
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories
 - Now only 4 main sectors: Energy, IPPU (Industrial Processes and Product Use), AFOLU (Agriculture, Forestry and Other Land Use) and Waste





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Methodological approaches unchanged

- ✓ Continued from 1996 Guidelines, through GPG 2000 & LULUCF to 2006 Guidelines:

$$\text{Emission} = [\text{Emission Factor}] \times [\text{Activity Data}]$$

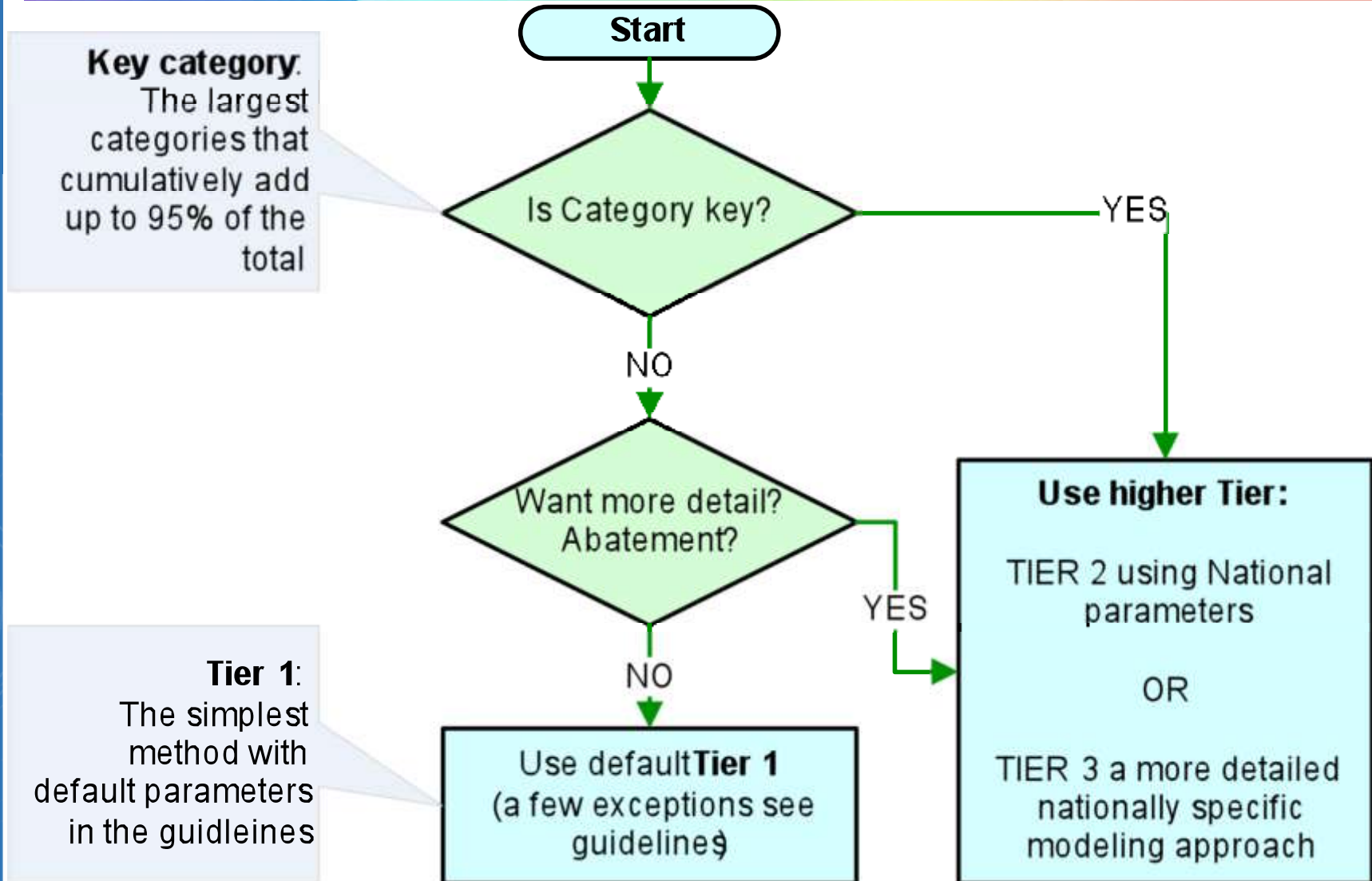
- In General:
 - Energy emissions
 - Based on carbon content of fuel
 - Industrial Processes
 - Based on chemistry of process
 - Some use mass balance of product used
 - Land Use
 - Stock changes \Rightarrow Emissions/Removals
 1. Inputs (e.g. growth) - outputs (e.g. decay, harvest)
 2. Total Stock at end minus Total stock at beginning
 - Waste
 - Tracks carbon (fossil & biogenic) in waste

