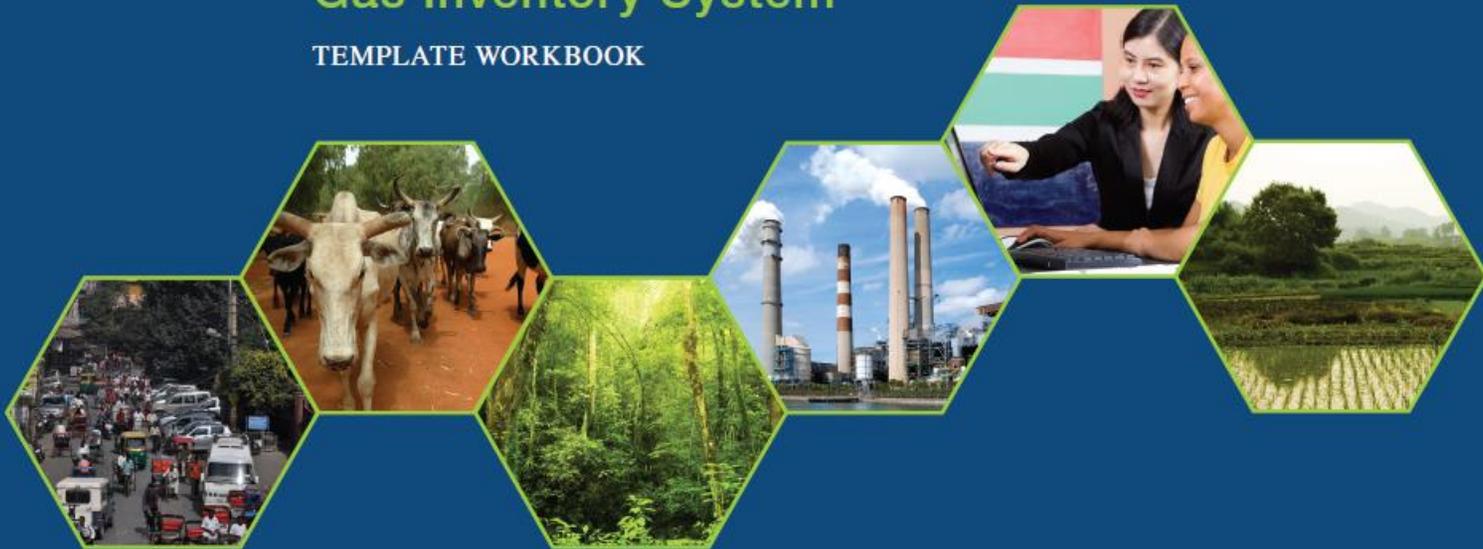




# Developing a National Greenhouse Gas Inventory System

TEMPLATE WORKBOOK



**EPA-430-K-11-005**  
**December 2011**

## **Acknowledgements**

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# Table of Contents

<b>Background: U.S. EPA Approach to Greenhouse Gas (GHG) Inventory Capacity Building</b>	<b>i</b>
<b>Template 1: Institutional Arrangements</b>	<b>1-1</b>
Instructions	1-2
Institutional Arrangements (IA)	1-3
1.1. Overview of Current Inventory Management Team	1-3
1.2. Sectoral Roles and Arrangements	1-4
1.3. Potential Improvements	1-8
1.4. Inventory Cycle	1-9
<b>Template 2: Methods and Data Documentation</b>	<b>2-1</b>
Instructions	2-2
Methods and Data Documentation (MDD)	2-3
2.1. Category Information	2-3
2.2. Method Choice and Description	2-4
2.3. Activity Data	2-5
2.4. Emission Factors	2-6
2.5. Uncertainty (Optional)	2-6
2.6. Provide Any Additional Information	2-7
2.7. Improvements to the Methodology and Data Documentation Analysis	2-7
<b>Template 3: Description of QA/QC Procedures</b>	<b>3-1</b>
Instructions	3-2
Quality Assurance/Quality Control (QA/QC) Procedures	3-3
3.1. Background	3-3
3.2. QA/QC Plan	3-3
3.3. QA/QC Personnel	3-4
3.4. Communicating the QA/QC Plan	3-5
3.5. General (Tier 1) QC Procedures for Source/Sink Category Leads	3-6
3.6. Category-specific (Tier 2) Procedures	3-9
3.7. QA Procedures	3-12
3.8. Proposed QA/QC Plan Improvements	3-12
<b>Template 4: Description of Archiving System</b>	<b>4-1</b>
Instructions	4-2

Description of Archiving System (AS) for [Country X]	4-3
4.1. Background	4-3
4.2. Assess Existing Archiving Program and Procedures	4-3
4.3. Archive System Plan	4-4
4.4. Improvements to the Inventory Archive System	4-10

**Template 5: Key Category Analysis** ----- **5-1**

Instructions	5-2
Key Category Analysis (KCA)	5-3
5.1. Background	5-3
5.2. Download Key Category Software	5-4
5.3. Tier 1 Current Year Level Analysis	5-4
5.4. Tier 1 Base Year Level and Trend Analyses	5-5
5.5. Tier 2 Current Year Level Analysis	5-7
5.6. Tier 2 Base Year and Trend Analyses with Incorporated Uncertainty	5-8
5.7. Methodology	5-10
5.8. Improvements to the Key Category Analysis	5-14
5.9. Provide Any Additional Information	5-14
5.10. References	5-15

**Template 6: National Inventory Improvement Plan** ----- **6-1**

Instructions	6-2
National Inventory Improvement Plan (NIIP)	6-3
6.1. Objective	6-3
6.2. Institutional Arrangement Priorities	6-3
6.3. Summary of Key Categories	6-4
6.4. Potential Category-Improvements	6-6
6.5. Potential Improvements to QA/QC Procedures	6-7
6.6. Potential Archiving System Improvements	6-8
6.7. Communication, Outreach, and Training Priorities	6-8
6.8. Potential Improvements	6-9
6.9. Prioritized List of Potential Improvements	6-10
6.10. Propose Inventory Improvement Projects	6-10

## **Background: U.S. EPA's Approach to Greenhouse Gas (GHG) Inventory Capacity Building**

The foundation for EPA's approach to assisting developing countries in building their capacity to produce high-quality national GHG inventories is based on lessons learned over 15 years of working alongside developing country experts in many regions around the world, in addition to leading development of the U.S. national GHG inventory. Through these efforts, a number of key lessons have been learned and incorporated into EPA's approach:

- A high level of technical expertise on the source and sink categories (forests, crops, livestock, energy, etc.) already exists in most developing countries. The challenge is to put this expertise to use in applying the IPCC methodologies to develop a high quality, well-documented inventory, and a sustainable inventory management system.
- Developing country climate change teams may face significant challenges, including:
  - Small teams with multiple responsibilities and limited resources;
  - Incomplete or missing activity data;
  - Lack of country-specific emission factors;
  - Insufficient documentation of methods and data sources used in previous inventories; and
  - Difficulties retaining capacity and expertise developed during the preparation of previous National Communications.
- Host countries should lead the effort to set priorities for inventory improvements.
- GHG inventory capacity-building activities must be highly targeted, focusing on specific, measurable, and realistic outcomes with the ultimate goal of preparing a complete, transparent, accurate, consistent, and comparable national GHG inventory.
- A complete, transparent, well-documented GHG inventory provides a solid foundation for developing future national inventories.

EPA's capacity-building activities focus mainly on agriculture, forestry, and other land use (AFOLU) sectors, although the Agency also provides inventory assistance with other sectors. The two complementary areas of technical assistance provided to developing countries include:

- Improving the institutional capacity of a country to establish a sustainable inventory system.
- Providing technical assistance on methods, activity data collection, and documentation.

This workbook addresses the first key area of assistance, and also supports documentation of the data and methods applied under the second area. There are many helpful guidance and reference documents available to inventory compilers for developing national GHG inventories as well as a national GHG inventory system. These include: the current UNFCCC Non-Annex 1 Guidelines on National Communications, IPCC Good Practice Guidance, 2006 IPCC Guidelines, and UNDP's Managing the National GHG Inventory Process Guidance. This template workbook considers recommendations from those guidance documents and helps inventory experts walk through the necessary steps. For example, this workbook helps inventory compilers implement IPCC Good Practice Guidance recommendations for identifying key categories and documenting inventory data.

This workbook also complements software tools, such as the widely-used Agriculture and Land Use (ALU) software tool for generating the AFOLU inventory. These tools, developed in conjunction with USAID, are consistent with UNFCCC reporting guidelines.

The workbook is available through EPA's website at: [www.epa.gov/climatechange/emissions/ghginventorycapacitybuilding](http://www.epa.gov/climatechange/emissions/ghginventorycapacitybuilding).

## ***Introduction: Building Sustainable National Inventory Management Systems***

A major component of EPA's approach is to build sustainable national GHG inventory management systems using the pre-defined National System Templates in this workbook as a starting point. These templates can be compiled into a single National Inventory System Report, typically consisting of less than fifty pages, which provides a comprehensive documentation of each critical component for managing development of the GHG inventory development process. These tools are consistent with IPCC and UNFCCC guidelines for national GHG inventory development. The advantages of the templates are that they:

- Focus on documenting essential information in a concise format and avoid wasting time in writing unnecessarily long reports;
- Standardize tasks, allowing countries within regions to share information and compare and contrast results;
- Ensure roles and responsibilities are understood;
- Accommodate varying levels of national capacity;
- Provide an objective and efficient system for identifying priorities for future improvements;
- Serve as an instruction manual and a starting point for future inventory teams in developing an inventory;
- Help countries apply IPCC Good Practice Guidelines and other UN guidance documents for preparing national inventories;

- Create transparency in a country's national system; and
- Facilitate inventory improvement over time.

The six National System Templates are as follows:

1. **Institutional Arrangements for National Inventory Systems (IA)** - Assists inventory teams in assessing and documenting the strengths and weaknesses of existing institutional arrangements for inventory development to ensure continuity and integrity of the inventory, promote institutionalization of the inventory process, and facilitate prioritization of future improvements.
2. **Methods and Data Documentation (MDD)** - Assists inventory teams in documenting and reporting the origin of methodologies, activity datasets, and emission factors used to estimate emissions or removals. Future inventory teams can refer to the completed template for each source and sink category to determine what information was collected, how the data were obtained, and what methods were used, as well as to reproduce estimates.
3. **Description of Quality Assurance and Quality Control Procedures (QA/QC)** - Guides countries through the establishment of a cost-effective QA/QC program to improve transparency, consistency, comparability, completeness, and confidence in national GHG inventories. The template includes supplemental checklists with recommended QA/QC procedures that are specific to management roles, such as the

Inventory Coordinator and QA/QC Coordinator, as well as sector leads.

4. **Description of Archiving System (AS)** - An archive system is an inexpensive yet critical step towards a sustainable National Inventory System. An archive system allows estimates to be easily reproduced, safeguards against data and information loss, and facilitates development of subsequent inventories by future inventory staff.
5. **Key Category Analysis (KCA)** - Identifies the sources and/or sinks that have the greatest contribution to national emissions, and thus should be the focus of improvement efforts. The template and KCA tool are consistent with IPCC Guidelines. The accompanying KCA tool enables a country to determine key categories from GHG inventory estimates.
6. **National Inventory Improvement Plan (NIIP)** - Synthesizes findings and describes specific priorities for future capacity-building projects based on the needs identified in the first five templates, and facilitates continual inventory improvements.



