

Information Matters, Ghana:

Capacity Building for Ambitious Reporting and Facilitation
of International Mutual Learning through Peer-to-peer Exchange



REPORT ON THE TRAINING-WORKSHOP ON QA/QC OF GREENHOUSE GAS INVENTORY/IES

Tills Hotel, Gomoa Fetteh, Ghana 12-13 November 2014



**ENVIRONMENTAL
PROTECTION
AGENCY, GHANA**

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

On behalf of:



Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

of the Federal Republic of Germany

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Acronyms

AGI	Association of Ghanaian Industries
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
BUR	Biennial Update Report
CDM	Clean Development Mechanism
DSA	Data Supply Agreements
EC	Energy Commission
EPA	Environmental Protection Agency
FC	Forestry Commission
FPP	Forest Preservation Program
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIPC	Ghana Investment Promotion Council
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
IKI	International Climate Initiative
IM	Information Matters
IPCC	Intergovernmental Panel on Climate Change
KSEFs	Key Sector Emission Factors
LECB	Low Emission Capacity Building Programme
LULUCF	Land Use, Land Use Change and Forestry
M&E	Monitoring and Evaluation
MDAs	Ministries, Departments and Agencies
MESTI	Ministry of Environment, Science, Technology and Innovation
MoF	Ministry of Finance
MOFA	Ministry of Food and Agriculture
MRV	Measurement, Reporting and Verification

Information Matters Ghana: Training-Workshop on QA/QC of Greenhouse Gas Inventory

NAMAs	Nationally Appropriate Mitigation Actions
NCSP	National Communication Support Programme
NDPC	National Development Planning Commission
PEF	Private Enterprise Federation
REDD+	Reducing Emissions from Deforestation and Forest Degradation
TACCC	Transparency, Accuracy, Completeness, Comparability and Consistency
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change

1. Background Information

1.1 Introduction

In 2013, Ghana launched a programme named “climate ambitious reporting (CARP)” which seeks to provide foundation for coordinating all climate reporting efforts. The aim of the CARP is to put in place an integrated national system that is capable of enabling Ghana to meet its international reporting obligations of (a) preparing National Communications (NATCOM) every four (4) years, (b) preparing Biennial Update Reports (BUR) every two (2) years and (c) participate in international Consultation and Analysis (ICA) of the BUR and above all provide evidence to support climate mitigation planning at all levels.

The Environmental Protection Agency (EPA) has received support from the German Government through the GIZ Information Matters (IM) Project to contribute to the rolling-out of the CARP. The contributions from IM will help to create awareness and build capacities among key institutions that are involved in the preparation of the national greenhouse gas inventory, implementation actions and tracking of climate finance.

In line with the GIZ-IMP, the EPA organized a training workshop on QA/QC of Greenhouse Gas Inventory/ies from 12-13 November 2014 at Till’s Hotel, Gomoa Fetteh. The aim of the workshop is to familiarize the participants with the fundamental principles of QA/QC, the main requirements when compiling a GHG Inventory,

verification and the three main principles of QA/QC. According, various institutions were invited to participate in the training programme. The workshop was moderated by Mr. Mark Fynn of GIZ and Mr. K. Y. Opong-Boadi.

1.2 Objectives

The following objectives were spelt out for the participant by Dr. Ross:

- Participants were to understand the role and importance of QA/QC processes in the development of GHG inventories.
- Participants were to understand what is meant by and contained within a QA/QC system and plan for the GHG Inventory.
- Participants were to understand what ‘Quality Control’ procedures are, the types of processes and activities that can be undertaken and how these can be applied in practice to implement effective quality assurance within a GHG Inventory.
- Participants were to understand what ‘Quality Assurance’ procedures are, the types of processes and activities that can be undertaken and how these can be applied in practice to implement effective quality assurance within a GHG Inventory.
- Participants were to have an overview of and a basic understanding of how to undertake Key Category Analysis.