GPG and Sectoral Guidance



- Good Practice inventories are defined as ***“those that contain neither over- nor under-estimates so far as can be judged, and in which uncertainties are reduced as far as is practical”***
- GPG retains consistency with Revised 1996 Guidelines and is **updated and expanded in the 2006 Guidelines**
 - Approaches to Data Collection

Tiers and Key Categories



“New” gases in 2006 Guidelines

– Sources Identified in 2006 Guidelines

By-product & fugitive emissions

	Electronics Industries	Magnesium production	Halogenated Compounds Production	GWP in TAR	GWP in AR4
nitrogen trifluoride (NF ₃)	✓		✓	✓	✓
trifluoromethyl sulphur pentafluoride (SF ₅ CF ₃)			✓	✓	✓
halogenated ethers (e.g. C ₄ F ₉ OC ₂ H ₅ , CHF ₂ OCF ₂ OC ₂ F ₄ OCHF ₂ , CHF ₂ OCF ₂ OCHF ₂)	✓		✓	✓	✓
CF ₃ I, CH ₂ Br ₂ , CHCl ₃			✓	✓	
CH ₂ Cl ₂ , CH ₃ Cl			✓	✓	✓
C ₃ F ₇ C(O)C ₂ F ₅		✓	✓		
C ₄ F ₆ , C ₅ F ₈ , c-C ₄ F ₈ O	✓		✓		

Carbon Dioxide Equivalence

- IPCC Guidelines do not specify any particular parameters to convert mass of a gas to a equivalent mass of CO₂ – users need to choose
 - e.g. Kyoto Protocol uses GWP from IPCC SAR with 100 year time horizon
 - IPCC also has newer GWP values in TAR and AR4
 - Alternatives to GWP have been discussed
- Used only for:
 - IPPU to aggregate the various fluorinated gases
 - Key Category Analysis
 - Uncertainty Assessment



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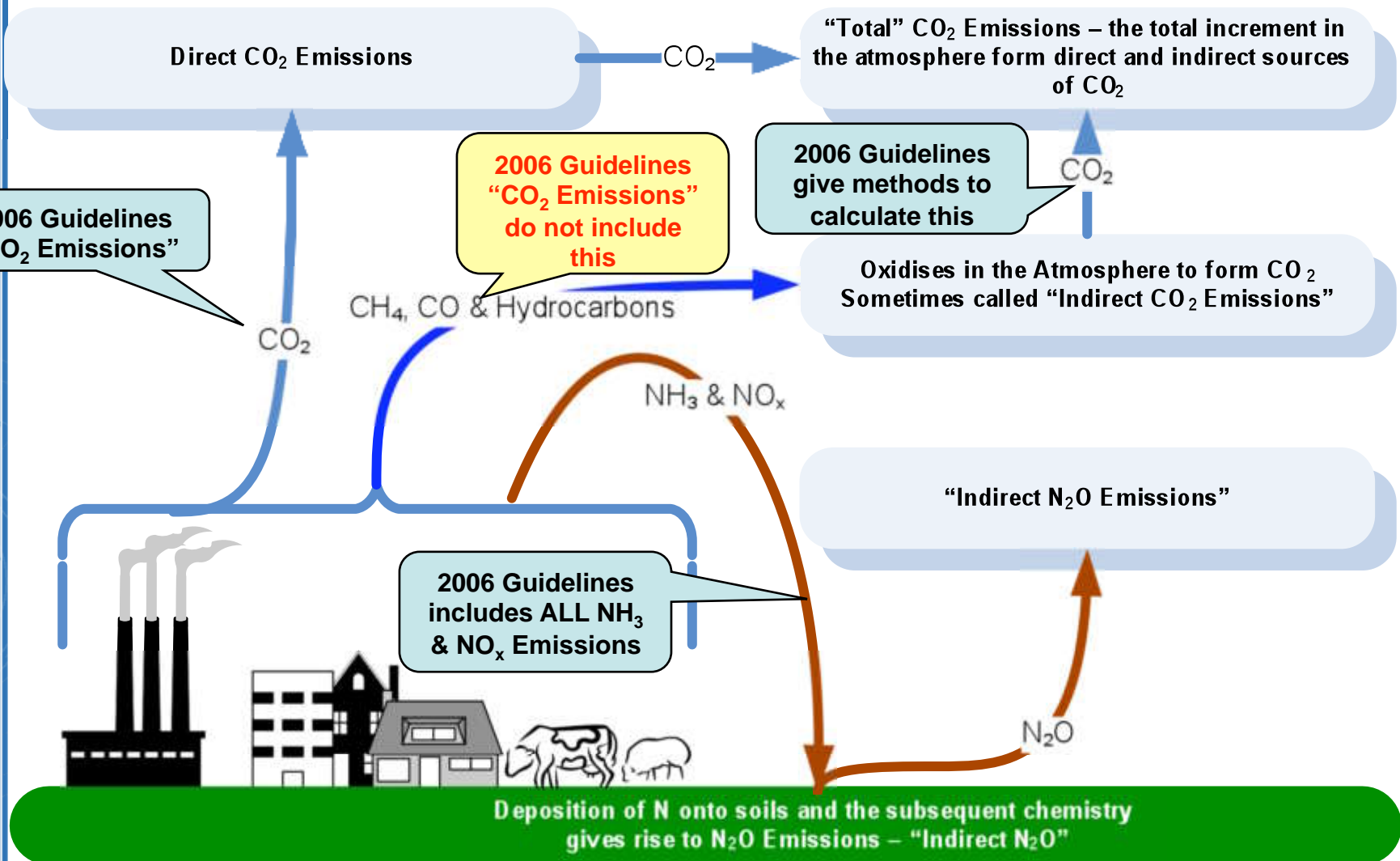