## Template 1: Institutional Arrangements



**1: Institutional Arrangements**



**2: Methods and Data Documentation**



**3: Description of QA/QC Procedures**



**4: Description of Archiving System**



**5: Key Category Analysis**



**6: National Inventory Improvement Plan**

### Country Representative Contact Information

<b>Country:</b>		<b>Postal Address:</b>	
<b>Contact Name:</b>		<b>Phone Number:</b>	
<b>Title:</b>		<b>E-Mail:</b>	
<b>Organization:</b>		<b>URL:</b>	

## Template 1: Institutional Arrangements



### **Instructions**

- *This document, once completed, will summarize existing institutional arrangements for GHG inventory management in your country.*
- *In preparing this document, most countries will need to document what arrangements exist, the status of existing arrangements for inventory development, and identify and list future improvements which will subsequently be prioritized in the National Inventory Improvement Plan (NIIP) template. This completed document will also create an archive for describing institutional arrangements in future National Communications and related documents.*
- *Countries should use this Word document to enter country-specific data and for preparing final plans. The green text is used to provide instructions and guidance throughout the template as well as within tables. In the final plan, all green text should be deleted, and country-specific information should be used in its place.*
- *Instructions are listed in the box above. Each step is explained in detail in the corresponding section of the template.*

### **Step-by-Step Instructions**

- STEP 1: Identify current inventory management team
- STEP 2: Provide sectoral roles and arrangements
- STEP 3: Provide improvements to institutional arrangements
- STEP 4: Review and complete inventory cycle timeline



## ***Institutional Arrangements (IA)***

### **1.1. Overview of Current Inventory Management Team**

- *STEP 1: The inventory management team coordinates the development of the national GHG inventory. In STEP 1, list the lead agency in Table 1.1 and identify inventory management team members in Table 1.2. Information for additional contacts for each sector can be listed in STEP 2. In Table 1.2, the status of the institutional arrangements can be noted in the “Comments” column.*

**Table 1.1: Designated Inventory Agency**

Designated National GHG Inventory Preparation Agency/Organization	UNFCCC Focal Point (Name) and UNFCCC Focal Point Agency	Describe the arrangements or relationship between Inventory Agency/Organization and UNFCCC Focal Point Agency, if different.

**Table 1.2: National Inventory Management Team**

Role	Name	Organization	Contact Information	Comments
<i>Inventory Director/Coordinator</i>				
<i>Energy Sector Lead</i>				
<i>Industrial Processes Lead</i>				
<i>Agriculture Sector Lead</i>				
<i>LULUCF Sector Lead</i>				
<i>Waste Sector Lead</i>				
<i>Archive (Data and Document) Manager/Coordinator</i>				
<i>QA/QC coordinator</i>				

## Template 1: Institutional Arrangements



<i>Uncertainty Analysis coordinator</i>				
<i>Other: e.g., GHG Policy Specialist who tracks capacity building efforts and IPCC processes</i>				

### 1.2. Sectoral Roles and Arrangements

- *STEP 2: In this step, list more specific information about contacts/experts for inventory development for each sector.*
- *One table is provided for each sector to document existing arrangements for obtaining, compiling and reviewing inventory data (Table 1.3 through Table 1.8). In each table, identify the role, organization, and contact information for those providing relevant data for estimating emissions. Use the examples provided as a guide for the type of information required. Example roles are provided in Table 1.3 below.*
- *In the “Comments” section, provide information on the status of the institutional arrangement, or any additional information not included within the table.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*
- *In the comments column of each table, explain in detail how the arrangements were established. For example, the data provider listed in Table 1.3 provides the statistics that will be used in the inventory. Describe for each sector the strategies that were used to collect the necessary inventory data from an organization. In this description, address the following questions and add additional comments as necessary:*
  - *Is there a formal legal contract between the organizations?*
  - *Was there a meeting with the experts, data providers, and other key contributors explaining the background and purpose of the inventory?*
  - *Is it an informal arrangement (e.g., written or verbal communication with staff)?*
  - *How was the request for data made?*

## *Template 1: Institutional Arrangements*



- *At what level of management was the request made?*
- *How was the organization motivated to share its data and information with the inventory agency?*

Template 1: Institutional Arrangements



**Table 1.3: Energy Sector Institutional Arrangements**

Role	Organization	Contact(s) [Name]	Contact Information [E-mail, Phone, etc.]	Participated in meetings on GHG inventory development? [Yes/No]	Comments [See instructions above]
<i>Technical coordinator (Could be source/sector lead from Table 1.2)</i>					
<i>Consultant compiling estimates</i>					
<i>Expert reviewer</i>					
<i>Data provider</i>					
<i>Other</i>					

**Table 1.4: Industrial Processes Sector Institutional Arrangements**

Role	Organization	Contact(s) [Name]	Contact Information [E-mail, Phone, etc.]	Participated in meetings on GHG inventory development? [Yes/No]	Comments [See instructions above]

*Template 1: Institutional Arrangements*



**Table 1.5: Agriculture Sector Institutional Arrangements**

Role	Organization	Contact(s) [Name]	Contact Information [E-mail, Phone, etc.]	Participated in meetings on GHG inventory development? [Yes/No]	Comments [See instructions above]

**Table 1.6: LULUCF Sector Institutional Arrangements**

Role	Organization	Contact(s) [Name]	Contact Information [E-mail, Phone, etc.]	Participated in meetings on GHG inventory development? [Yes/No]	Comments [See instructions above]

**Table 1.7: Waste Sector Institutional Arrangements**

Role	Organization	Contact(s) [Name]	Contact Information [E-mail, Phone, etc.]	Participated in meetings on GHG inventory development? [Yes/No]	Comments [See instructions above]

## Template 1: Institutional Arrangements



**Table 1.8: Other Sector Institutional Arrangements [Optional]**

Role	Organization	Contact(s) [Name]	Contact Information [E-mail, Phone, etc.]	Participated in meetings on GHG inventory development? [Yes/No]	Comments [See instructions above]

### 1.3. Potential Improvements

- *STEP 3: Within each sector list where institutional arrangements to support preparing the inventory are well established, where data are collected and managed adequately, and where strengthening is not needed.*
- *Given the key category analysis and existing institutional arrangements within each sector, identify what improvements are needed to enhance the institutional arrangements for each sector, and list these in Table 1.9. In preparing this section, consider whether any important tasks for inventory preparation have not been assigned or delegated, and determine whether they could be assigned.*

**Table 1.9: Potential Improvements in Management Structure of National Inventory System**

Sector	Strengths in Management Structure of National Inventory System	Potential Improvements in Management Structure of National Inventory System
<i>Energy</i>		
<i>Industrial Processes</i>		
<i>Agriculture</i>		
<i>Waste</i>		
<i>LULUCF</i>		

## Template 1: Institutional Arrangements



Other [Optional]

### 1.4. Inventory Cycle

- STEP 4: The length of the inventory cycle depends on national circumstances and reporting requirements. The inventory cycle diagram in Figure 1.1 below can be applied to annual, biennial, or longer-term completion cycles. In this step, use the diagram below to outline the overall inventory cycle as it exists in your country. Use the side boxes to note the length of time devoted to each phase or determine tentative completion dates for each phase. This cycle presents important information that should be considered and adopted to reflect institutional arrangements in your inventory development schedule. This cycle will help to communicate when and where in the process institutional coordination will need to occur. Data providers may have different schedules for the publication of relevant information and data. Therefore, adequate time should be scheduled for data collection or to adjust sector specific schedules as needed. Sometimes agencies may be able to provide preliminary estimates in advance of final estimates so that review and draft write-ups of estimates are not delayed.*



Figure 1.1: Inventory Cycle





## Template 2: Methods and Data Documentation



1: Institutional Arrangements



**2: Methods and Data Documentation**



3: Description of QA/QC Procedures



4: Description of Archiving System



5: Key Category Analysis



6: National Inventory Improvement Plan

### Country Representative Contact Information

<b>Country:</b>		<b>Postal Address:</b>	
<b>Contact Name:</b>		<b>Phone Number:</b>	
<b>Title:</b>		<b>E-Mail:</b>	
<b>Organization:</b>		<b>URL:</b>	

## Template 2: Methods and Data Documentation



### Instructions

- The purpose of this template is to assist inventory teams in documenting and reporting the methodologies, datasets (including activity data and emission factors) and assumptions used to estimate emissions and removals from each category. Future inventory teams can refer to the completed documentation for each category to determine what information was collected, how the data were obtained, and what methods were used. In addition to documenting methodologies and data sources for each category within the National System Report, the Methods and Data Documentation (MDD) can be used as an appendix in National Communications or companion reports to provide transparency on how estimates were developed. Furthermore, this documentation can serve as an important source of supporting documentation during peer review processes. Overall, the MDD will reduce the amount of effort required by future teams to develop the inventory and provide a basis for ensuring consistency in future reports.*

### Step-by-Step Instructions

- STEP 1: Provide source/sink category information
- STEP 2: Identify method choice and description
- STEP 3: List activity data
- STEP 4: List emission factors
- STEP 5: List uncertainty estimates (optional)
- STEP 6: Provide any additional information
- STEP 7: Provide improvements to this analysis

- The following template serves as an archive for the information used to develop the GHG inventory. Sector/category leads are encouraged to complete this template for all categories included in the inventory. At minimum, if resources are limited, sector/category leads should complete this template for each key category identified in the Key Category Analysis.*
- Countries should use this Word document to enter country-specific data and for preparing final plans. The green text is used to provide instructions and guidance throughout the template as well as within tables. In the final plan, all green text should be deleted, and country-specific information should be used in its place.*
- Instructions are listed in the box above. Each step is explained in detail in the corresponding section of the template.*



## Methods and Data Documentation (MDD)

### 2.1. Category Information

- *STEP 1: Provide information about each category, including the sector it belongs to, a description of the category, and details about emissions and removals from this category in your country including which GHGs are emitted. A standard description from existing documents is sufficient to describe the category. Descriptions of relevant categories can also be documented in Step 6.*

*In the Country Detail field, describe the importance of emissions/removals in your country from the category. Provide the contribution to total net emissions and the historical context for emissions/removals in your country from this category (e.g., relative importance and trends).*

- *Copy and paste tables below as necessary to provide detailed information for each key category, or alternatively, save each greenhouse gas category as a separate file.*

Tables 2.1 through 2.X below includes the relevant information about categories, including descriptions of each category as it pertains to [country].

**Table 2.1: Category Information**

Sector	
Category	
Key Category? [Yes or No]	
Category Description/Definition	<i>(Can pull description from IPCC GL)</i>
Country Detail	

**Table 2.X: Category Information**

Sector	
Category	

## Template 2: Methods and Data Documentation



Key Category? [Yes or No]	
Category Description/Definition	
Country Detail	

### 2.2. Method Choice and Description

- *STEP 2: Provide information about the method used to estimate emissions/removals from each category. List the equation used and the reference (e.g., 1996 IPCC Guidelines), equation page number, etc. for the equation. Describe the reason(s) that this methodology was chosen. If completing this template for key categories in the current inventory cycle, describe the methods likely to be used.*
- *Copy and paste as many of the below tables as necessary to provide the detailed information for each category, or alternatively, save each category as a separate file.*

Table 2.2 through Table 2.X describes the methodology used to calculate greenhouse gas emissions and removals from [category name], including the equation used, its reference, and why this methodology was chosen.

