

# The Quality Assurance / Quality Control (QA/QC) Plan



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

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## **What will this presentation achieve?**

*Describe the important aspects of a QA/QC plan, share lessons from our experience, review/design a draft QA/QC plan for your inventory work.*





1. Introduction to QA/QC
2. Overview of the Template Workbook
3. Who, What, When, Where
4. Lessons Learned from the U.S. Approach to QA/QC



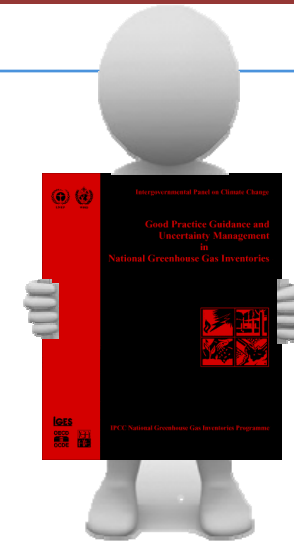


"Countries can benefit from applying the [IPCC] good practice guidance as it provides useful guidance for selecting methods (tiered approaches), emission factors and activity data. It helps, inter alia, in selecting appropriate methods and emission factors, in quantifying and analyzing uncertainty, in determining key categories, in recalculating emissions data, and in setting up ***quality assurance and quality control plans***."



## What is Quality Assurance?

Planned system of review, and sometimes audit, procedures conducted by personnel *not involved* in the inventory development process



IPCC GPG 2000

**Reviews**, preferably by **independent third parties**, are performed on a **finalized inventory** following implementation of the Quality Check (QC) procedures to:

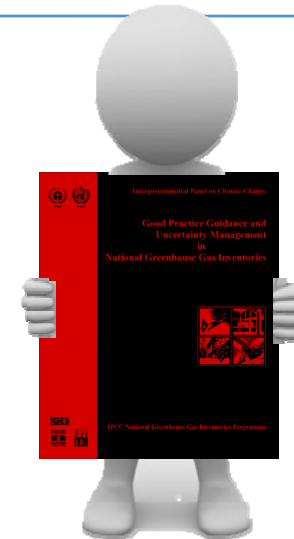
- **Verify the data quality objectives** defined by the inventory agency were met
- Ensure that the inventory represents the **best possible estimates** of emissions and sinks given current scientific understanding and data availability
- Support the QC program





## What is Quality Control?

System of routine, planned technical activities implemented by inventory development team to measure and control the quality of the inventory as it is being prepared, including:



IPCC GPG 2000

- Checks to ensure data integrity, correctness and completeness
- Checks to identify errors and omissions
- Checks on data acquisition and calculations and the use of approved standardized procedures for emissions calculations, emissions measurements, estimating uncertainties, documentation, archiving and reporting
- Technical reviews of data, methods and results





## Key Components of QA/QC

- Inventory agency responsible for coordinating QA/QC activities (develops QA/QC plan)
- General QC procedures
- Source/sink category-specific QC procedures
- Coordinating QA procedures
- Reporting, documentation, and archiving procedures





## Discussion question:

*What quality control, quality assurance procedures do you currently have in place?*

*How was this managed under the SNC Inventory?*

*When do you implement them?*







### Example QC Procedures

Check that units are properly labeled	Reproduce a representative sample of emissions calculations	Check that estimates are reported for all source categories and for all years
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How many of these checks can be done?  
How will they be prioritized?





Which procedures will be conducted annually?