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Direct & Indirect Emissions: CO₂ and N₂O





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Estimation of Actual Annual Emissions

- In the 1996 Guidelines and Good Practice Guidance for a few sources, the simplest methodology estimates a “potential emission” rather than the actual annual emission.
 - *This “potential emission” assumes all the emissions from an activity occur in the current year, ignoring the fact they will occur over many years (e.g. methane emissions from waste in landfills occurs over decades as the decay processes take place).*
- In the 2006 Guidelines, simple default methods estimate emissions when they occur, thus removing the need for potential emissions.
- The removal of potential emission estimates also allows the emission reductions of abatement techniques to be properly estimated and ensures that the Tier 1 methods are compatible with higher tier methods. The areas where this occurred are:
 - *Actual emissions of fluorinated compounds*
 - *Methane from landfills*



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New Guidance in 2006 Guidelines

Fuel Combustion

- CO₂ -Transport and Storage
- Urea-based Catalysts (Road Transport)

Fugitive Emissions from Fuels

- Abandoned Underground Mines

Mineral Industry

- Glass Production
- Ceramics
- Non Metallurgical Magnesia Production

Chemical Industry

- Caprolactam, Glyoxal & Glyoxylic Acid
- Titanium Dioxide Production
- Petrochemical and Carbon Black Production

Metal Industry

- Lead Production
- Zinc Production

Electronics Industries

- Integrated Circuit or Semiconductor
- TFT Flat Panel Display
- Photovoltaics
- Heat Transfer Fluid

Other Product Manufacture and Use

- Electrical Equipment
- Military Applications
- Accelerators
- Medical Applications
- Propellant for Pressure and Aerosol Products

Substitutes for Ozone Depleting Substances

Land Use

- Complete, consistent treatment of fires
- Liming
- Settlements remaining Settlements
- Some wetlands categories
- Urea Application
- Indirect N₂O Emissions from Manure
- Harvested Wood Products