**Table 2.2: Methodology for [category name]**

Equation (Describe variables for method used.)	
Reference	
Describe How and Why this Method Was Chosen	

## Template 2: Methods and Data Documentation



**Table 2.X: Methodology for [category name]**

<b>Equation</b> (Describe variables for method used.)	
<b>Reference</b>	
<b>Describe How and Why this Method Was Chosen</b>	

### 2.3. Activity Data

- *STEP 3: List the activity data used to estimate emissions and removals from each category, including the value, units, and year. Provide a reference for this data and other relevant information, such as when the data were obtained, and the contact name (if the data were supplied by a person) or a full citation (if the data were collected from a published source). If completing this template for categories in the current inventory cycle, identify the data likely to be used.*
- *Copy and paste as many of the below tables as necessary to provide the detailed information for each key category.*

Table 2.3 shows the activity data used with the methodology described above to calculate greenhouse gas emissions and removals for [category name]. Information in this table contributes to understanding the overall quality of the activity data chosen to this estimate.

**Table 2.3: [Category name] Activity Data**

Type of Activity Data	Activity Data Value(s)	Activity Data Units	Year (s) of Data	Reference	Other Information (e.g., date obtained and data source or contact information)	Category QA/QC Procedure Adequate / Inadequate / Unknown	Are all data entered correctly into models, spreadsheets, etc.? Yes / No (List Corrective Action)	Checks with Comparable Data (e.g., At international level, IPCC defaults). Explain and show results.

## Template 2: Methods and Data Documentation



### 2.4. Emission Factors

- *STEP 4: List emission factors and carbon-stock change factors used to estimate emissions and removals from each category, including the value and units. Provide a reference for this data and other relevant information, such as the date the factor was obtained, and either the contact name (if the data were supplied by a person) or a full citation (if the data were collected from a published source). If completing this template for categories in the current inventory cycle, identify the emission factors likely to be used.*
- *Copy and paste as many of the below tables as necessary to provide the detailed information for each category.*

Table 2.4 provides the emission factors used to calculate emissions from *[category name]*. Also included in Table 2.4 are each emission and carbon-stock change factor's reference, an explanation on how appropriate the emission factor is for calculation emissions from *[country]*, and more information on how the emission factor was obtained.

Table 2.4: *[Category name]* Emission/carbon-stock change Factors

Type of Factor	Emission or carbon-stock change Factor Value	Emission or carbon-stock change Factor Units	Reference	Other Information (e.g., Date obtained and data source or contact information)	Category QA/QC Procedure Adequate / Inadequate / Unknown	Are all data entered correctly into models, spreadsheets, etc.? Yes / No (List Corrective Action)	Explain how this factor is appropriate to national circumstances. Provide sources.

### 2.5. Uncertainty (Optional)

- *STEP 5: List the current year's emissions for each category for which an uncertainty estimate has been assigned. Also, include the assigned lower bound and upper bound uncertainty estimate and the resulting lower and upper bound estimate when the uncertainty bounds are applied to the current estimate.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*

Table 2.5 provides information on the uncertainty associated with several *[key and non-key]* category estimates. More information on the sources of uncertainty for each inventory category can be found in sections 2.3, 2.4, and 2.6.

## Template 2: Methods and Data Documentation



**Table 2.5: Uncertainty Estimates Calculated for Categories**

Category	Key Category? [Yes or No]	Emissions Estimate (Gg CO <sub>2</sub> Eq.)	Relative Lower Bound Uncertainty (%)	Relative Upper Bound Uncertainty (%)	Lower Bound Emissions Estimate (Gg CO <sub>2</sub> Eq.)	Upper Bound Emissions Estimate (Gg CO <sub>2</sub> Eq.)

### 2.6. Provide Any Additional Information

- *STEP 6: Provide any other relevant information for each key category that would increase transparency of the estimates from this category. Examples include QA/QC activities performed, notes on reporting and documentation, and data quality.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*

Table 2.6 shows any additional relevant information pertaining to the estimate for *[category name]*.

**Table 2.6: Comments on Estimates for Categories**

Category	Key Category? [Yes or No]	Comments

### 2.7. Improvements to the Methodology and Data Documentation Analysis

- *STEP 7: Enter any suggested improvements to the Methodology and Data Documentation category-by-category Background Document Template in Table 2.7 below.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each improvement.*

Table 2.7 provides a list of suggested improvements to the methodology and data documentation category-by-category analysis. These improvements will be incorporated into the template in future years.

*Template 2: Methods and Data Documentation*



**Table 2.7: Improvements to the Methodology and Data Documentation Analysis**

Improvement #	Sector	Category	Potential Improvement



## Template 3: Description of QA/QC Procedures



1: Institutional Arrangements



2: Methods and Data Documentation



**3: Description of QA/QC Procedures**



4: Description of Archiving System



5: Key Category Analysis



6: National Inventory Improvement Plan

### Country Representative Contact Information

Country:		Postal Address:	
Contact Name:		Phone Number:	
Title:		E-Mail:	
Organization:		URL:	

## Template 3: Description of QA/QC Procedures



### **Instructions**

- *The implementation of quality assurance and quality control (QA/QC) procedures is an important part of the development of national greenhouse gas inventories. As described in the IPCC Good Practice Guidance and the latest IPCC Guidelines (2006), an adequate QA/QC program helps improve transparency, consistency, comparability, completeness, and confidence in national GHG inventories.*
- *Countries should use this Word document to enter country-specific data and for preparing final plans. The green text is used to provide instructions and guidance throughout the template as well as within tables. In the final plan, all green text should be deleted, and country-specific information should be used in its place.*
- *Step-by-step instructions are listed in the box above. Each step is explained in detail in the corresponding section of the template.*

### **Step-by-Step Instructions**

- STEP 1: Review the main elements of a QA/QC plan
- STEP 2: List key QA/QC personnel and any country-specific additional QA/QC responsibilities
- STEP 3: Complete the Tier 1 QA/QC checklist
- STEP 4: Complete the Tier 2 QA/QC checklist as appropriate
- STEP 5: Complete the list of external reviewers
- STEP 6: Provide improvements to the QA/QC plan



## **Quality Assurance/Quality Control (QA/QC) Procedures**

### **3.1. Background**

Quality assurance and quality control measures are two distinct types of activities. The IPCC defines each as follows:

- **Quality Assurance (QA)** – a planned system of review procedures conducted by personnel not involved in the inventory development process.
- **Quality Control (QC)** – a system of routine technical activities implemented by the inventory development team to measure and control the quality of the inventory as it is prepared.

An effective QA/QC plan contains the following elements:

- Personnel responsible for coordinating QA/QC activities.
- General (Tier 1) QC procedures.
- Source-specific (Tier 2) QC procedures.
- QA review procedures.
- Reporting, documentation, and archiving procedures.

Each of these elements are described in more detail below.

### **3.2. QA/QC Plan**

- *STEP 1: Fill out each subsection to document or develop the various elements of your country's QA/QC plan. Once developed, use the plan in subsequent inventory preparation. Modify the plan as necessary to reflect new processes.*

A written QA/QC plan is a fundamental element of a QA/QC system. This plan outlines QA/QC activities performed, the personnel responsible for these activities, and the schedule for completing these activities. The following sections describe the QA/QC plan that *[country]* plans to follow to ensure a high quality national inventory.

## Template 3: Description of QA/QC Procedures



### 3.3. QA/QC Personnel

- *STEP 2: List responsibilities for the QA/QC coordinator. Fill out Table 3.1 below with the names and contact information for appropriate staff person(s) responsible for each activity listed.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each activity listed.*

The QA/QC coordinator is the main person responsible for implementing the QA/QC plan. In this role, the QA/QC coordinator:

- Clarifies and communicates QA/QC responsibilities to inventory members.
- Develops and maintains QA/QC checklists appropriate to various inventory team member roles. *(See Table 3.2 and Table 3.3 for examples)*
- Ensures the timely and accurate completion of QA/QC checklists and related activities. *Develops an overall QA/QC timeline and when external reviews will occur.*
- Manages and delivers documentation of QA/QC activities to the inventory lead and archive coordinator.
- Coordinates external reviews of the inventory document and ensures that comments are incorporated into the inventory.

In this role, the QA/QC coordinator communicates with several other inventory members. Table 3.1 summarizes the key personnel responsible for QA/QC activities.

## Template 3: Description of QA/QC Procedures



**Table 3.1: Personnel Responsible for QA/QC Activities**

Title	QA/QC Responsibility	Name	Organization	Contact Information
Inventory Lead	All aspects of the inventory program, cross, cutting QA/QC			
QA/QC Coordinator	Implementing the overall QA/QC plan			
Category Lead(s)	Implementing category specific QA/QC procedures (Tier 1 and Tier 2 procedures listed in Table 3.2 and 3.3 below)			
Outside Expert(s)	Expert review of the inventory			

### 3.4. Communicating the QA/QC Plan

It is essential to communicate the contents of the QA/QC plan to inventory team members and outside experts so that the procedures can be effectively implemented, evaluated, and improved. The QA/QC coordinator for *[Country]* will implement the following procedures for the QA/QC plan:

- *Convene a meeting with all team members to develop a QA/QC plan.*
- *Write and distribute a QA/QC plan to all team members required to perform QA/QC.*
- *Conduct a “kick-off” meeting with all of those working on the inventory (including consultants, universities, etc), introduce plan and distribute QC checklists (this can be completed in conjunction with the inventory kick-off meeting)*
- *Send memos (written or electronic) reminding team members of their QA/QC responsibilities and overall schedule.*
- *[List additional ways of communicating the QA/QC plan].*

### Template 3: Description of QA/QC Procedures



#### 3.5. General (Tier 1) QC Procedures for Source/Sink Category Leads

- *STEP 3: As each item in Table 3.2 below is completed, enter the name or initials of the person completing the item and the date the item was completed.*
- *Insert as many rows within the table below as necessary to provide the detailed information for QA/QC procedures.*

According to the 2006 IPCC Guidelines, although general QC procedures are designed to be implemented for all categories and on a routine basis, it may not be necessary or possible to check all aspects of inventory input data, parameters and calculations every year. A representative sample of data and calculations from every category may be subjected to general QC procedures each year. In establishing criteria and processes for selecting sample data sets and processes, it is good practice for the inventory compiler to plan to undertake QC checks on all parts of the inventory over an appropriate period of time as determined in the QA/QC plan.

A minimum set of QC procedures are followed each year for all categories to ensure that basic standards of quality are met. These standards generally focus on the processing, handling, documenting, archiving, and reporting procedures common to all categories. Table 3.2 lists the specific Tier 1 QC activities performed by *[country]*, and a checklist for when these activities were completed.

