United Nations Framework Convention on Climate Change

National GHG Inventories:

Transitioning from the Revised 1996 to 2006 IPCC Guidelines for National GHG Inventories

CGE webinar for the Asia-Pacific region on 22 April 2020

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- These presentation materials to explain the contents of the 2006 IPCC Guidelines:
  1) are based on the presentations (except presentation on QA/QC) delivered by the Technical Support Unit of the Task Force on National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC TFI TSU) in the *Africa Regional Workshop on the Building of Sustainable National Greenhouse Gas Inventory Management Systems, and the use of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (Swakopmund, Namibia, 24-28 April 2017);
  2) have not been subject to a formal IPCC review process http://www.ipcc.ch/pdf/ipcc-principles/ipcc-principles-appendix-a-final.pdf; and
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- The CGE acknowledges the inputs from, and expresses its appreciation to, the IPCC TFI TSU.

Overview of GHG inventories, IPCC Guidelines, Good Practice Guidance

Contents

- What are national GHG inventories? And why we need it?
- Why do we need inventory guidelines?
- How to estimate?
- Credibility and good practices
- IPCC inventory guidelines evolution
- UNFCCC rules and practices

What are national GHG inventories?

- Estimates of all emissions (and removals) of particular gases from given sources from a defined region in a specific period of time.

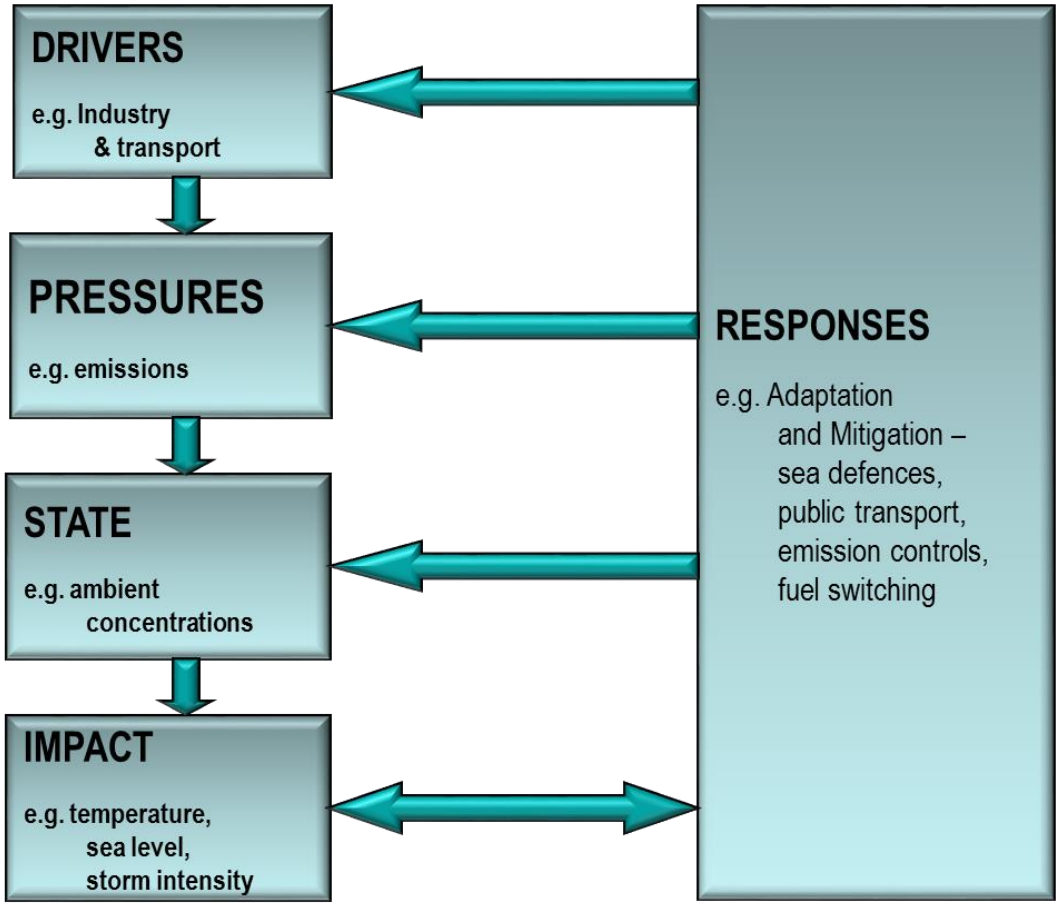
- Here we are dealing with:
  - Greenhouse Gases,
  - National Estimates,
  - Annual Estimates.

Why?