Waste

- Open Burning of Waste
- Biological Treatment of Solid Waste

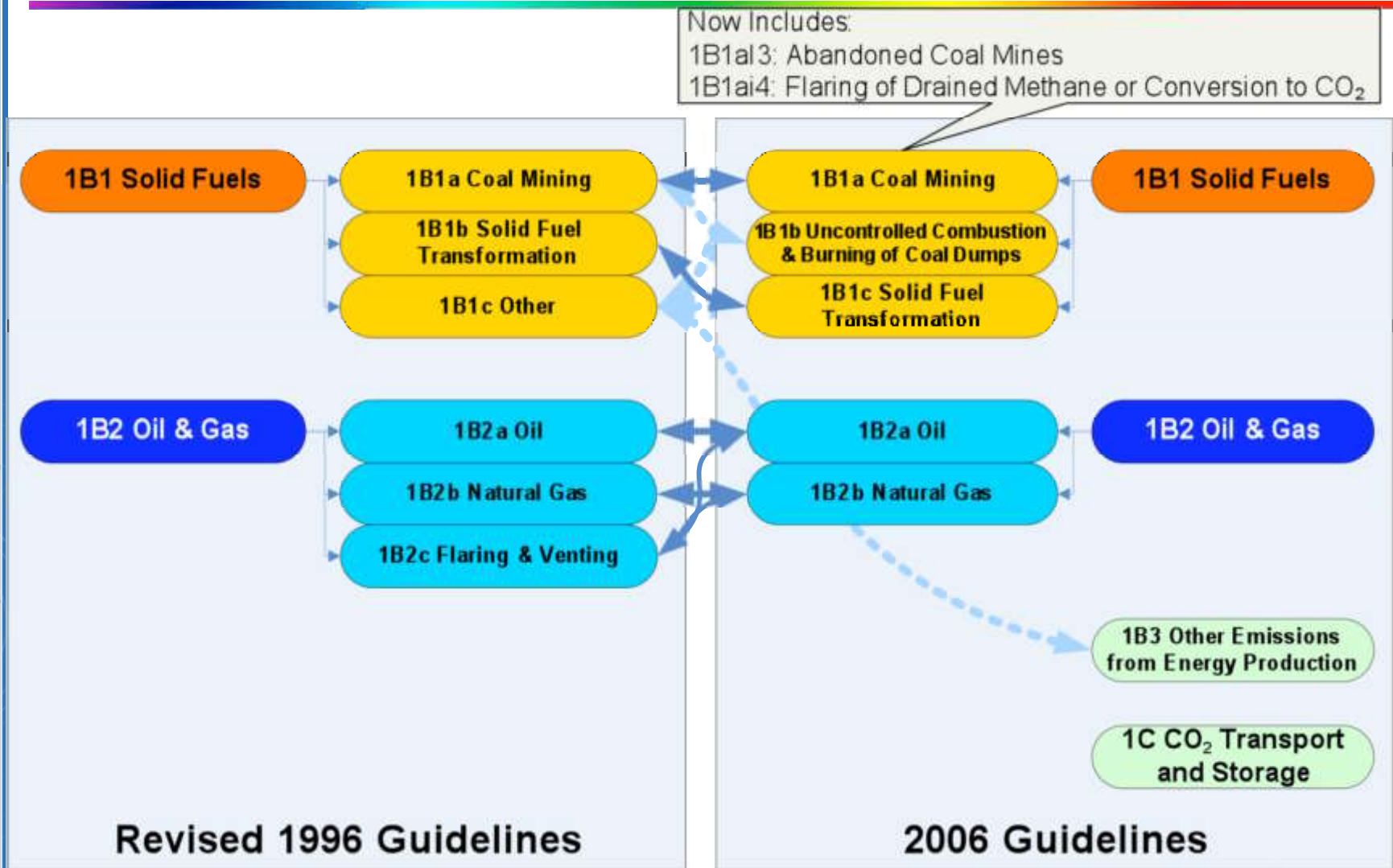
Other

- Indirect N₂O Emissions from the Atmospheric Deposition of N (excluding agriculture)

Energy Sector – Fuel Combustion

- Methods and categories largely unchanged
- Improved default emission factors for fossil fuel use,
 - based on survey of global data
 - uncertainties derived from range of data
- 1A2 “Manufacturing Industries and Construction” – suggested list of sub-categories to be reported, extended to include:
 - Mining (excluding fuels) and Quarrying, Wood and Wood Products, Construction, Textile and Leather
- New category: Road transport: Urea-based catalysts

Energy Sector – Fugitive Emissions



Carbon Dioxide Capture and Storage

- The impact of Carbon Dioxide Capture and Storage (CCS) is covered comprehensively in the 2006 Guidelines:
 - fugitive losses from CO₂ capture and transport stages (estimated using conventional inventory approaches)
 - any losses from carbon dioxide stored underground (estimated by a combination of modelling and measurement techniques, - which would also be monitored for management purposes).
 - no assumptions of leakage rates are made
 - methods reflect the actual emissions in the year in which they occur.
 - methods are consistent with the IPCC Special Report on Carbon Dioxide Capture and Storage (2005).
 - CO₂ captured from combustion of bio-fuels, are included in the inventory as a “negative emission” so that no distinction is needed between any subsequent leakage of this CO₂ and that of CO₂ from fossil sources.