### 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>				

### Template 3: Description of QA/QC Procedures



Check the integrity of database files.	<ul style="list-style-type: none"> <li>• Confirm that the appropriate data processing steps are correctly represented in the database.</li> <li>• Confirm that data relationships are correctly represented in the database.</li> <li>• Ensure that data fields are properly labeled and have the correct design specifications.</li> <li>• Ensure that adequate documentation of database and model structure and operation are archived.</li> </ul>				
Check for consistency in data between categories.	<ul style="list-style-type: none"> <li>• Identify parameters (e.g., activity data, constants) that are common to multiple categories and confirm that there is consistency in the values used for these parameters in the emissions/removals calculations.</li> </ul>				
Check that the movement of inventory data among processing steps is correct.	<ul style="list-style-type: none"> <li>• Check that emissions/removals data are correctly aggregated from lower reporting levels to higher reporting levels when preparing summaries.</li> <li>• Check that emissions/removals data are correctly transcribed between different intermediate products.</li> </ul>				
<b>Data Documentation</b>					
Review of internal documentation and archiving.	<ul style="list-style-type: none"> <li>• Check that there is detailed internal documentation to support the estimates and enable duplication of calculations.</li> <li>• Check that every primary data element has a reference for the source of the data (via cell comments or another system of notation).</li> <li>• Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review.</li> <li>• Check that the archive is closed and retained in secure place following completion of the inventory</li> <li>• Check integrity of any data archiving arrangements of outside organizations involved in inventory preparation.</li> </ul>				
<b>Calculation Checks</b>					
Check methodological and data changes resulting in recalculations.	<ul style="list-style-type: none"> <li>• Check for temporal consistency in time series input data for each category.</li> <li>• Check for consistency in the algorithm/method used for calculations throughout the time series.</li> <li>• Reproduce a representative sample of emission calculations to ensure mathematical correctness.</li> </ul>				

### Template 3: Description of QA/QC Procedures



Check time series consistency	<ul style="list-style-type: none"> <li>• Check for temporal consistency in time series input data for each category.</li> <li>• Check for consistency in the algorithm/method used for calculations throughout the time series.</li> <li>• Check methodological and data changes resulting in recalculations.</li> <li>• Check that the effects of mitigation activities have been appropriately reflected in time series calculations.</li> </ul>				
Check completeness	<ul style="list-style-type: none"> <li>• Confirm that estimates are reported for all categories and for all years from the appropriate base year over the period of the current inventory.</li> <li>• For subcategories, confirm that the entire category is being covered.</li> <li>• Provide clear definition of 'Other' type categories.</li> <li>• Check that known data gaps that result in incomplete category emissions/removals estimates are documented, including qualitative evaluation of the importance of the estimate in relation to total net emissions (e.g. subcategories classified as 'not estimated').</li> </ul>				
Trend checks	<ul style="list-style-type: none"> <li>• For each category, compare current inventory estimates to previous estimates, if available. If there are significant changes or departures from expected trends, re-check estimates and explain any difference. Significant changes in emissions or removals from previous years may indicate possible input or calculation errors.</li> <li>• Check value of implied emission factors (aggregate emissions/removals divided by activity data) across time series. Are changes in emissions or removals being captured?</li> <li>• Check if there any unusual or unexplained trends noticed for activity data or other parameters across the time series.</li> </ul>				
Source: This list has been adapted from IPCC Good Practice Guidance and the 2006 IPCC Guidelines for National GHG Inventories.					

### 3.6. Category-specific (Tier 2) Procedures

- *STEP 4: List Key Categories after completing Template 5 (Key Category Analysis). Add or remove Tier 2 QC procedures from Table 3.3 as necessary.*

### Template 3: Description of QA/QC Procedures



In addition to the Tier 1 QC procedures outlined in the preceding section, [country] follows Tier 2 QC procedures for select key categories and, as resources allow, for other categories. These key categories are:

- [List key categories].

[Country] conducts the Tier 2 QC procedures listed in Table 3.3 below.

**Table 3.3: Category-specific (Tier 2) QC Procedures**

QC Activity	Procedures	Task Completed		Corrective Measure Taken	
		Name/ Initials	Date	Supporting Documents (List Document Name)	Date
Assess the applicability of IPCC default factors	<ul style="list-style-type: none"> <li>• Evaluate whether national conditions are similar to those used to develop the IPCC default factors</li> <li>• Compare default factors to site or plant-level factors</li> <li>• Consider options for obtaining country-specific factors</li> <li>• Document results of this assessment</li> </ul>				
Review country-specific factors	<ul style="list-style-type: none"> <li>• QC the data used to develop the country-specific factor</li> <li>• Assess whether secondary studies used to develop country-specific factors used (at a minimum) Tier 1 QC activities</li> <li>• Compare country-specific factors to IPCC defaults; document any significant discrepancies</li> <li>• Compare country-specific factors to site or plant-level factors</li> <li>• Compare to factors from other countries (using IPCC Emission Factor Database)</li> <li>• Document results of this assessment</li> </ul>				
Review measurements	<ul style="list-style-type: none"> <li>• Determine if national or international (e.g., ISO) standards were used in measurements</li> <li>• Ensure measurement equipment is calibrated and maintained properly</li> <li>• Compare direct measurements with estimates using a factor; document any significant discrepancies</li> </ul>				

### Template 3: Description of QA/QC Procedures



QC Activity	Procedures	Task Completed		Corrective Measure Taken	
		Name/Initials	Date	Supporting Documents (List Document Name)	Date
Evaluate time series consistency	<ul style="list-style-type: none"> <li>Review significant (&gt; 10%) changes in year-over-year estimates for categories and sub-categories</li> <li>Compare top-down and bottom-up estimates for similar orders of magnitude</li> <li>Conduct reference calculations that use stoichiometric ratios and conservation of mass and land</li> </ul>				
Review national level activity data	<ul style="list-style-type: none"> <li>Determine the level of QC performed by the data collection agency. If inadequate, consider alternative data sources such as IPCC defaults and international data sets. Adjust the relevant uncertainty accordingly.</li> <li>Evaluate time series consistency</li> <li>Compare activity data from multiple references if possible</li> </ul>				
Review site-specific activity data	<ul style="list-style-type: none"> <li>Determine if national or international (e.g., ISO) standards were used in estimates</li> <li>Compare aggregated site-specific data (e.g. production) to national statistics/data</li> <li>Compare data across similar sites</li> <li>Compare top-down and bottom-up estimates for similar orders of magnitude</li> </ul>				
QC uncertainty estimates	<ul style="list-style-type: none"> <li>Apply QC techniques to uncertainty estimates</li> <li>Review uncertainty calculations</li> <li>Document uncertainty assumptions and qualifications of any experts consulted</li> </ul>				
Verify GHG estimates	<ul style="list-style-type: none"> <li>Compare estimates to other national or international estimates at the national, gas, sector, or sub-sector level as available</li> </ul>				



### 3.7. QA Procedures

- *STEP 5: Complete Table 3.4 with a list of external experts who have reviewed the Inventory. If possible, these experts should be independent of the inventory agency, either from other national agencies, international organizations, or other relevant organizations with expertise. If third party reviewers are unavailable, staff from another part of the inventory agency not involved in the portion of the inventory under review can fulfill this role. Key categories (as outlined in Template 5) should be given priority for review, as well as source categories where significant changes in methodology or data have been made.*

Expert review offers the opportunity to uncover technical issues related to the application of methodologies, selection of activity data, and development and choice of emission factors. Because of their knowledge and experience in areas related to the inventory, the listed experts and/or organizations indicated in Table 3.4, below, have been included in the QA process. Their comments have been reviewed and addressed, as appropriate, prior to the submission of the Inventory.

**Table 3.4: External Reviewers**

Name	Organization	Area of Expertise	Contact Information	Comment Summary

### 3.8. Proposed QA/QC Plan Improvements

- *STEP 6: An important part of the QA/QC plan is continually improving the plan as appropriate (i.e., when changes in processes occur or on the advice of independent reviewers). Fill out Table 3.5 with any planned QA/QC improvements.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each planned improvement.*

To enhance the inventory process and accompanying emission estimates, [country] plans to implement the improvements to the QA/QC plan listed in Table 3.5.

*Template 3: Description of QA/QC Procedures*



**Table 3.5: Improvements to the QA/QC Plan**

Improvement #	Sector	Category	Potential Improvement	
			QA	QC

## QA/QC Coordinator Checklist

Activities	Task Completed	
	Name	Date
<ul style="list-style-type: none"> <li>• Clarify and communicate QA/QC responsibilities to inventory team members.</li> </ul>		
<ul style="list-style-type: none"> <li>• Develop and QA/QC checklists appropriate to roles on the inventory team. <i>(See Table 3.2 and Table 3.3 in the "Description of QA/QC Procedures" Template for examples)</i></li> </ul>		
<ul style="list-style-type: none"> <li>• Distribute QA/QC checklist to appropriate inventory team members and set deadline for completion.</li> </ul>		
<ul style="list-style-type: none"> <li>• Ensure the timely and accurate completion of QA/QC checklists and related activities by checking in with team members.</li> </ul>		
<ul style="list-style-type: none"> <li>• Collect completed QA/QC checklists and forms.</li> </ul>		
<ul style="list-style-type: none"> <li>• Review completed QA/QC checklists and forms for completeness and accuracy.</li> </ul>		
<ul style="list-style-type: none"> <li>• Deliver documentation of QA/QC activities to the inventory lead and archive coordinator.</li> </ul>		
<ul style="list-style-type: none"> <li>• Coordinate external reviews of the inventory document and ensure that comments are incorporated into the inventory. Steps to coordinating external reviewers include:               <ol style="list-style-type: none"> <li>(1) Identify external reviewers (e.g. through category leads).</li> <li>(2) Set review schedule.</li> <li>(3) Establish review format (e.g., digital mark-up in Word or Excel).</li> <li>(4) Contact external reviewers informing them of the schedule and expectations.</li> <li>(5) Distribute Inventory draft for review.</li> <li>(6) Collect and compile review comments.</li> <li>(7) Deliver compiled comments to inventory and document/archive coordinator</li> <li>(8) Update inventory, as appropriate based on comments.</li> </ol> </li> </ul>		

## Inventory Lead Checklist: Cross-Cutting Checks for Overall Inventory Quality

Activities	Task Completed	
	Name	Date
<b>Emission Calculations Across GHG Emission and Removal Categories</b>		
<ul style="list-style-type: none"> <li>Identify parameters that are common across categories (e.g. conversion factors, carbon content coefficients, etc.) and check for consistency</li> </ul>		
<ul style="list-style-type: none"> <li>Check that using same data inputs (e.g. animal population data) report comparable values (i.e., analogous in magnitude)</li> </ul>		
<ul style="list-style-type: none"> <li>Check across categories that same electronic data set is used for common data (e.g., linking animal population data to the enteric fermentation and manure management calculations)</li> </ul>		
<ul style="list-style-type: none"> <li>Check that the number of significant digits or decimal places for common parameters, conversion factors, emission factors, or activity data is consistent across categories</li> </ul>		
<ul style="list-style-type: none"> <li>Check that total emissions are reported consistently (in terms of significant digits or decimal places) across categories</li> </ul>		
<ul style="list-style-type: none"> <li>Check that emissions data are correctly aggregated from lower reporting levels to higher reporting levels</li> </ul>		
<ul style="list-style-type: none"> <li>Other (specify):</li> </ul>		
<b>Documentation</b>		
<ul style="list-style-type: none"> <li>Check if internal documentation practices are consistent across categories</li> </ul>		
<ul style="list-style-type: none"> <li>Other (specify):</li> </ul>		
<b>Completeness</b>		
<ul style="list-style-type: none"> <li>Check for completeness across categories and years</li> </ul>		
<ul style="list-style-type: none"> <li>Check that data gaps are identified and reported as required</li> </ul>		
<ul style="list-style-type: none"> <li>Compare current national inventory estimates with previous years'</li> </ul>		
<ul style="list-style-type: none"> <li>Other (specify):</li> </ul>		
<b>Maintaining Master Inventory File: Spreadsheets and Inventory Document</b>		
<ul style="list-style-type: none"> <li>Have file control procedures been followed?</li> </ul>		
<ul style="list-style-type: none"> <li>Other (specify):</li> </ul>		