- Scientific Understanding
  - Input to models
  - Understand link between environmental pollution and effects to sources of pollution

- Policy
  - Before any pollution problem can be efficiently controlled we need to know the sources and amounts emitted
  - To help develop cost-effective policy
  - To monitor progress towards policy goals
  - To inform the public

DPSIR


DRIVERS
e.g. Industry & transport
PRESSURES
e.g. emissions
STATE
e.g. ambient concentrations
IMPACT
e.g. temperature, sea level, storm intensity
RESPONSES
e.g. Adaptation and Mitigation – sea defences, public transport, emission controls, fuel switching

Why do we need inventory guidelines?

- Any international agreement to limit climate change must set emission limits/targets/goals and monitor progress in an open and transparent way
- Currently, most national emissions can only be estimated, not measured and so we need a consensus on the best way of doing this.
  - Cannot measure all sources (e.g. road transport would be impractical; Remote sensing techniques not available)
- To do this we need reliable, generally accepted methods and guidelines

How?

- Make estimates based on parameters associated with emission rates
  - CO_2 from fuel depends on carbon in fuel
  - CO_2 proportional to amount of fuel burnt
  - Changes on stocks of carbon in forests give emissions (or removals) of CO_2

$$E = EF \bullet AD$$

- Where:
  - E = Emission
  - EF = Emission Factor
  - AD = Activity Data

Credibility

- As these are **estimates** we need to ensure they are **credible**

- **Verification**
  - Checking that the numbers are correct – that they reflect the unbiased emissions

- **Validation**
  - Checking that the estimates are compiled correctly in the way they are supposed to be done
  - Needs a common methodological framework and inventory management

Good Practice (1)

- 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/practicable*
  - Gives a way to manage uncertainties
  - Identifies main “KEY” categories to focus resources
  - Documentation provides transparency

Good Practice (2)

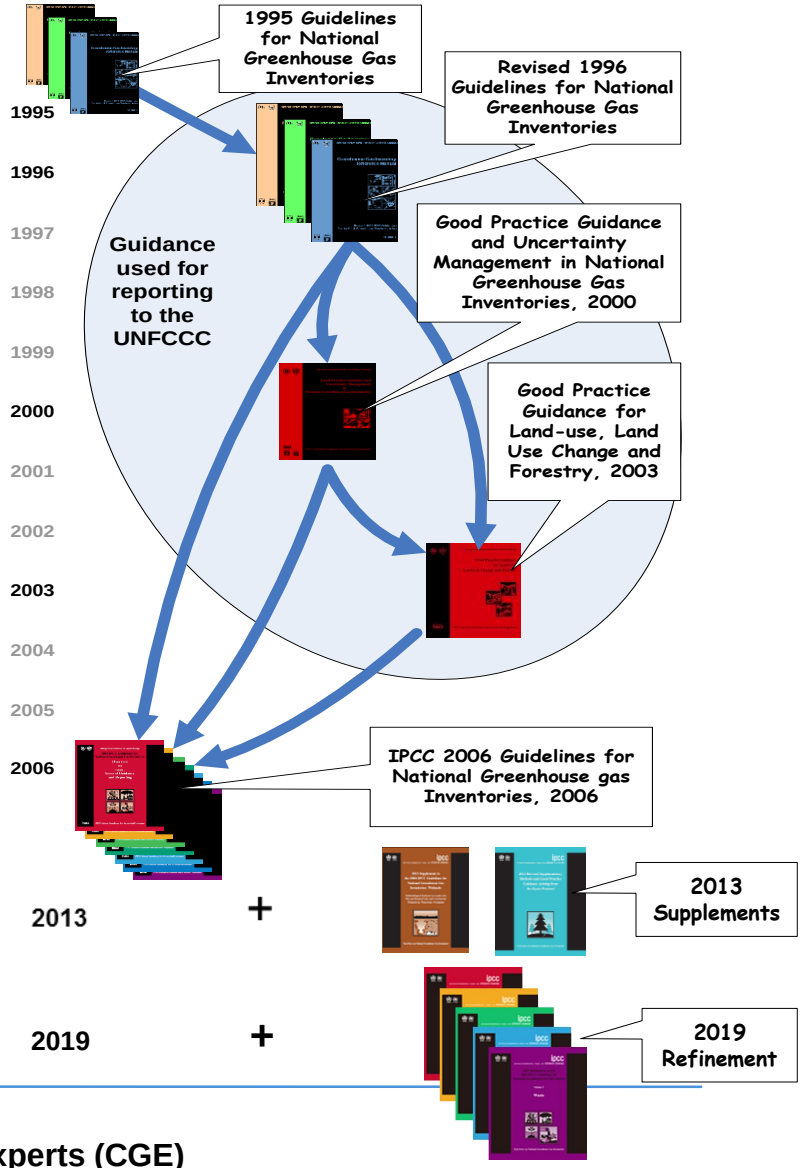
- IPCC Good Practice gives guidance on
  - Approaches to Data Collection
  - Uncertainty Evaluations
  - Key Category Analysis and Methodological Choice
  - Recalculations
  - Quality Control and Quality Assurance
  - Review
  - Documentation