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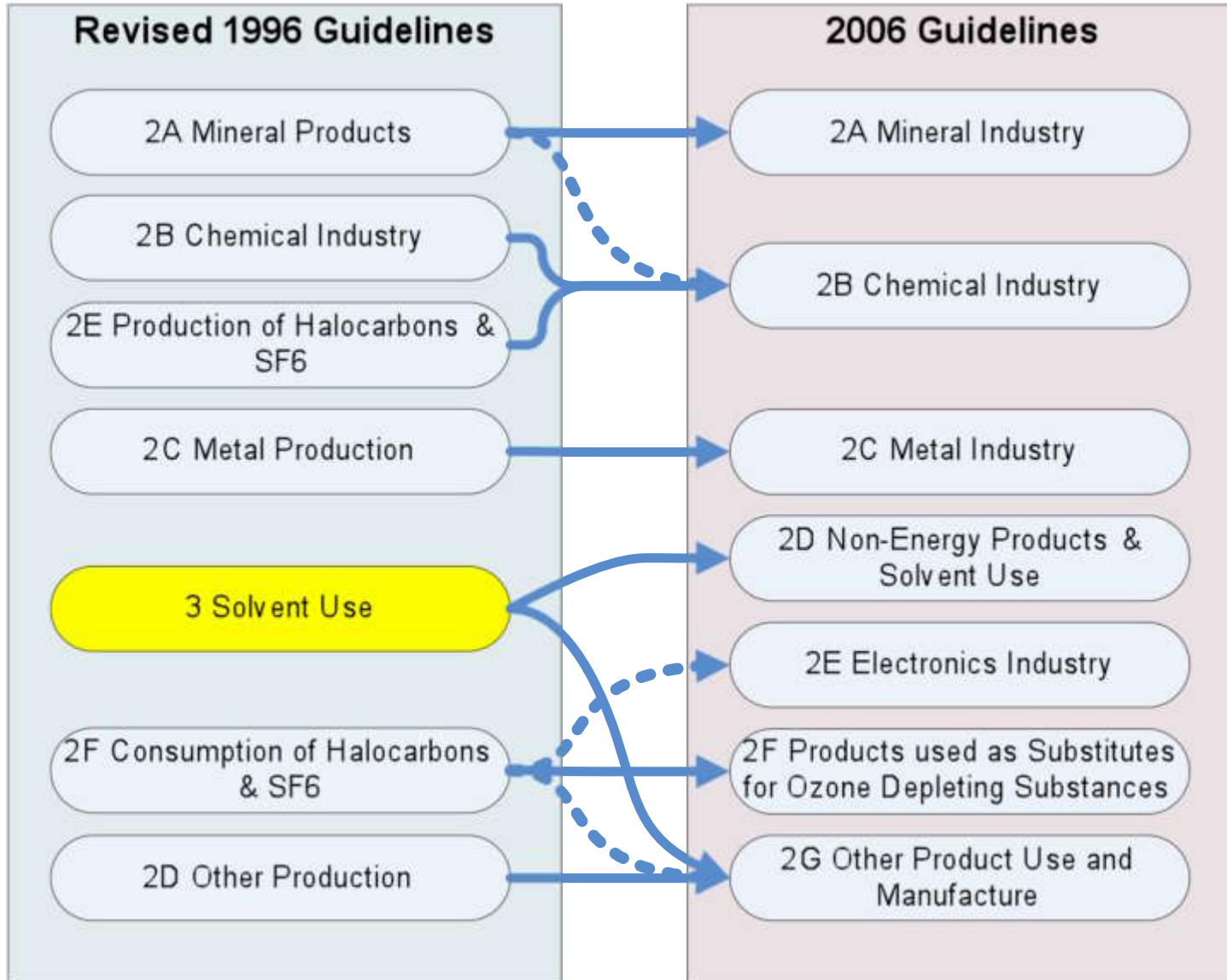
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IPPU ≈ Industrial Processes + Solvent Use

- Solvent Use does not have much direct GHG emissions (it is mainly NMVOC) while the use of products is broader than solvent use and can result in emissions
- Quantities of CO₂ for later use and short-term storage should not be deducted from CO₂ emissions except when the CO₂ emissions are accounted for elsewhere in the inventory
 - e.g. urea and methanol production
 - Ensures completeness and consistency,
- Non-Energy Uses of Fossil Fuels
 - Guidance on demarcation between the Energy and Industrial Processes and Product Use sectors has been improved,
 - Emissions from non-energy uses of fossil fuels are now reported under IPPU, rather than in Energy.
 - A method has been introduced for checking the completeness of carbon dioxide emission estimates from the non-energy uses.
- To increase transparency several sources that were combined in other categories are reported separately in the 2006 Guidelines