## Inventory Lead Checklist: Detailed Checklist for Inventory Document

Activities	Task Completed	
	Name	Date
<b>Front Section</b>		
• Cover page has correct date, title, and contact address		
• Tables of contents/tables/figures are accurate: titles match document, page #s match; numbers run consecutively and have correct punctuation		
• The Executive Summary and Introduction are updated with appropriate years and discussion of trends		
• Other (specify):		
<b>Tables and Figures</b>		
• All numbers in tables match numbers in spreadsheets		
• Check that all tables have correct number of significant digits		
• Check alignment in columns and labels		
• Check that table formatting is consistent		
• Check that all figures are updated with new data and referenced in the text		
• Check table and figure titles for accuracy and consistency with content		
• Other (specify):		
<b>Equations</b>		
• Check for consistency in equations		
• Check that variables used in equations are defined following the equation		
• Other (specify):		
<b>References</b>		
• Check consistency of references, and that in text citations and references match		
• Other (specify):		
<b>General Format</b>		
• All acronyms are spelled out first time and not subsequent times throughout each chapter		
• All fonts in text, headings, titles, and subheadings are consistent		
• All highlighting, notes, and comments are removed from document		
• Size, style, and indenting of bullets are consistent		
• Spell check is complete		
• Other (specify):		
<b>Other Issues</b>		
• Check that each section is updated with current year (or most recent year that inventory report includes)		
• Other (specify):		



## Template 4: Description of Archiving System



1: Institutional Arrangements



2: Methods and Data Documentation



3: Description of QA/QC Procedures



4: Description of Archiving System



5: Key Category Analysis



6: National Inventory Improvement Plan

### Country Representative Contact Information

<b>Country:</b>		<b>Postal Address:</b>	
<b>Contact Name:</b>		<b>Phone Number:</b>	
<b>Title:</b>		<b>E-Mail:</b>	
<b>Organization:</b>		<b>URL:</b>	

## Template 4: Description of Archiving System



### **Instructions**

- *An archiving system is an inexpensive yet critical step in the sustainability of the National Inventory System because it serves as a starting point for future inventory teams.*
- *Countries should use this Word document to enter country-specific data and for preparing final plans. The green text is used to provide instructions and guidance throughout the template as well as within tables. In the final plan, all green text should be deleted, and country-specific information should be used in its place.*
- *Instructions are listed above. Each step is explained in detail in the corresponding section of the template.*

### **Step-by-Step Instructions**

- STEP 1: Describe the existing archiving program and procedures
- STEP 2: Provide the Archive System Plan
- STEP 3: Provide improvements to the inventory archive system



## **Description of Archiving System (AS) for [Country X]**

### **4.1. Background**

Archives refer to a collection of records that have been created during the development of the inventory (references, methodological choice, expert comments, revisions, etc.), as well as document the location where these records are kept. The Archiving System is a critical component of the inventory development process and is important for sustaining any National Inventory System. An Archiving System helps make a national inventory transparent and reproducible, and facilitates development of subsequent inventories by future inventory staff and category leads (individuals responsible for developing estimates within a particular sector). Each new inventory cycle will benefit from effective data and document management during development of the previous inventory.

All information used to create the inventory should be archived in a single location in both electronic and/or hard copy (paper) storage so that future inventory managers can reference all relevant files to respond to reviewer feedback including questions about methodologies. Archived information should include all emission factors and activity data at the most detailed level, and documentation of how these factors and data have been generated and aggregated for the preparation of the inventory. This information should also include internal documentation on QA/QC procedures, external and internal reviews, documentation of annual key categories and key category identification, and planned inventory improvements. If possible, a copy of all archive documents should be kept in multiple locations to reduce the risk of losing all records due to theft or disaster (e.g., fire, earthquake, or flooding).

### **4.2. Assess Existing Archiving Program and Procedures**

- *STEP 1: Describe any archiving procedures from the first inventory, as well as those currently in place. These questions below will help identify these procedures to include in the plan:*

*Previous Inventory:*

- *What documents and files are available from the previous inventory?*
  - *Where are they located? Were they stored electronically or in hard copy?*

## Template 4: Description of Archiving System



- *Who has access?*
- *Are both final and draft copies available?*
- *Are contact names available in a list by category/sector?*

### *Current Inventory:*

- *Who has received data or documents from previous inventories that will be updated and used to compile the next inventory?*
  - *How are the data stored?*
  - *Where are the data stored?*
  - *Are they stored electronically or in hard copy? In both formats?*
  - *How are the files named?*
  - *How are the names/files changed to reflect updates?*
- *Who is keeping the following templates while they are being completed, and where are they stored?*
  - *Institutional Arrangements Template*
  - *Methods and Data Documentation (MDD) Template*
  - *QA/QC Measures Template*
  - *Archiving System Template*
  - *Key Category Analysis Template*
  - *National Inventory Improvement Plan Template*

### **4.3. Archive System Plan**

The following sections describe the Archive System Plan that *[Country]* plans to follow to ensure a high-quality national inventory based on an assessment of existing practices as described in section 4.2.

## Template 4: Description of Archiving System



### 4.3.1. Archiving Coordinator Role and Responsibilities

The role of Archiving Coordinator will be designated at the beginning of the inventory process. The Archiving Coordinator is responsible for ensuring that all archiving procedures are performed for the inventory and all supporting documents and spreadsheets are retained appropriately. The Archiving Coordinator is also responsible for clarifying who is responsible for carrying out archive procedures at various levels, as well as for ensuring that all team members know their archiving responsibilities, including which documents should be archived. These responsibilities require that the Archiving Coordinator:

- Communicate archiving system plan, procedures, and responsibilities to other staff.
- Determine archiving tasks and assign tasks to staff, create a checklist of archiving procedures for team members to follow.
- Ensure that the archive procedures (see section 4.3.2 below) are carried out effectively.
- Serve as the keeper of the permanent archive and respond to future requests to view archive materials.

This task is the general responsibility of *[e.g., the Inventory Coordinator, who is in charge of compiling the Inventory Chapter for the National Communications for [Country]. She/he is with X organization (e.g., Ministry, University, etc.).]*

### 4.3.2. Archive Procedures

It is essential to outline each aspect of the archiving process so that these procedures can be effectively implemented. The archive plan developed by the Archive Coordinator for *[Country]* that takes into account the following:

- *STEP 2: Modify the following list according to proposed procedures.*

#### Management of Files.

- Save files with IPCC category name and inventory year, and track the file version by including the date the file was last saved. For example, use a category-year naming convention such as "N2O soils 2000.23\_0523\_05\_2001.xls" or "KEY-CO2 stat combust-2000.23\_0505\_2001.xls."
- Clearly establish and communicate the file management procedures and naming conventions for version control.

## Template 4: Description of Archiving System



**Data Retention.** Spreadsheets and other electronic files used to create inventory estimates should be provided to the Archiving Coordinator.

The following are essential components of the archive:

- Data and calculation spreadsheets and other electronic files for every category used to create inventory estimates.
- QA/QC plan with completed checklists.
- Key category analysis spreadsheets.
- Internal and external review comments and responses.
- Latest draft and final electronic versions of the inventory document (for use as a starting point to update the inventory in the future).
- Updated MDD templates, which should be used to list and check references (references provided in STEP 2 through STEP 4 in the MDD template).
- *[List any additional components of the data retention archiving checklist.]*

The files listed above are most easily archived by saving to a CD-ROM disk or other durable media, and should be given to the Archiving Coordinator. If it is not possible to store the data archive in electronic format, files should be printed, catalogued, and placed in the inventory archive. The contents of the CD-ROM disc should be clearly labeled for easy reference.

- *There are several types of numerical systems that can be used to catalogue archive items. One of these systems involves cataloguing by sector. For example, the data related to the first new source in the energy sector would be labeled "E-1-dat," the second source "E-2-dat," etc. The sources for waste would be "W-1-dat," "W-2-dat," etc. Dates should also be included in the labels for proper version control.*
- *[List any additional document retention procedures.]*

**Document Retention.** Source documents and references used to create the inventory will be collected and provided to the Archiving Coordinator. Vital information from publications, contacts, and other sources must be included in the documents provided to the Archiving Coordinator. This information includes, at a minimum, the title page with the name of the author(s), pages of actual data used, pages explaining data used, and pages describing methodologies used.

## Template 4: Description of Archiving System



These documents should include *[edit as appropriate]*:

- All new reference documents for the current year's inventory records file. The files retained in storage from any given inventory year are known as the inventory archive. The Archiving Coordinator is responsible for reviewing the references cited in the inventory and collecting all new documents. It is not necessary to include duplicate copies of references that are already in the records file from the previous inventory cycle.
- Draft versions (either electronic or hard copy) used for major internal and external peer reviews, as well as the final submitted versions of the inventory.
- Final version of the National Systems Report (compilation of completed templates including Institutional Arrangements, QA/QC Plan, Description of Archiving System, Key Category Analysis Report, and National Inventory Improvement Plan).
- Documents created to address comments received during any official review periods (or from expert reviews). These documents typically include both, comments received verbatim, as well as the response and subsequent actions taken by the inventory staff.
- *[List any additional document types.]*

**Storage Mechanisms.** Archived inventory files are stored in *[insert location(s) of hard copy and electronic files here]*.

- The master copies of the archive files are stored in *[insert location of master versions of hard copy and electronic files]* by *[insert name of person(s) in charge of master files]*.
- Duplicate copies of the archive files are stored in *[insert location, address, etc.]* by *[insert name of person(s) in charge of copied files]*.

All archive materials should be duplicated (two copies of each document), catalogued and placed in the archive file. An index describing the contents of the archive should be placed at the front. The Archiving Coordinator will choose a centralized and secure location for the placement of the hard copy and electronic archive.

### 4.3.3. Overall Archive Procedures Checklist

To ensure a successful archiving system, the Archiving Coordinator should use a comprehensive checklist. Checklists help to ensure that all archiving procedures occur in a timely and complete manner.

## Template 4: Description of Archiving System



The final archiving task list and schedule will show all archiving tasks, corresponding task leaders, and due dates. The Archiving Coordinator will ensure that all tasks are outlined prior to the start of any archive procedure. The Archiving Coordinator is also responsible for assigning task leaders to accomplish each archive task prior to the due date. Staffing for each task and date due will be completed by the Archiving Coordinator at the beginning of the inventory process. Table 4.1 provides the comprehensive checklist to be used by the Archiving Coordinator for [Country].

- *The checklist below contains a list of proposed archiving activities for both the overall Archive coordinator and also category leads. Edit this list according to your country's circumstances and objectives. The "date due" column does not need to be completed for the purposes of describing and developing archive procedures in your national system report. When using the checklist below at the beginning of the next inventory cycle, develop due dates in accordance with the "Inventory Cycle" proposed in the Institutional Arrangements Template. Archive material should be collected when the material is first used for the inventory, to avoid searching for materials at a later date.*
- *Review Table 4.1 carefully. As noted above, edit the tasks and responsibilities so that they accurately reflect those in your country's inventory system.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each subtask.*

**Table 4.1: Archive Tasks, Responsibilities, and Schedule for [Country]**

Subtask	Date Due	Task Completed	
		Initials	Date
<i>Archiving Coordinator</i>			
Create official archive located in <i>[insert location of master versions of hard copy and electronic files]</i> .			
Communicate archiving plan and set deadlines.			
Collect copies of all data references.			
Request missing references from category leads.			
Compile electronic versions of spreadsheets used to estimate net emissions by sector.			
Collect copies of draft versions of inventory document.			
Collect copies of final versions of inventory document.			