Good Practice (3)

- Supports the development of inventories that are:
  - Transparent
  - Documented
  - Consistent over time
  - Complete
  - Comparable
  - Assessed for uncertainties
  - Subject to quality control and assurance
  - Efficient in the use of resources available to inventory agencies
  - In which uncertainties are gradually reduced as better information becomes available

IPCC Inventory Guidelines

- Guidelines have evolved from 1996 to 2006
- Development of Good Practice Guidance (GPG) was 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
- 2006 Guidelines [2.5 years work, 250 authors]
  - Have 4 sectors
  - Have improved methods and default data
  - Cover more greenhouse gases and methods
  - Integrate GPG
  - Require similar resources
  - Do not pre-empt accounting choices
  - The best globally applicable methods



IPCC Inventory Guidelines

Refinement in 2019 +

New Supplementary Guidance in 2013 +

Non-Annex I Parties are encouraged to use GPGs.

Non-Annex I Parties should use 1996 Guidelines. (Annex to Decision 17/CP.8)

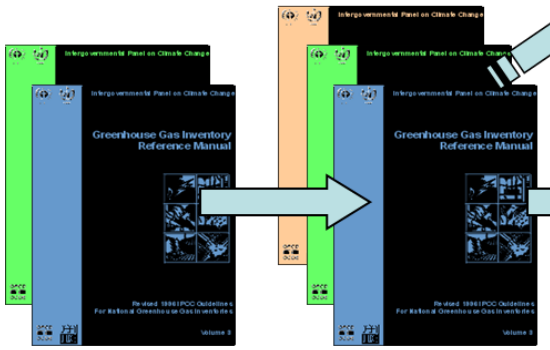
GPG2000 (non-LULUCF)

GPG2003 (LULUCF)

Annex I Parties must use from 2015 (Annex to Decision 24/CP.19)

2006 IPCC Guidelines

Revised 1996 IPCC Guidelines



Actually, 2006 Guidelines are being used by more and more Non-Annex I Parties.

Revision/Update by the IPCC

2006 Guidelines being used by NAI Parties

- At the 42nd Session held in June 2015, the Subsidiary Body for Implementation (SBI) of the UNFCCC concluded under the agenda item on "Reporting from Parties not included in Annex I to the Convention":
  - "The SBI noted the requests from non-Annex I Parties for further technical support aimed at improving their domestic capacity to facilitate continuity in meeting reporting requirements through training on the use of the ***2006 IPCC Guidelines for National Greenhouse Gas Inventories***, …" (FCCC/SBI/2015/10, paragraph 29)

2006 Guidelines shall be used by all Parties under PA

- "Katowice Climate Package" was adopted by the UNFCCC COP24/CMA1 in December 2018 to operationalize the Paris Agreement.
- Decision 18/CMA.1 "Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement" stipulates in its Annex, paragraph 20:
  - "**Each Party shall use the *2006 IPCC Guidelines***, and shall use any subsequent version or refinement of the IPCC guidelines agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA). Each Party is encouraged to use the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*." (FCCC/PA/CMA/2018/3/Add.2)

Technical considerations regarding the transitioning from IPCC 1996 Guidelines to 2006 Guidelines

Contents

- 2006 IPCC Guidelines – general guidance and sectoral guidance

- Difference between 1996 Guidelines/GPG reports and 2006 Guidelines
  - ✓ General guidance
  - ✓ Energy Sector
  - ✓ IPPU Sector
  - ✓ AFOLU Sector
  - ✓ Waste Sector

- New guidance (new categories)