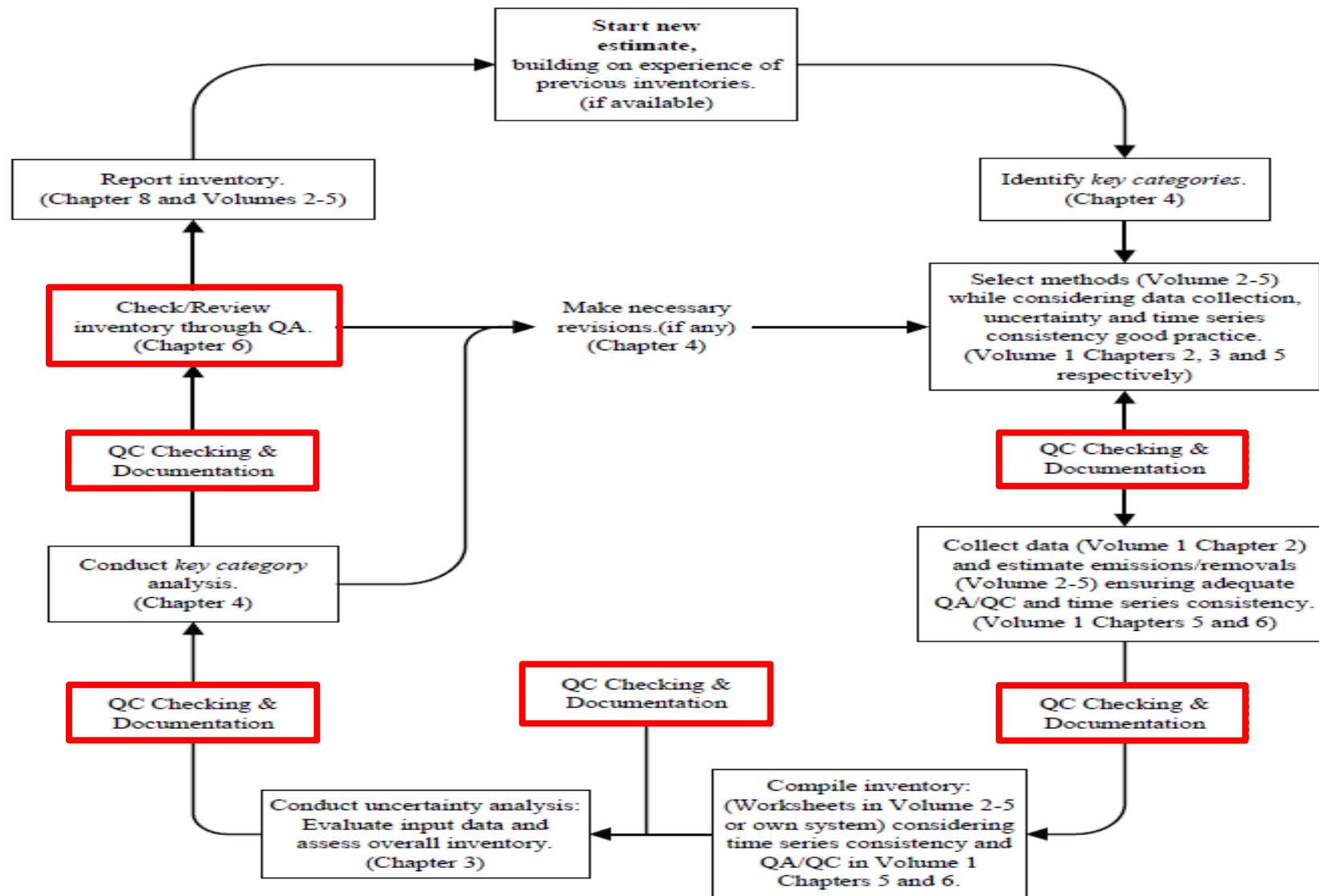
- a) Consider inventory cycle?

What level of QC is needed annually?

- a) Data updates
- b) A sample of data and calculations from each sector should be checked each year
- c) QC should be performed prior to expert review

How Often to Perform QC			
Biannual?	Annual?	Biennial?	Triennial?