## Template 4: Description of Archiving System



Subtask	Date Due	Task Completed	
		Initials	Date
Compile electronic versions of final versions of inventory document.			
Collect copies of expert review comment response documents from each category lead.			
Collect copies of public review comment response documents from each category lead.			
Catalogue all documents using a unique tracking number and index.			
Collect completed Institutional Arrangements and Methods and Data Documentation templates.			
Compile electronic versions of Key Category analyses. (Some files will be duplicated from the previous subtask.)			
Compile electronic versions of QA/QC checklists.			
Save all electronic files on archive CD-ROM.			
Ensure all hard copy materials are present in official archive by reviewing contents against index.			
Ensure all necessary electronic files are contained on CD-ROM and ensure that it is placed with other official archive materials.			
Distribute electronic files at start of next inventory update.			
<i>[List additional tasks]</i>			
<b>Category Lead</b>			
Send electronic versions of spreadsheets used to estimate net emissions to Inventory Coordinator (using naming convention).			
Send final text documents for sector or category to Inventory Coordinator.			
Send Methods and Data Documentation reports for category.			
Create index of draft documents and files for electronic and hard copy storage.			
Create index of final documents and files for electronic and hard copy storage.			
Compile and send electronic versions of any Key Category analyses and documents to Inventory Coordinator (add "key" to naming convention).			
Send summary or list of QA/QC steps and corrective actions (by category) to Inventory Coordinator.			
Save all final electronic files on archive CD-ROM. Label as "FINAL" with name of category/sector, date, and contact information, and send copy to Inventory Coordinator.			

## Template 4: Description of Archiving System



Subtask	Date Due	Task Completed	
		Initials	Date
[List additional tasks]			

### 4.4. Improvements to the Inventory Archive System

- *STEP 3: Improvements to the Archiving System include improvements associated with staff roles and responsibilities and archiving procedures, including file management, file storage, and document and data retention.*
- *Enter any suggested improvements to the inventory archive system in Table 4.2 below.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each improvement.*

Table 4.2 provides a list of suggested improvements to the archive system. These improvements should be incorporated into the archive system in future years.

**Table 4.2: Improvements to the Inventory Archive System**

Improvement #	Archive System Task	Potential Improvement



## Template 5: Key Category Analysis



1: Institutional Arrangements



2: Methods and Data Documentation



3: Description of QA/QC Procedures



4: Description of Archiving System



5: Key Category Analysis



6: National Inventory Improvement Plan

### Country Representative Contact Information

<b>Country:</b>		<b>Postal Address:</b>	
<b>Contact Name:</b>		<b>Phone Number:</b>	
<b>Title:</b>		<b>E-Mail:</b>	
<b>Organization:</b>		<b>URL:</b>	

## Template 5: Key Category Analysis



### **Instructions**

- *Each country should prepare its "Final Report on IPCC Key Categories" using this template. The template can be used in combination with the appropriate key category software provided by U.S. EPA.<sup>1</sup> Countries with only one inventory year should not complete Step 3 or Step 5.*
- *Countries should use this Word document to enter country-specific data and for preparing final plans. The green text is used to provide instructions and guidance throughout the template as well as within tables. In the final plan, all green text should be deleted, and country-specific information should be used in its place.*
- *Step-by step instructions are listed in the box shown. Each step is explained in detail in the corresponding section of the template.*

### **Step-by-Step Instructions**

- STEP 1: Download the key category software
- STEP 2: Complete the Tier 1 key category "current year level analysis"
- STEP 3: If your country has GHG inventories for more than one year, complete the Tier 1 key category "base year level analysis" and "trend analysis"
- STEP 4: If your country has uncertainty estimates, complete the Tier 2 key category "current year level analysis"
- STEP 5: If your country has uncertainty estimates and a GHG inventory for more than one year, complete the Tier 2 key category "base year level analysis" and "trend analysis"
- STEP 6: Update the "Methodology" section, deleting any part that is not relevant
- STEP 7: Provide improvements to the KCA analysis
- STEP 8: Provide any additional information
- STEP 9: Complete the "References" section

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<sup>1</sup> Countries may also use the UNFCCC GHG software, which generates a key category analysis; however, the steps in this template will be different since they follow the structure of the EPA key category software.



## Key Category Analysis (KCA)

### 5.1. Background

The concept of "key categories" was created by the IPCC as a way to help countries prioritize resources for improving national greenhouse gas inventories.<sup>2</sup> Key categories have the greatest contribution to the overall level of national emissions. When an entire time series of emission estimates is prepared, key categories can also be identified as those categories that have the largest influence on the trend of emissions over time.<sup>3</sup> In addition, when uncertainty estimates are incorporated into emission estimates, additional key categories are identified.

The results of the key category analysis provide a country with a list of their most important inventory categories. This list is a starting point from which a country can begin the process of improving their greenhouse gas inventory. To improve the national greenhouse gas inventory, it may be necessary to consider applying more accurate or higher tier methodologies, collect more detailed activity data, or develop country-specific emission factors. These activities all require additional resources, and it is not possible to make improvements for every inventory category. The inventory category list resulting from this analysis can provide a quantitative framework for the national greenhouse gas inventory team to develop an inventory improvement plan. The key category analysis also provides more complete and transparent information for the National Communication.

This report presents the results of the IPCC Approach 1 and Approach 2 methodologies for determining key categories (referred to as Tier 1 and Tier 2 throughout this template). In the Tier 1 methodology, key categories are identified using a pre-determined

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<sup>2</sup> The 1996 IPCC Guidelines refer to "key source categories" which has been revised in subsequent IPCC Guidelines to "key categories" since sinks are also included in the analysis.

<sup>3</sup> The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006) defines a key category as a "category that is prioritized within the national inventory system because its estimate has a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level, the trend, or the uncertainty in emissions and removals. Whenever the term key category is used, it includes both source and sink categories." See Chapter 4, "Methodological Choice and Identification of Key Categories," in IPCC 2006 for more information, < <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>.

## Template 5: Key Category Analysis



cumulative emissions threshold, where *key categories* are those that, when summed together in descending order of magnitude, add up to 95% of the total level. The Tier 2 methodology to identify *key categories* can be used if category uncertainties or parameter uncertainties are available. Under the Tier 2 key category methodology, source or sink categories are sorted or ranked according to their contribution to uncertainty, and emissions are weighted by their combined uncertainty, in addition to contribution to total emissions.

### 5.2. Download Key Category Software

- *STEP 1: Download the key category software from the project website by right clicking on the Excel document and selecting “save as...”. Once the Excel document is saved, simply double click the file to open and begin the key category analysis. Be sure to save copies of the document as different versions for draft and final analyses by inserting the date at the end of the file name (e.g., “EPA KCA Tool v2.2\_3-4-2012.xls”)*

### 5.3. Tier 1 Current Year Level Analysis

- *STEP 2: Complete Table 5.1 using the results from the “Tier 1 Current Year Level” tab in the key category software provided by U.S. EPA. Enter the first inventory category identified as a key category (highlighted in green in the table on this tab in the software) and include its greenhouse gas type, emission estimate, “Level assessment” (or contribution to national emissions), and cumulative percentage. Continue to add the next inventory category until all categories that are highlighted in green in the KCA tool (identified as key) are entered. The cumulative total (or cumulative percentage) of the level assessment for these categories should account for at least 95% of national emissions.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*

When inventory categories are sorted in order of decreasing GHG magnitude, those that fall at the top of the list and cumulatively account for 95% of emissions are considered key categories. They are those inventory categories that contribute the most to overall national total emissions.

Table 5.1 presents the results of the IPCC Tier 1 key category level analysis for the most recent or current year XXXX (e.g., 1994). There are a total of X key categories based on the Tier 1 level assessment.

## Template 5: Key Category Analysis



Table 5.1: Key Categories Based on Contribution to Total National Emissions in XXXX (e.g., 1994)\*

IPCC Category Code	IPCC Category	Gas	Current Year Emissions (Gg CO <sub>2</sub> Eq.)	Contribution to National Emissions	Cumulative Percent of National Emissions

\*Represents results from the “Tier 1 Current Year Level” tab.

### 5.4. Tier 1 Base Year Level and Trend Analyses

- STEP 3 should be completed by those countries that have GHG inventories for more than one year (most countries now have two or more inventories). If a GHG inventory is only available for a single year, countries should proceed to the next step and skip this section. Complete Table 5.2 using the results from the “Tier 1 Base Year Level” tab in the key category software provided in the U.S. EPA software. Enter the first inventory category identified as a key category (highlighted in green in the table on this tab in the software) and include its greenhouse gas type, emission estimate, and “Level assessment” (or contribution to national emissions), and cumulative percentage. Continue to add the next inventory category until all categories that are highlighted in green (identified as key) are entered. The cumulative total of the level assessment amounts for these categories should account for at least 95% of national emissions.*
- Insert as many rows within the table below as necessary to provide the detailed information for each category.*

When inventory categories are sorted in order of decreasing GHG magnitude, those that fall at the top of the list and cumulatively account for 95% of emissions are considered key categories. They are those inventory categories that contribute the most to overall national total emissions.

Table 5.2 presents the base year level results of the IPCC Tier 1 key category level analysis for the base year XXXX (e.g., 1990). There are a total of X key categories based on the Tier 1 level assessment.

## Template 5: Key Category Analysis



**Table 5.2: Key Categories Based on Contribution to Total National Emissions in XXXX (e.g., 1990)\***

IPCC Category Code	IPCC Category	Gas	Base Year Emissions (Gg CO <sub>2</sub> Eq.)	Contribution to National Emissions	Cumulative Percent of National Emissions

\*Represents results from the “Tier 1 Base Year Level” tab.

- *The second part of this step is to conduct the trend assessment using both the base year estimates and current estimates. Complete Table 5.3 using the results from the "Tier 1 Trend" tab in the key category software provided by U.S. EPA. Enter the first inventory category identified as a key category (highlighted in green in the table on this tab in the software) and include its greenhouse gas type, both its base year and current year estimates, “trend assessment” (or contribution to the trend), and cumulative percentage. Continue to add the next inventory category until all categories that are highlighted in green (identified as key) are entered. The cumulative total of these categories should account for at least 95% of the total national trend in emissions.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*
- *The trend assessment identifies categories whose trend is different from the trend of the total inventory, regardless of whether category trend is increasing or decreasing, or is a sink or source. Categories whose trend diverges most from the total trend should be identified as key when this difference is weighted by the level of emissions or removals of the category in the base year. The inventory category trend is defined, by IPCC as the change in net emissions from the base year to the current year, as a percentage of current year net emissions from that inventory category. The total trend is the percentage change in total inventory net emissions from the base year to the current year.*

Table 5.3 presents the results of the IPCC key category trend analysis for the years XXXX to XXXX (e.g., 1994-2000). The key categories are listed in order of decreasing contribution to the overall trend. Together they account for at least 95% of the overall trend in national total emissions. There are a total of X key categories based on the trend analysis.

## Template 5: Key Category Analysis



**Table 5.3: Key Categories Based on Contribution to Overall Trend in National Net Emissions\***

IPCC Category Code	IPCC Category	Gas	Base Year Emissions (Gg CO <sub>2</sub> Eq.)	Current Year Emissions (Gg CO <sub>2</sub> Eq.)	Contribution to Trend	Cumulative Contribution to Trend

\*Represents results from the “Tier 1 Trend” tab.

### 5.5. Tier 2 Current Year Level Analysis

- *STEP 4: Tables 5.4 through 5.6 are ONLY for those countries that have estimated the uncertainty associated with national emissions and sequestration estimates. Complete Table 5.4 using the level assessment results from the "Tier 2 Current Year Level" tab in the key category software provided by U.S. EPA. Enter the first inventory category identified as a key category (highlighted in green in the table on this tab in the software) and include its greenhouse gas type, relative level assessment with uncertainty, and cumulative percentage. Continue to add the next inventory categories until all categories that are highlighted in green (identified as key) are entered. The cumulative total of the level assessment amounts for these categories should account for at least 90% of national emissions.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*

The Tier 2 approach to assessing key categories, as defined in the IPCC’s 2006 Guidelines (IPCC 2006), incorporates each source and sink category’s associated uncertainty estimates into the equation to identify any additional key categories not already identified in the Tier 1 assessment. When inventory categories are sorted in order of decreasing GHG magnitude with the incorporated uncertainty, those that fall at the top of the list and cumulatively account for 90% of emissions are considered key categories.