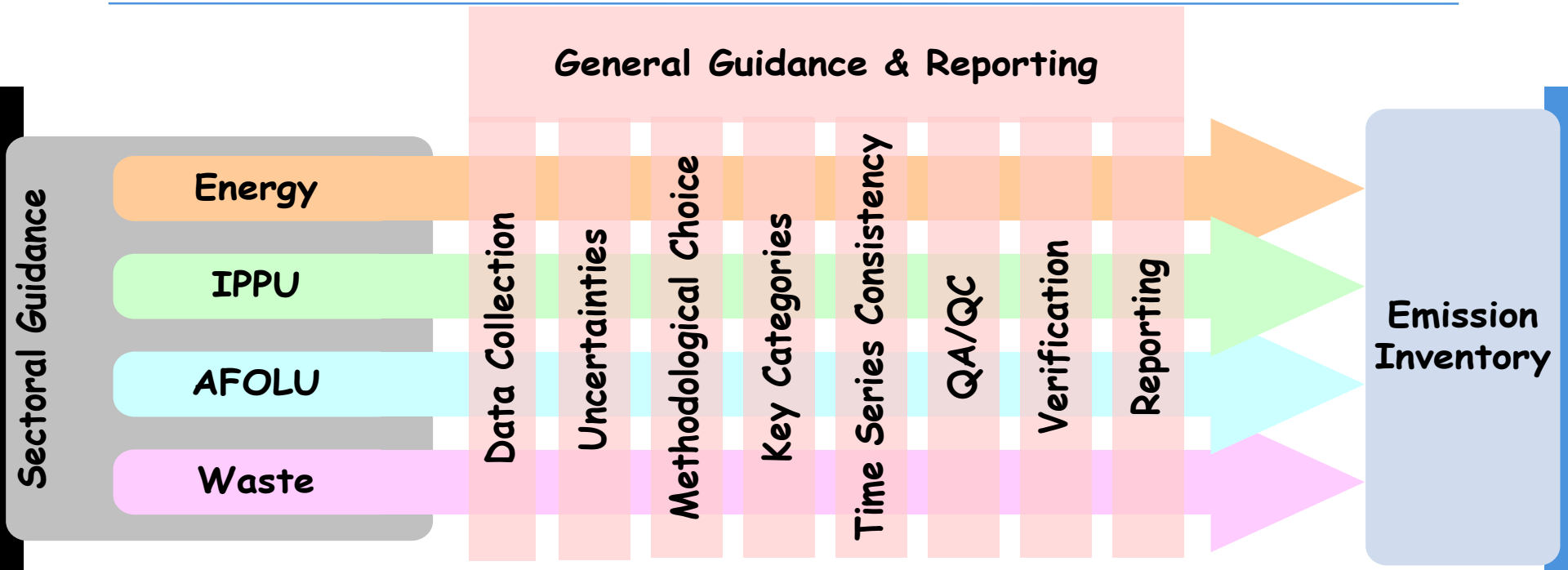
- Consideration on how to transit from 1996 Guidelines to 2006 Guidelines

- Consideration on **reporting** under the UNFCCC/Paris Agreement
  - ✓ Reporting under the current MRV system
  - ✓ Reporting under the ETF of Paris Agreement

2006 IPCC Guidelines for National GHG Inventories

- Consists of 5 volumes:
  - **Vol.1 General Guidance and Reporting**
  - **Vol.2 Energy**
  - **Vol.3 Industrial Processes and Product Use (IPPU)**
  - **Vol.4 Agriculture, Forestry and Other Land Use (AFOLU)**
  - **Vo.5 Waste**
- "Industrial Processes" and "Solvent and Other Product Use" Sectors in the 1996 Guidelines are combined into "IPPU".
- "Agriculture" and "(Land Use,) Land-Use Change and Forestry" Sectors in the 1996 Guidelines are combined into "AFOLU".
- Although the number of sectors in the 2006 Guidelines has been reduced from six to four, this is not accompanied by any great changes in methodological approaches at the individual category level except for land categories in AFOLU.

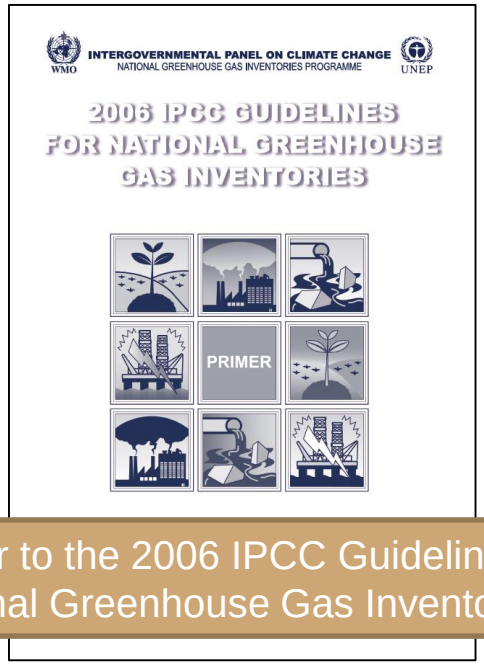
General Guidance and Sectoral Guidance



- 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 possible/practicable"***
- General guidance retains consistency with Revised 1996 Guidelines and is updated and expanded in the 2006 Guidelines
  - Approaches to Data Collection