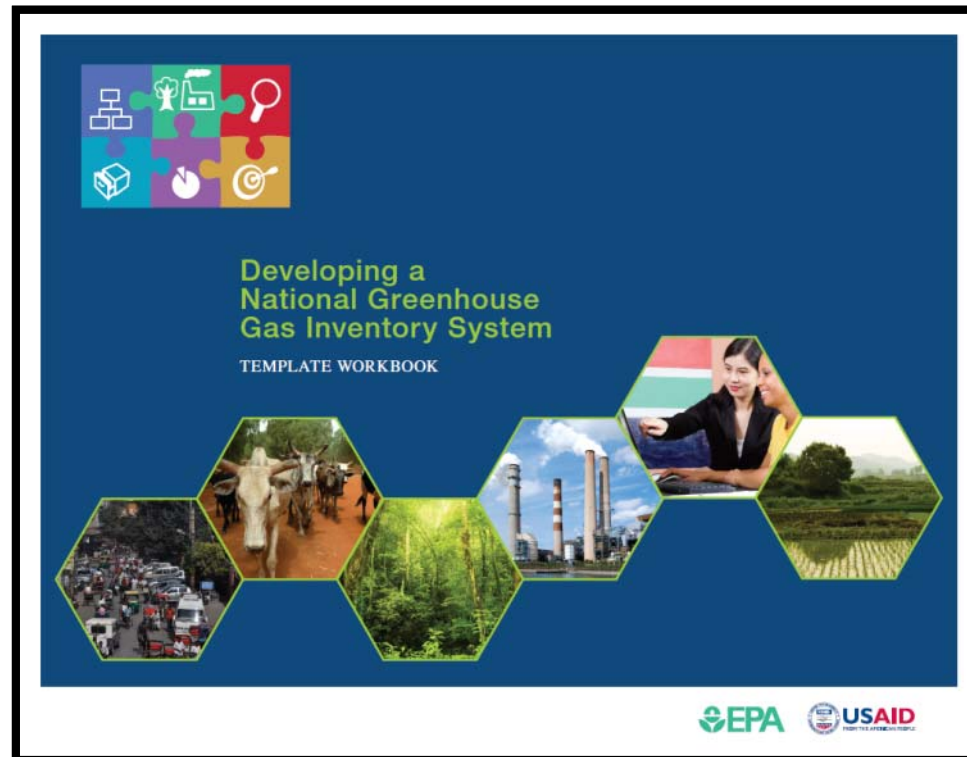


## Some processes need more QA/QC than others



### Focus On These

Focus On These		
Key Categories	Emission and removal categories with recent data changes	Emission and removal categories with recent methodological changes



Current Year Emissions (kg CO2e/Population)	Contribution to Overall Total	Cumulative Contribution to Overall Total
		100%

**ATTENTION!**  
Source Category Estimate / Total Estimate (in %)

Use a line to help to analyze trends. Guidance for reporting national level contribution to the overall level of national emissions. Key source for the trend of emissions over time.  
Easy to consider more accurate methodologies, develop country specific. They all require additional resources, and it is not possible to make a analysis a up provide a quantitative tool for the national greenhouse

Current Year Emissions (kg CO2e/Population)	Contribution to Overall Total	Cumulative Contribution to Overall Total
100	100%	100%
500	20%	20%
1000	20%	40%
50	20%	60%
10	20%	80%
10	20%	100%
10	20%	100%
100	20%	100%

- Based on inventory systems developed in concert with other countries
- Each template becomes a chapter of the National Inventory System Report
- Each template provides documentation of critical building blocks



Institutional Arrangements



Methods and Data Documentation



Description of QA/QC Procedures



Description of Archiving System



Key Category Analysis



National Inventory Improvement Plan





*Sources inform workbook and workbook draws on sources*

<p>IPCC 2006 GL IPCC Good Practice Guidance (2000) and Revised IPCC Guidelines (1996)</p>	<p>U.S. EPA Quality Assurance/Quality Control and Uncertainty Management for the U.S. Greenhouse Gas Inventory (2002)</p>	<p>UNDP-GEF Managing the National Greenhouse Gas Inventory Process. National Communications Support Unit (2005)</p>	<p>GHG Inventory Template Workbook (2011)</p>
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### The template helps you and the inventory team:

- Identify existing QA/QC procedures
- Define roles responsibilities for QC and QA
- Establish QC and QA procedures
- Develop a schedule and customized QA/QC program to build upon
- Find calculation errors
- Be confident in their inventory
- Enhance National Communication report by applying IPCC Good Practice