Table 5.4 presents the results of the IPCC Tier 2 key category level analysis for the year XXXX (e.g., 1994). There are a total of X key categories based on the Tier 2 current year level analysis.

Template 5: Key Category Analysis



Table 5.4: Key Categories Based on Contribution to Total National Emissions with Incorporated Uncertainty in XXXX (e.g., 1994)\*

IPCC Category Code	IPCC Category	Gas	Level Assessment with Uncertainty	Relative Level Assessment with Uncertainty	Cumulative Percent of National Emissions

\*Represents results from the “Tier 2 Current Year Level” tab.

**5.6. Tier 2 Base Year and Trend Analyses with Incorporated Uncertainty**

- STEP 5: Tables 5.5 and 5.6 are ONLY for those countries that have estimated the uncertainty associated with national emissions and sequestration estimates, and those countries that have GHG inventories for more than one year. Complete Table 5.5 using the results from the "Tier 2 Base Year Level" tab in the key category software provided by U.S. EPA. Enter the first inventory category identified as a key category (highlighted in green in the table on this tab in the software) and include its greenhouse gas type, level assessment with uncertainty, and relative level assessment with uncertainty. Continue to add the next inventory categories until all categories that are highlighted in green (identified as key) are entered. The cumulative total of the level assessment amounts for these categories should account for at least 90% of national emissions.*
- Insert as many rows within the table below as necessary to provide the detailed information for each category.*

Table 5.5 presents the results of the IPCC Tier 2 key category level analysis for the year XXXX (e.g., 1990). There are a total of X key categories based on the Tier 2 base year level analysis.

Template 5: Key Category Analysis



Table 5.5: Key Categories Based on Contribution to Total National Emissions with Incorporated Uncertainty in XXXX (e.g., 1990)\*

IPCC Category Code	IPCC Category	Gas	Level Assessment with Uncertainty	Relative Level Assessment with Uncertainty	Cumulative Percent of National Emissions

\*Represents results from the "Tier 2 Base Year Level" tab.

- *The last part of this step is to conduct the trend assessment using both the base year estimates and current estimates. Complete Table 5.6 using the results from the "Tier 2 Trend" tab in the key category software provided by U.S. EPA. Enter the first inventory category identified as a key category (highlighted in green in the table on this tab in the software) and include its greenhouse gas type, trend assessment with uncertainty, relative level assessment with uncertainty, and cumulative percent of national emissions. Continue to add the next inventory category until all categories that are highlighted in green (identified as key) are entered. The cumulative total of these categories should account for at least 90% of the total national trend in emissions.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*

Table 5.6 presents the results of the IPCC Tier 2 key category trend analysis for the years XXXX to XXXX (e.g., 1994-2000). The key categories are listed in order of decreasing contribution to the overall trend when uncertainty is incorporated. Together they account for at least 90% of the overall trend in national total emissions. There are a total of X key categories based on the trend analysis.

## Template 5: Key Category Analysis



**Table 5.6: Key Categories Based on Contribution to Overall Trend in National Net Emissions with Incorporated Uncertainty**

IPCC Category Code	IPCC Category	Gas	Trend Assessment with Uncertainty	Relative Trend Assessment with Uncertainty	Cumulative Percent of National Emissions

\*Represents results from the “Tier 2 Trend” tab.

### 5.7. Methodology

- *STEP 6: Review the following methodology sections and delete any sections that are not applicable for your country. If your country does not have inventory estimates for more than one year, delete sections 5.4 and 5.6. If your country does not have uncertainty estimates for inventory categories, delete sections 5.5 and 5.6.*

The methodologies used in this report are taken from *IPCC Good Practice (2000)* and *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. More detailed descriptions of the methodologies can be found in these documents.

#### 5.7.1. Tier 1 Level Assessment

For a Tier 1 Level Assessment of key categories, calculate the contribution of each inventory category's emissions to the total national inventory level, according to Equation 1:

#### EQUATION 1

Key Category Level Assessment =  $\frac{|\text{Source or Sink Category Estimate}|}{\text{Total Contribution}}$

$$L_{x,t} = \frac{|E_{x,t}|}{\sum_y |E_{y,t}|}$$



where:

$L_{x,t}$  = the level assessment for source or sink category  $x$  in year  $t$

$|E_{x,t}|$  = the absolute value of emission or removal estimate of source or sink category  $x$  in year  $t$

$\sum_y |E_{y,t}|$  = the total contribution, which is the sum of the absolute values of emissions and removals in year  $t$  calculated using the aggregation level chosen by the country for key category analysis. Because both emissions and removals are entered with positive sign, the total contribution/level can be larger than a country's total emissions less removals.

This equation determines the contribution of each inventory category's GHG emissions to the national total. Key categories are those that, when added together in descending order of magnitude, constitute at least 95% of the total emissions for a given year.

### 5.7.2. Tier 1 Trend Assessment

- *Countries that have emission inventories for more than one year and have conducted the Trend Assessment should include this section.*

The contribution of each category's emission trend to the trend in the total inventory can be assessed if more than one year of inventory data are available, according to Equation 2:

EQUATION 2

$$T_{x,t} = \frac{|E_{x,0}|}{\sum_y |E_{y,0}|} \times \left| \left[ \frac{(E_{x,t} - E_{x,0})}{|E_{x,0}|} \right] - \frac{(\sum_y E_{y,t} - \sum_y E_{y,0})}{|\sum_y E_{y,0}|} \right|$$

where:

$T_{x,t}$  = the trend assessment of source or sink category  $x$  in year  $t$  as compared to the base year (year 0)

$|E_{x,0}|$  = the absolute value of emission or removal estimate of source or sink category  $x$  in year 0

## Template 5: Key Category Analysis



$E_{x,t}$  and  $E_{x,0}$  = the real values of estimates of source or sink category  $x$  in years  $t$  and 0, respectively

$\sum_y E_{y,t}$  and  $\sum_y E_{y,0}$  = the total inventory estimates in years  $t$  and 0, respectively

The trend assessment for an individual source or sink category is the change in the category emission/removal over time, computed by subtracting the base year (year 0) estimate for source or sink category  $x$  from the current year (year  $t$ ) estimate, and dividing by the current year estimate. The total trend is the change in the total inventory emissions over time, computed by subtracting the base year (year 0) estimate for the total inventory from the current year (year  $t$ ) estimate, and dividing by the current year estimate.

The trend assessment will identify inventory categories that have a trend different from the trend of the overall inventory. As differences in trend are more significant to the overall inventory level for larger inventory categories, the result of the trend difference (i.e., the inventory category trend minus the total trend) is multiplied by the result of the level assessment from the base year ( $L_{x,t}$  from Equation 1) to provide appropriate weighting. Thus, key categories will be those where the inventory category trend diverges significantly from the total trend, weighted by the emission level of the inventory category.

This type of key category analysis is only applicable to those countries that have emission inventories for more than one year. Thus, key categories are those whose trend diverges significantly from the total trend, weighted by the level of emissions or removals of the category in the base year. Key categories are those that, when summed together in descending order of magnitude, add up to more than 95% of the total trend.

### 5.7.3. Tier 2 Level Assessment

- *Countries that have estimated uncertainty and have performed a Tier 2 Level Assessment should include this section.*

The key category analysis is enhanced by incorporating the national source or sink category uncertainty estimates. The contribution of each source or sink category to the total national inventory level as weighted by their respective category percent uncertainty is calculated according to Equation 3:



**EQUATION 3**

$$LU_{x,t} = \frac{(L_{x,t} \times U_{x,t})}{\sum_y [(L_{y,t} \times U_{y,t})]}$$

where:

$LU_{x,t}$  = the level assessment for category  $x$  in latest inventory year (year  $t$ ) with uncertainty

$L_{x,t}$  = the Tier 1 level assessment as computed in Equation 1

$U_{x,t}$  = category percentage uncertainty in year  $t$  calculated according to the 2006 IPCC Guidelines Chapter 3. If the reported uncertainty is asymmetrical, the larger uncertainty should be used. The relative uncertainty will always have a positive sign.

This equation determines the contribution of each source or sink category's GHG contribution to the national total as weighted by their respective uncertainty estimates. Key categories are those that, when added together in descending order of magnitude, constitute at least 90% of the total emissions for a given year.

**5.7.4. Tier 2 Trend Assessment**

- *Countries that have estimated uncertainty and have performed a Tier 2 Trend Assessment should include this section.*

The contribution of each source or sink category to the trend in the total inventory as weighted by their respective category percent uncertainty can be assessed if more than one year of inventory data is available, according to Equation 4.

**EQUATION 4**

$$TU_{x,t} = (T_{x,t} \times U_{x,t})$$

where:

## Template 5: Key Category Analysis



$TU_{x,t}$  = the trend assessment for category  $x$  in latest inventory year (year  $t$ ) with uncertainty

$T_{x,t}$  = the Tier 1 trend assessment as computed in Equation 2

$U_{x,t}$  = the category percent uncertainty in year  $t$  calculated according to the 2006 IPCC Guidelines Chapter 3. If the reported uncertainty is asymmetrical, the larger uncertainty should be used. The relative uncertainty will always have a positive sign.

This type of key category analysis is only applicable to those countries that have emission inventories for more than one year and uncertainty estimates for individual source and sink categories. Thus, key categories are those whose trend diverges significantly from the total trend, weighted by the uncertainty. Key categories are those that, when summed together in descending order of magnitude, add up at least 90% of the total trend.

### 5.8. Improvements to the Key Category Analysis

- *STEP 7: Enter any suggested improvements to the key category analysis in Table 5.7 below.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each improvement.*

Table 5.7 provides a list of suggested improvements to this template. These improvements shall be incorporated into the template in future years.

**Table 5.7: Improvements to the key category analysis**

Improvement #	Sector	Source Category	Potential Improvement

### 5.9. Provide Any Additional Information

- *STEP 8: Countries may add more detailed qualitative or quantitative results here, including the output tables from the U.S. EPA software.*



### 5.10. References

- *STEP 9: Add any additional references used in the analysis.*

2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006). < <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>

IPCC Good Practice Guidance (IPCC 2000). < <http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm>>



## Template 6: National Inventory Improvement Plan



1: Institutional Arrangements



2: Methods and Data Documentation



3: Description of QA/QC Procedures



4: Description of Archiving System



5: Key Category Analysis



6: National Inventory Improvement Plan

### Country Representative Contact Information

<b>Country:</b>		<b>Postal Address:</b>	
<b>Contact Name:</b>		<b>Phone Number:</b>	
<b>Title:</b>		<b>E-Mail:</b>	
<b>Organization:</b>		<b>URL:</b>	

## Template 6: National Inventory Improvement Plan



### Instructions

- *The purpose of a National Inventory Improvement Plan (NIIP) is to help countries identify and prioritize improvements to their national systems. A completed plan will guide future efforts to increase the transparency, consistency, comparability, completeness, and accuracy of future inventories. This template draws upon information from other report templates in this handbook to identify priority areas for improvement. Therefore, this template should be filled out after the other templates are completed.*
- *Countries should use this Word document to enter country-specific data and for preparing final plans. The green text is used to provide instructions and guidance throughout the template as well as within tables. In the final plan, all green text should be deleted, and country-specific information should be used in its place.*
- *Step-by-Step instructions are listed in the box above. Each step is explained in detail in the corresponding section of the template.*

### Step-by-Step Instructions

- STEP 1: Provide country-specific objectives
- STEP 2: Summarize priorities for improving institutional arrangements
- STEP 3: Summarize findings from the Key Category Analysis template
- STEP 4: Summarize improvements identified in the Methods and Data Documentation (MDD) Background Document
- STEP 5: Summarize potential QA/QC improvements
- STEP 6: Summarize potential archiving improvements
- STEP 7: Describe communication, outreach, and training activities/plans
- STEP 8: Summarize potential improvements across all templates
- STEP 9: Prioritize inventory improvements
- STEP 10: Propose inventory improvement projects



## ***National Inventory Improvement Plan (NIIP)***

### **6.1. Objective**

This National Inventory Improvement Plan (NIIP) presents actions that [Country] has identified to improve its national GHG inventory systems. The NIIP will guide future efforts to increase the transparency, consistency, comparability, completeness, and accuracy of future inventories. The plan addresses many of the shortcomings of the previous inventory, and will inform future inventory teams of needed improvements. These improvements have been identified through documentation of existing institutional arrangements, category-by-category analyses of methods and data, QA/QC procedures, developing archiving systems, and an assessment of key categories in [Country].