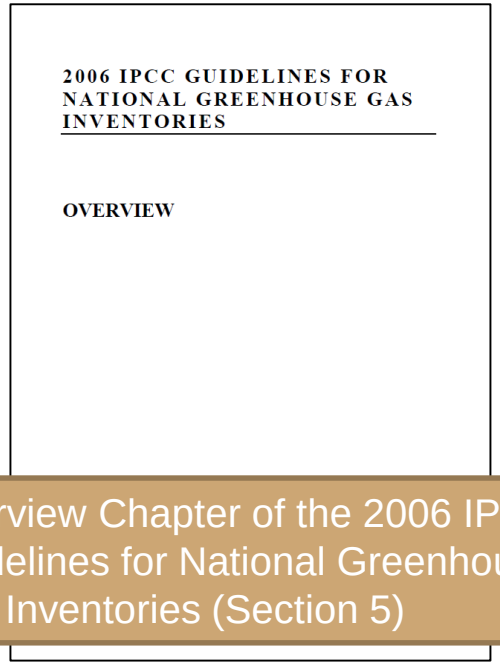
Difference: 1996 Guidelines/GPG and 2006 Guidelines

- Key differences between the Revised 1996 IPCC Guidelines/Good Practice Guidance reports (2000, 2003) and the 2006 IPCC Guidelines are explained in, e.g., the following materials.



Primer to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

https://www.ipcc-nggip.iges.or.jp/support/Primer_2006GLs.pdf



Overview Chapter of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Section 5)

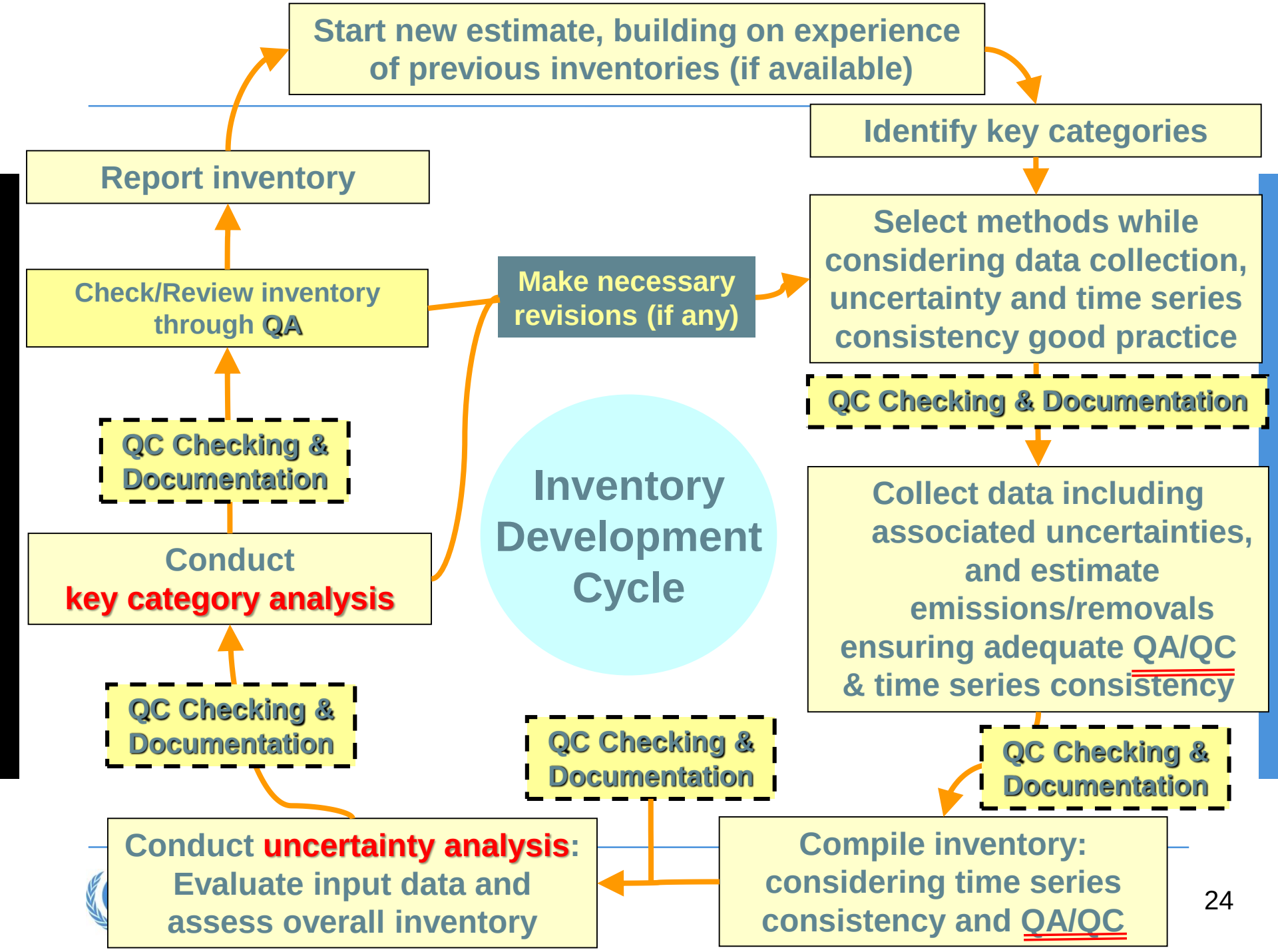
https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/0_Overview/V0_1_Overview.pdf