Industry & Solvent Classification



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

1996 Revised IPCC Guidelines

Agricultural Soils

Prescribed Burning of Savannas

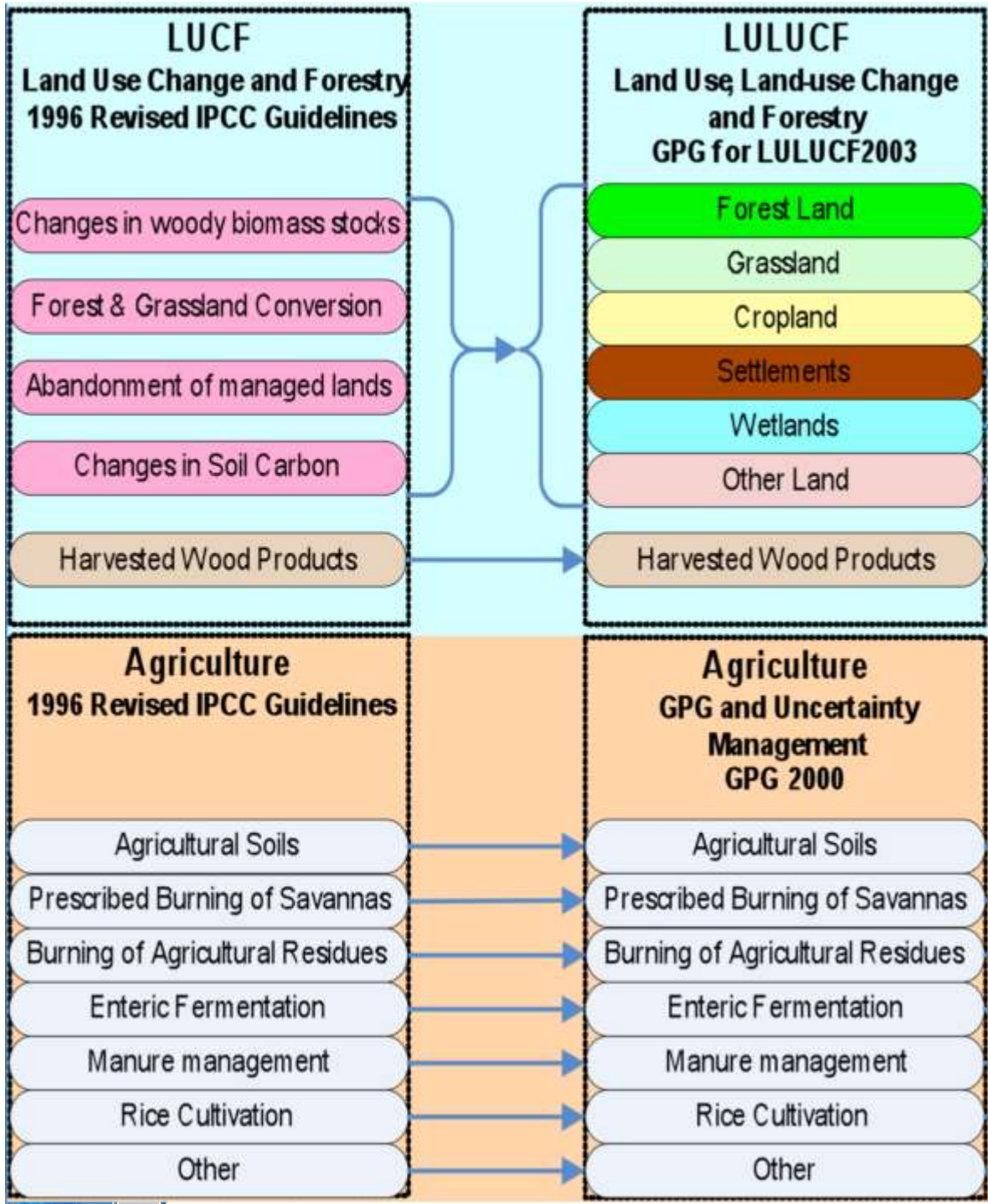
Burning of Agricultural Residues

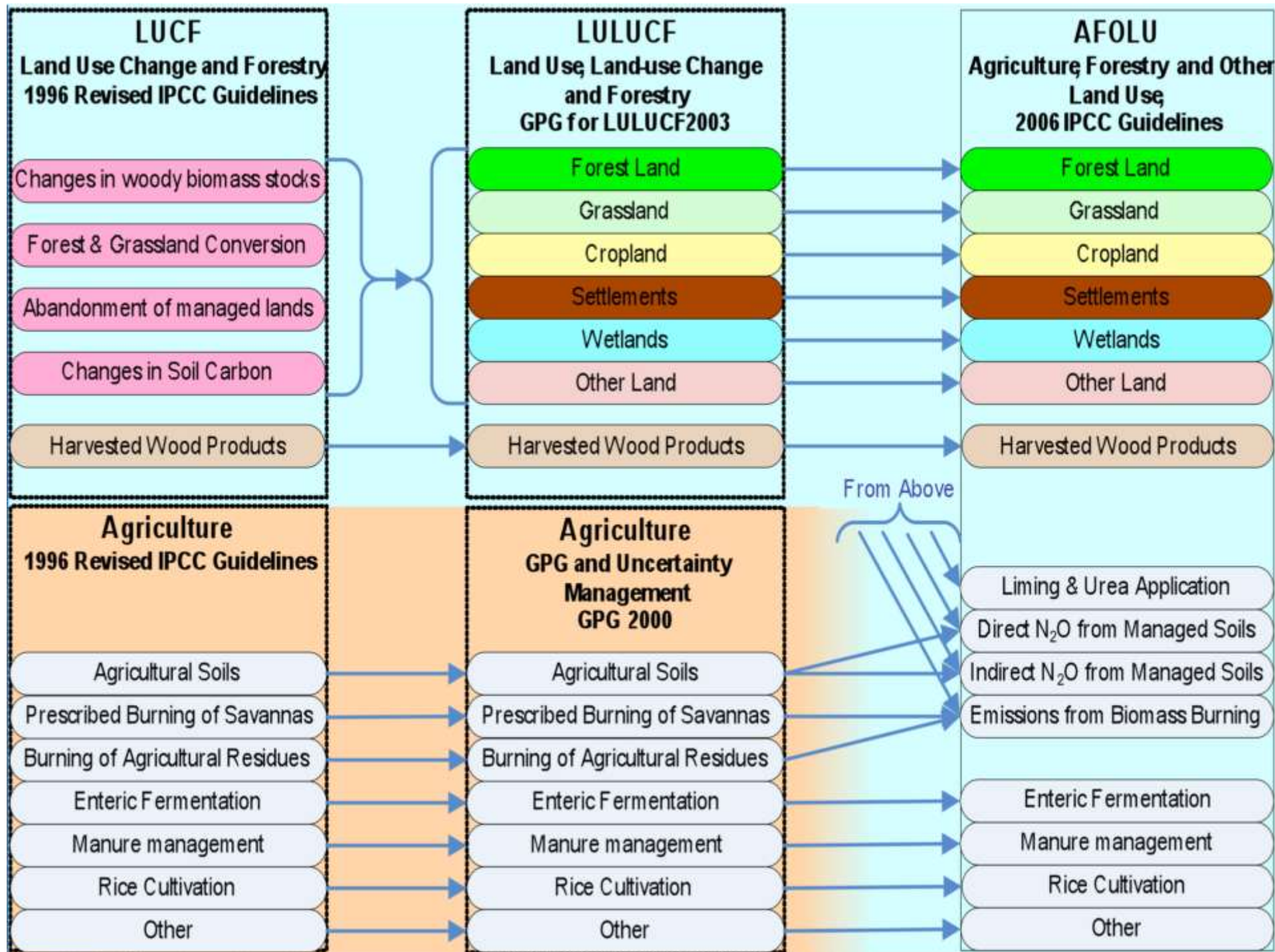