QA/QC effort can be spread across different individuals or agencies



Agency Inventory Lead	QA/QC Coordinator	Emission and Removal Category Lead	Outside Experts	Consultants (depending on institutional arrangements)
General QA/QC	Directs overall implementation of QA/QC and maintaining plan	Implements source specific QA/QC; Responsible for taking corrective actions	QA by university experts, industry groups	Day-to-day QC and additional QA support





## What are some examples of Overall QC checks?

- a) Checking that spreadsheets use consistent units
- b) Cross-checking spreadsheet values to publication values
- c) Performing matrix comparisons between relevant worksheets or file versions
- d) Checking cell formulas/linking architecture to ensure consistency
- e) Checking that in-text references have a citation in the references section

What are some examples of Sector-Specific QC checks (Energy)?

- a) Check for fuel consumption year to year trends
  - Follow up with external sources when fuel consumption inputs show unusual trends





## Template 3: Description of QA/QC Procedures

**Table 3.2: General (Tier 1) QC Activities**

QC Activity	Procedures	Task Completed		Corrective Measure Taken	
		Name/Initials	Date	Supporting Documents (List Document Name)	Date
<b>Data Gathering, Input, and Handling Checks</b>					
Check that assumptions and criteria for the selection of activity data and emission factors are documented.	<ul style="list-style-type: none"> <li>• Cross-check descriptions of activity data and emission factors with information on categories and ensure that these are properly recorded and archived.</li> </ul>				
Check for transcription errors in data input and reference.	<ul style="list-style-type: none"> <li>• Confirm that bibliographical data references are properly cited in the internal documentation (MDD template report)</li> <li>• Cross-check a sample of input data from each category (either measurements or parameters used in calculations) for transcription errors.</li> <li>• Utilize electronic data where possible to minimize transcription errors.</li> <li>• Check that spreadsheet features are used to minimize user/entry error:                             <ul style="list-style-type: none"> <li>○ Avoid hardwiring factors into formulas.</li> <li>○ Create automatic look-up tables for common values used throughout calculations.</li> <li>○ Use cell protection so fixed data cannot accidentally be changed.</li> <li>○ Build in automated checks, such as computational checks for calculations, or range checks for input data.</li> </ul> </li> </ul>				
Check that emissions/removals are calculated correctly.	<ul style="list-style-type: none"> <li>• Reproduce a representative sample of emissions/removals calculations.</li> <li>• If models are used, selectively mimic complex model calculations with abbreviated calculations to judge relative accuracy.</li> </ul>				
Check that parameter and emission/removal units are correctly recorded and that appropriate conversion factors are used.	<ul style="list-style-type: none"> <li>• Check that units are properly labeled in calculation sheets and (MDD template report)</li> <li>• Check that units are correctly carried through from beginning to end of calculations.</li> <li>• Check that conversion factors are correct.</li> <li>• Check that temporal and spatial adjustment factors are used correctly.</li> </ul>				





- Is a source/sink a key category?
- Is a methodology complex or “data heavy”?
- Are emission factors different from IPCC default factors or commonly used factors?
- Was a category updated a long time ago?
- Did the last QA/QC and verification take place a long time ago?
- Did significant changes occur in how data are processed and managed?
- Is there a risk of double counting or incomplete estimates?





## Some tips to facilitate and enhance QC!

- a) Do not hard-code equations (instead link cells)
- b) Put commonly used factors in their own cells, and link to them (EFs, GWPs, conversion factors).
  - If they change, then it's easy to implement broadly
- c) Use conditional formatting (or “checkers”), for example
  - national total =  $\Sigma$  sectors
  - sector =  $\Sigma$  sources



## Discussion questions:

- *Do you have a point person for your QA/QC?*
- *What role do sectoral experts/compilers currently play?*
- *Do you use checklists and track each step of the QC process?*
- *Do you currently have a QC plan in place? And a plan for QA?*
- *Can you think of any improvements that would be helpful?*





- Assign specific responsibilities for QA/QC
  - Define procedures
- Develop a QA/QC Plan
  - Include budgeting!
- Communicate QC plan with all working on inventory
- Establish *process and schedule* for inventory review (expert and/or public review)
- Implement QA/QC Plan



Thank you !



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