- *STEP 1: List any additional ways in which you have identified improvements. Describe any further objectives that your country may have in developing this plan.*



### **6.2. Institutional Arrangement Priorities**

- *STEP 2: Complete Table 6.1 using information from Table 1.9 in STEP 3 of the completed Institutional Arrangements template. Provide any additional information on how institutional arrangement priorities were identified.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each sector's institutional arrangements.*

The National Inventory System involves all of the institutional, legal, and procedural arrangements made by a country for estimating anthropogenic emissions and removals, as well as the reporting and archiving of inventory information. Identified within a National Inventory System is the designated government agency responsible for producing a national greenhouse gas inventory, the key organizations that contribute data and methods, estimates, and the end-users of the inventory.

Preparing a comprehensive inventory requires establishing, identifying, and documenting all relevant contributors to the National Inventory. Assessing and documenting the status of existing institutional arrangements for inventory development will ensure continuity and integrity of the inventory, promote institutionalization of the inventory process, and facilitate prioritization of future improvements.

## Template 6: National Inventory Improvement Plan



- Provide additional comments that describe details on institutional priorities in your country, such as how priority actions were identified.

Table 6.1 lists the priority actions identified in the Institutional Arrangements template.

**Table 6.1: Priority Actions for [Country's] National Inventory System**

Sector	Strengths in Management Structure of National Inventory System	Potential Improvements in Management Structure of National Inventory System

Note: Taken from Table 1.9 in Section 1.3, in the IA template.

- In the note to the table above, fill in the appropriate table and section numbers.



### 6.3. Summary of Key Categories

- **STEP 3:** Complete Table 6.2 using the information in Table 5.1 through Table 5.3 of the completed Key Category Analysis template, as applicable. Include a short paragraph summarizing categories listed in this table. If your country has completed Table 5.1 through Table 5.3 in the Key Category Analysis template, include all key categories identified in these tables and note which assessment identifies each key category using the “key category assessment” column in Table 6.2. See additional instructions below.
- Insert as many rows within the table below as necessary to provide the detailed information for each category.

## Template 6: National Inventory Improvement Plan



The concept of "key categories" was created by the IPCC as a way to help countries prioritize resources for improving national greenhouse gas inventories.<sup>4</sup> Key categories have the greatest contribution to the overall level of national emissions. When an entire time series of emission estimates is prepared, key categories can also be identified as those categories that have the largest influence on the trend of emissions over time.<sup>5</sup> In addition, when uncertainty estimates are incorporated into emission estimates, additional key categories are identified.

The results of the key category analysis provide a country with a list of their most important inventory categories. This list is a starting point from which a country can begin the process of improving their greenhouse gas inventory. To improve the national greenhouse gas inventory, it may be necessary to consider applying more accurate or higher tier methodologies, collect more detailed activity data, or develop country-specific emission factors. These activities all require additional resources, and it is not possible to make improvements for every inventory category. Therefore, *[Country]* has identified the categories listed in Table 6.2 as the most important categories contributing to national net emissions. Assessing the methods and data used to estimate emissions and/or removals from these key categories is integral to identifying priorities. These categories were identified through the Key Category Analysis, using software provided by U.S. EPA. A level assessment was conducted, identifying the largest categories accounting for at least 95% of the total estimate.

- *Provide additional information on other key category assessments if they were conducted (such as Tier 2 methodologies incorporating uncertainty estimates).*

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<sup>4</sup> The 1996 IPCC Guidelines refer to "key source categories" which has been revised in subsequent IPCC Guidelines to "key categories" since sinks are also included in the analysis.

<sup>5</sup> The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006) defines a key category as a "category that is prioritized within the national inventory system because its estimate has a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level, the trend, or the uncertainty in emissions and removals. Whenever the term key category is used, it includes both source and sink categories." See Chapter 4, "Methodological Choice and Identification of Key Categories," in IPCC 2006 for more information, < <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>.

## Template 6: National Inventory Improvement Plan



- Write a short paragraph to provide context on the key categories for your country. Explain why certain categories represent a large portion of national net emissions. If possible, identify which categories have become increasingly important in recent years, or which are likely to be increasingly important in the future.

**Table 6.2: Key Categories for [Country]**

Key Category Assessment*	IPCC Category Code	IPCC Category	Gas	Emissions (Gg CO <sub>2</sub> Eq.)	Percent Contribution to National Net Emissions	Cumulative Percent of National Net Emissions

Note: Taken from Table x.x in Section x, in the KCA template.

\* Assessments include: 1) current year level analyses, 2) base year level analyses, and 3) trend analyses.

- In the note to the table above, fill in the appropriate table and section numbers from the KCA template.



### 6.4. Potential Category-Improvements

- **STEP 4:** Review the completed Methods and Data Document for each key category, and identify any improvements needed to improve emissions and/or removals estimates. These actions may include, but are not limited to, improving transparency, obtaining more complete activity data, using a higher-tiered methodology (e.g., IPCC Tier 2 instead of Tier 1), or using regional- or country-specific factors. Describe the problem and the potential improvement. Also, identify any other improvements needed to improve emissions and/or removals estimates for other categories in Table 6.3 (e.g., estimating emissions for a category not included in past inventories). These can be copied from the table in STEP 7 of the MDD Background Document.

Information for each key category is reported in section 6.3, which included a description of the category, relevance to [Country], methodology, activity data, and emission factors used. Priority areas for improvement for these and other categories are identified using this documentation. Table 6.3 lists the problems and potential improvements for each category.

- Include any additional information on process used to identify improvements for each category.
- Insert as many rows within the table below as necessary to provide the detailed information for each category.

## Template 6: National Inventory Improvement Plan



**Table 6.3: Potential Improvements for Categories**

Sector	Category	Describe Problem	Potential Improvement

Note: Taken from Table 2.X in Section X, in the MDD template.

- *In the note to the table above, fill in the appropriate table and section numbers.*

Improvements planned for additional categories are identified in Table 6.4, which also includes categories for which emissions and/or removals have not been estimated to improve completeness of inventory.

- *Table 6.4 is optional. If it is not used, it should be deleted, as should the sentence above, and successive tables should be renumbered.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each category.*

**Table 6.4: Improvements Planned for Additional Categories**

Sector	Category	Describe Problem	Potential Improvement



### 6.5. Potential Improvements to QA/QC Procedures

- *STEP 5: Review the completed QA/QC template, and identify any improvement needed to improve QA/QC procedures. These can be copied from the table in STEP 6 of the QA/QC template.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each planned improvement.*



**Table 6.5: Potential Improvements to QA/QC procedures**

Sector	Category	Describe Problem	Potential Improvement	
			QA	QC



### 6.6. Potential Archiving System Improvements

- *STEP 6: Review the completed Archiving template, and identify any improvements needed to improve inventory archiving procedures. These can be copied from the table in STEP 3 of the Archiving template.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each planned improvement.*

**Table 6.6: Potential Improvements to the Archive System**

Archive System Task	Describe Problem	Potential Improvement

### 6.7. Communication, Outreach, and Training Priorities

- *STEP 7: Communicating the purpose of the inventory and results to policymakers is important. In this section, you should include priorities based on your current activities or plans for raising awareness of GHG inventory efforts or for training staff on the inventory system or practices. These plans and activities may include any of the following:*
  - *Communicating to inventory results to data providers*

## Template 6: National Inventory Improvement Plan



- *Scheduling stakeholder meetings*
- *Raising awareness with government, academia, and the public*
- *Providing feedback to government and associated institutions*
- *Training or hiring inventory staff*
- *Developing a transition plan to ensure a smooth transfer of inventory capacity when needed*
- *Improving relationships with institutions*
- *This section should be removed from this chapter if there are not current or planned communication, outreach, and training activities.*

### 6.8. Potential Improvements

- *STEP 8: Enter the improvements identified (and summarized from each template in sections above) in Table 6.7 below.*
- *Insert as many rows within the table below as necessary to provide the detailed information for each improvement.*

Table 6.7 provides a list of potential improvements across the national inventory system. These improvements should be incorporated into the national inventory system in future years.

**Table 6.7: Improvements to National Inventory System**

Improvement #	Template	Sector (if applicable)	Category (if applicable)	Potential Improvement



### 6.9. Prioritized List of Potential Improvements

- *STEP 9: List up to 10 of the most important improvements identified from Step 8, above. Classify these improvements according to how critical they are: "High," "Medium," or "Low." For example, improvements to an agricultural category may be very important (High), while developing outreach materials may be a lower priority (Low). Insert a short paragraph discussing the highest priority items (see additional instructions below).*
- *Insert as many rows within the table below as necessary to provide the detailed information for each improvement.*

This section prioritizes the most critical improvements needed, based on an assessment of the relative importance of improvements identified for institutional arrangements, categories, QA/QC procedures, archiving systems, key categories, additional categories, and communication, outreach, and training identified in Steps 2 through 8, above. By addressing these issues, [Country] can move toward producing a more complete and higher-quality inventory. Table 6.8 lists these potential improvements, and identifies the level of priority associated with each (High, Medium, or Low).

- *Insert a paragraph describing the highest priority items and the areas of priority that are most applicable to your country (e.g., developing estimates for new categories, enhancing current methodologies, obtaining more reliable activity data, developing closer relationships with other institutions.)*

**Table 6.8: National Inventory Improvement Priorities**

Priority Level	Improvement Needed

### 6.10. Propose Inventory Improvement Projects

- *STEP 10: Propose projects to address inventory improvement priorities listed in Table 6.8 to strengthen the National Inventory System and improve the quality and completeness of GHG estimates. Use the text below as a general guide and list potential projects in Table 6.9.*
- *Insert as many rows into the table below as necessary to provide the detailed information for each improvement.*

## Template 6: National Inventory Improvement Plan



Through an assessment of key categories, current methods and data, and institutional arrangements, we have identified *[insert number]* projects to address national inventory improvement priorities. Some of these improvements will require additional personnel, capital, or other resources to implement them.

- *Provide one sentence on the objective of each project. For example, “Project 1 will enable us to estimate CO<sub>2</sub> emissions from cement production, which may be a significant source of emissions in [Country]. This project will focus on collecting data on annual clinker production from the 3 cement facilities in [Country]. Currently estimates are based on national statistics for cement production, which carries more uncertainty.”*

**Table 6.9: Potential Projects for Improving the National Inventory System**

#	Potential Project	Estimated Personnel Needed	Estimated Cost (\$)	Estimated Capital (equipment) Needed