Enteric Fermentation

Manure management

Rice Cultivation

Other







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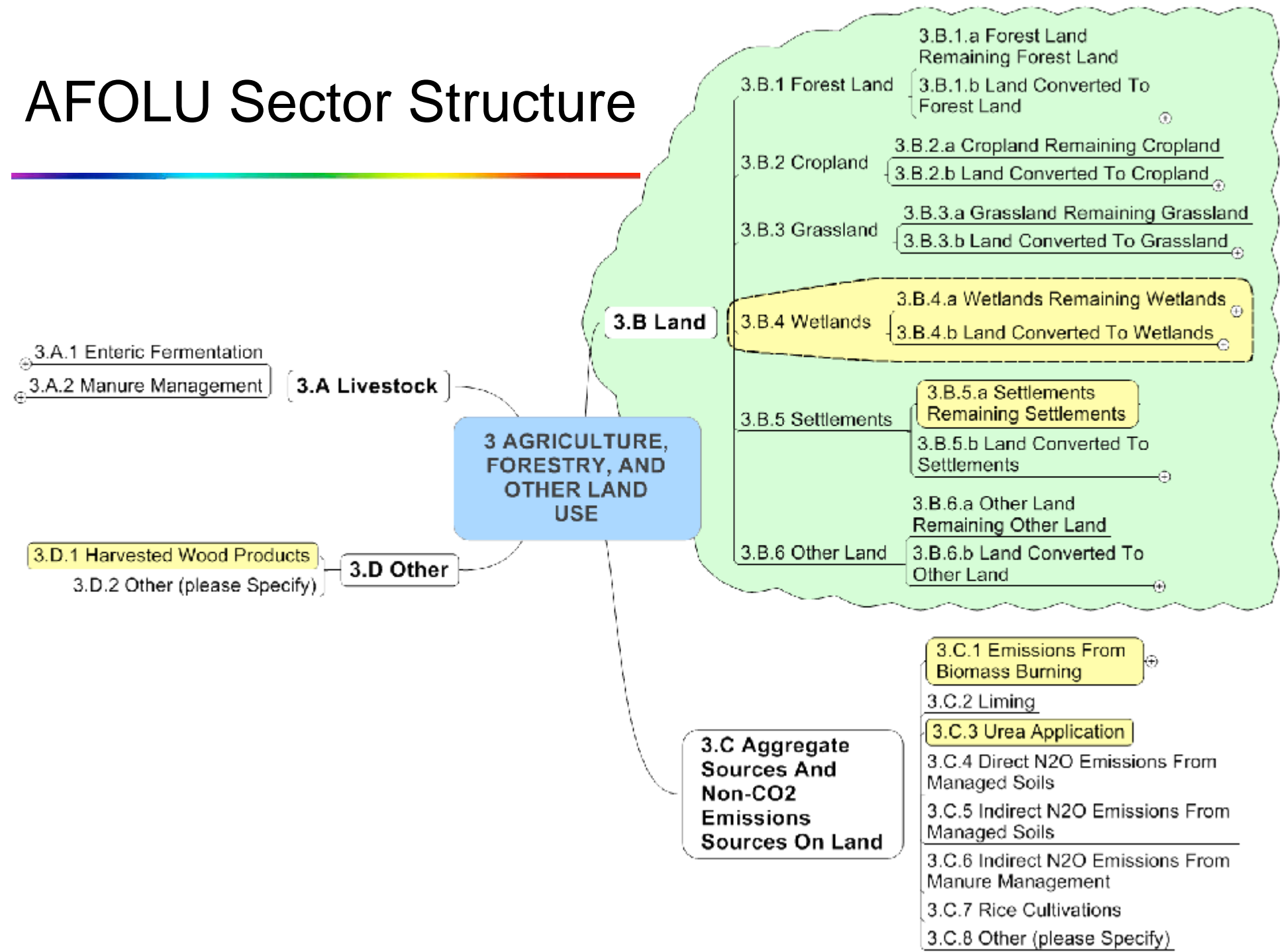
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Improvements in AFOLU Guidance