General Guidance

- Elaborated general guidance has been included which is applicable to all sectors and helps overall inventory management, such as:
  - ✓ Approaches to data collection
  - ✓ Uncertainty analysis
  - ✓ Key category analysis
  - ✓ Time series consistency
  - ✓ Quality assurance and quality control (QA/QC)

Updated from GPG2000/GPG-LULUCF

- The general guidance enables continuous improvement through a systematic inventory development cycle.
- Inventory compilers using GPG2000/GPG-LULUCF are expected to be already familiar with most of the elements of general guidance


Start new estimate, building on experience of previous inventories (if available)
Identify key categories
Select methods while considering data collection, uncertainty and time series consistency good practice
QC Checking & Documentation
Collect data including associated uncertainties, and estimate emissions/removals ensuring adequate QA/QC & time series consistency
QC Checking & Documentation
Compile inventory: considering time series consistency and QA/QC
QC Checking & Documentation
Conduct uncertainty analysis: Evaluate input data and assess overall inventory
QC Checking & Documentation
Conduct key category analysis
QC Checking & Documentation
Check/Review inventory through QA
Make necessary revisions (if any)
Report inventory
Inventory Development Cycle

Energy Sector

- The changes from 1996 Guidelines are minimal.
- Two new sources have been added:
  - ✓ Urea-Based Catalysts
  - ✓ Carbon Dioxide Transport and Storage
- More details have been provided particularly for:
  - ✓ Fuel Combustion Activities – Manufacturing Industries and Construction
  - ✓ Fugitive Emissions from Fuels – Oil and Natural Gas

More explanation can be found in:

- ➢ Page 10 of Overview Chapter of the 2006 IPCC Guidelines
- ➢ Page 18 of the Primer to the 2006 IPCC Guidelines

IPPU Sector

- The whole sector has been restructured.
- There are various categories that were not present in the Revised 1996 IPCC Guidelines: some were previously included in other categories while for the others new guidance is provided.
- Emissions from the Non-Energy Use of fuels are made in this Sector rather than in the Energy Sector.

More explanation can be found in:

- Page 11 of Overview Chapter of the 2006 IPCC Guidelines
- Page 18 of the Primer to the 2006 IPCC Guidelines
- Annex 3 to Vol.3 of the 2006 IPCC Guidelines (“Improvements since 1996”)

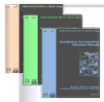
AFOLU Sector

- The GPG-LULUCF (2003) introduced a new approach for the “Land Use, Land-Use Change and Forestry” (LULUCF) Sector with a new classification of these categories. (It is based on land use types rather than activities.)
- The 2006 IPCC Guidelines maintain the same structure as GPG-LULUCF for land categories. Therefore inventory compilers already using the GPG-LULUCF should have no problems.
- More detailed guidance has been added for various categories, including livestock categories, harvested wood products (HWP), etc.