- **Wetlands**
 - 2006 GL has complete coverage of peatlands
 - 2006 GL improved coverage of flooded lands but some guidance is incomplete and awaits further scientific investigation
- **Fires**
 - Guidelines have increased consistency and coverage of fires
 - All emissions from fires reported in a separate category for increased transparency
- *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 introduced 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

AFOLU Sector Structure



Waste

- Landfill sites Solid Waste Disposal
 - New Tier 1 model (spreadsheet available)
 - Only estimate actual emissions at all Tiers
- New guidance for Biological Treatment of Waste
 - Previously reported under “Other”
- 2006 GL has separate categories for “Uncategorised Waste Disposal Sites” and “Open Burning of Waste”

Summary

- ✓ **The same basic methodological approaches are used from 1996 Guidelines, through GPG 2000 & GPG LULUCF to 2006 Guidelines**

- ✓ **The 2006 Guidelines maintain the methods of earlier guidelines and integrate GPG**
 - Improved guidance in some areas, more and improved default data
 - Wider coverage of gases
 - Additional sources covered
 - All estimates are now of actual annual emissions (“potential” emissions not needed)
 - Categories simplified and clarified in some areas
 - Do not pre-empt accounting choices - all the information needed is retained



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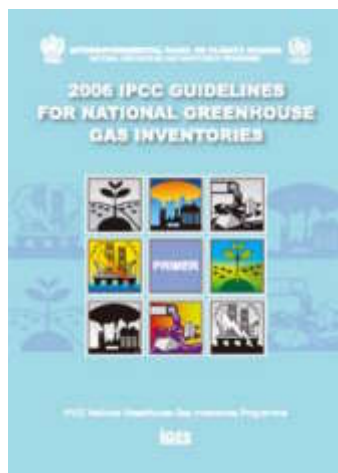
Summary

- ✓ **Energy Largely Unchanged**
 - ❖ Improved defaults for fossil fuel combustion
 - ❖ Some additional categories
 - e.g. CCS, Road Transport Urea Catalysts, uncontrolled burning of coal dumps
 - Fugitive Emission categories simplified and clarified

- ✓ **IPPU**
 - ❖ More process emissions identified
 - ❖ Chemical production and use coverage clarified

- ✓ **Integration of agriculture & LULUCF reduces chance of double counting or omissions – some simplification of categories**
 - ❖ The AFOLU Guidance in the 2006 Guidelines maintains the basic structure, definitions and methods of the GPG LULUCF
 - ❖ Mapping between the GPG and the 2006 Guideline classification is straightforward.
 - ❖ AFOLU effort and data requirements much the same as for LULUCF & Agriculture

- ✓ **Waste Largely Unchanged**
 - ❖ Significant improvement to default method for landfills.



Thank you

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