More explanation can be found in:

- Page 11 of Overview Chapter of the 2006 IPCC Guidelines
- Page 19 of the Primer to the 2006 IPCC Guidelines
- Chapter 1 of Vol.4 of the 2006 IPCC Guidelines (“Introduction”)

Evolution of IPCC Guidance on agriculture, forestry and other land-use



1996 IPCC GLs

- **Agriculture** and **Land Use and Change and Forestry** (LUCF) **separate** sectors
- Only the most important activities resulting in GHG emissions/removals
- Implicit assumption about estimating emissions and removals only over lands subject to human intervention
- Only accounted for above-ground biomass and soil C pools

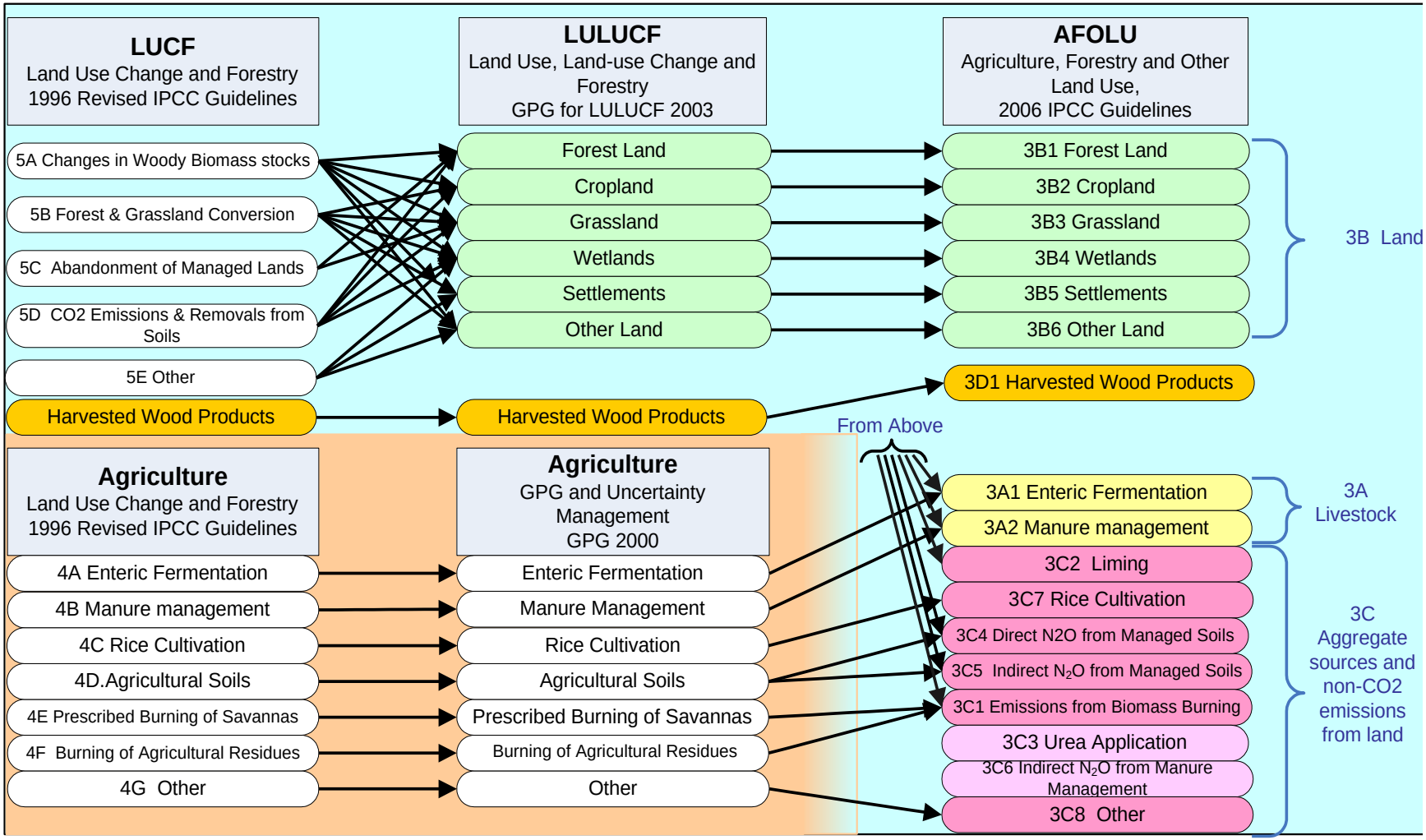
GPG & GPG-LULUCF

- **Agriculture** and **Land Use, Land-use Change and Forestry** (LULUCF) **separate** sectors
- Provides ***good practice*** and uncertainty management guidance
- Now includes all land use emissions/ removals split into six land-use categories from all pools
- Explicit Use of ***managed*** land as a proxy for anthropogenic emissions/removals

2006 IPCC Guidelines

- **Agriculture** and **Land Use and Change and Forestry** (LUCF) combined into a **single sector Agriculture, Forestry and Other Land Use** (AFOLU)
- Same approach as GPG-LULUCF
- Retained use of ***managed*** land proxy
- Inclusion and consolidation of several previously optional categories
- Refinement of methods and improved defaults

Evolution of IPCC Guidance on Agriculture and LUCF/LULUCF



Waste Sector

- The scope is similar to the earlier guidelines (Revised 1996 IPCC Guidelines and GPG2000).
- Sources that were not explicitly included in the earlier guidelines have been added to complement the guidance to cover all major waste management practices:
  - ✓ Biological treatment of solid waste
  - ✓ Open burning of waste
  - ✓ Septic tanks and latrines

More explanation can be found in:

- ➢ Pages 11-12 of Overview Chapter of the 2006 IPCC Guidelines
- ➢ Page 20 of the Primer to the 2006 IPCC Guidelines

“New” Guidance in 2006 Guidelines

Fuel Combustion
- CO_2 -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 N_2O Emissions from Manure
- Harvested Wood Products

Waste
- Open Burning of Waste
- Biological Treatment of Solid Waste

Other
- Indirect N_2O Emissions from the Atmospheric
- Deposition of N (excluding agriculture)

Transition

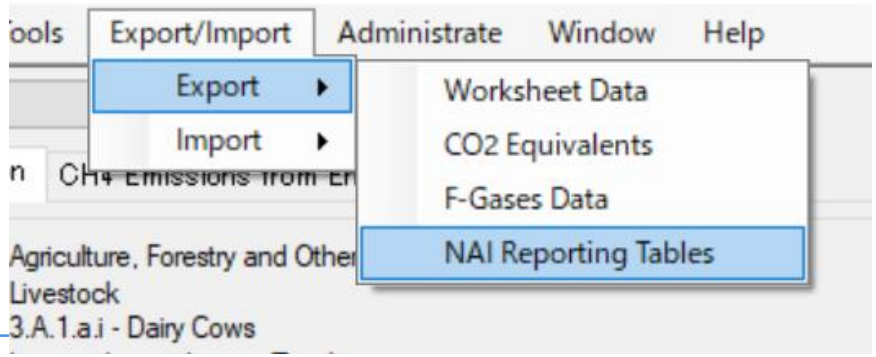
- For the categories that were present in the Revised 1996 IPCC Guidelines:
  - ✓ The data and data sources currently used can be used in many cases.
  - ✓ For some categories, even Tier 1 method has been modified. In that case, activity data and other data need to be changed.
  - ✓ Where default emission factors are used, they should be replaced with the updated ones in the 2006 IPCC Guidelines.
  - ✓ For the categories identified as “key categories”, data may need to be changed to use higher Tier methods.
- For the categories that were not present in the Revised 1996 IPCC Guidelines:
  - ✓ Inventory compilers firstly need to investigate whether the GHG sources relevant to those categories exist in the country.
  - ✓ If they exist, sources of activity data and other data need to be identified.
  - ✓ Default emission factors in the 2006 IPCC Guidelines can be used for the first estimates. They should be changed if those categories are identified as “key categories” later.

Reporting under the current MRV system

- The inventory section of the biennial update report (BUR) should consist of a national inventory report as a summary or as an update of the information contained in chapter III (National greenhouse gas inventories) of the annex to **decision 17/CP.8**, including **table 1 and table 2**. (Annex III to Decision 2/CP.17)

Following the **1996 Guidelines** Source/Sink categories

- **IPCC Inventory Software** help inventory compilers prepare GHG inventories following the 2006 IPCC Guidelines. It has a function to produce "**NAI reporting tables**" whose format follows tables 1 and 2 of annex to decision 17/CP.8. (https://www.ipcc-nggip.iges.or.jp/software/index.html)
- **Annex 1 to the User Manual of IPCC Inventory Software** shows the details on **mapping** of the emission estimates based on the 2006 IPCC Guidelines to the "NAI reporting tables".



Reporting under the ETF of Paris Agreement

- Modalities, procedures and guidelines for the enhanced transparency framework for action and support (ETF) referred to in Article 13 of the Paris Agreement (Annex to Decision 18/CMA.1) stipulates:
  - ✓ Each Party shall use the 2006 IPCC Guidelines with regard to methodologies, parameters and data. (Paragraph 20)
  - ✓ Each Party shall report the following sectors: **energy**, **industrial processes and product use**, **agriculture**, **LULUCF** and **waste**. (Paragraph 50)

Not as a single sector “AFOLU”!!

- Common reporting tables under the ETF are still under development. Details of reporting are therefore yet to be decided. However, it may be worth noting:
  - ✓ Category codes will be different from those in the 2006 IPCC Guidelines.
  - ✓ Developed country Parties are already using the 2006 IPCC Guidelines and reporting agriculture and LULUCF sectors separately.

Thank you