- Participants were to have an overview and a basic understanding of how to undertake Tier 1 Uncertainty Analysis and have an introduction to what Tier 2 processes entail.
- Participants were to be familiar with the principles of data quality issues and how to apply data management practices and gap filling techniques to resolve this.
- Participants were to understand the key QA/QC issues and challenges in the Ghana GHG Inventory, what actions and next steps are required to develop and resolve these and their role in this.

1.3 Scope of workshop

The workshop adopted discussion-based, hands-on approaches and guided by the information

provided on QA/QC System Overview, Quality Control (QC): Principles and Processes, Quality Assurance (QA): Principles and Processes, Key category Analysis and Uncertainty, Improving Data Quality-Dealing with Data Gaps and Problems by various presenters from GIZ (Information Matters), EPA, Ricardo-AEA. Because it was a result-based workshop, the workshop targeted at discussing issues and identifying QA/QC of GHG data. The workshop was a mixture of presentations, breakout sessions and plenary sessions.

1.4 Participants

Thirty-one (31) participants from different sectors such as public and private sectors, NGOs, Universities, Ricardo-AEA and GIZ attended the workshop.

1.5 Questions Raised During the Workshop

No.	Question/Comment
1	Is there a special rationale for the 10% sample for over 200 activities as representative sample? Should EPA develop a common plan/template for the data gathering institutions?
2	How does EPA sustain the online database they have developed to store GHG data? Can they sell data to people who require the data?
3	Who has responsibility for setting QA/QC targets particularly on GHG inventory which is focused on the global level? Is it Ghana or will it be preferable for the UN to set the targets as a result of the global objective?
4	What is the effect of bureaucracy in the smooth coordination and effectiveness of UK's QA/QC process? Any lessons from Ghana EPA on bureaucracy? How is confidentiality treated by the EPA? Are confidential data from Ghana's GHG inventory data given to reviewers and what are the actions initiated to safeguard the confidentiality of the data?
5	Why are countries doing QA/QC? What do they seek to achieve in the end? What is the difference between Tier 1 and Tier 2 data? From your experience with working with developing countries what are some of the envisaged challenges regarding this process?
6	Using the UK as a model who determines role play. How can the inventory team learn from the statistical service in relation to the BUR?
7	Are there set standards for QA like ISO standards being used for QC?
8	Is it possible for countries to underestimate their emissions and how can reviewers check this?
9	Have under- or overestimations of GHG emissions any implication on the global GHG emissions reduction goal?
10	What are the implications of underestimation/overestimation of GHG emissions on a country for instance Ghana/UK?
11	Interpolation was used to fill the data gaps in forestry data for Ghana's GHG inventory. The reason for the use of interpolation was that proxy database on ground inventory and expert judgement showed a different trend than the remote sensing based database used in the GHG inventory. Should we have used multiple approaches for the data filling or interpolation?
12	Can you explain why uncertainty analysis focuses on accuracy and not precision? Is there a fixed established significance level for uncertainty analysis within the IPCC Guidelines?
13	How does quality of data affect Tier 1 and 2?



1.6 Summary “Board of expectations”

As a warm up exercise each participant was asked to write down their expectations and worries about QA/QC on Zop boards to refer back to throughout the workshop. These questions were grouped under the following sections:

(a) Expectations;

- ❖ How to apply data management practices to QA/QC
- ❖ To know if institutions are able to qualify net GHG inventory per year
- ❖ To be able to manage and ensure quality data for analysis decision making on greenhouse gas
- ❖ Expects at the end to agree on QA/QC methods that should not be missing in any data production process
- ❖ To know how prepared Ghans is in reporting for the next BUR and what are the inputs required
- ❖ Understand Tier 1 and Tier 2 analysis
- ❖ To fully understand the QA/QC issues relative to GHG inventory in Ghana
- ❖ Application of QA/QC issues on natural resource data
- ❖ Apply QA/QC successfully in agricultural data collection to address GHG emissions
- ❖ Standard QA/QC process in relation to GHG data collection and interpretation
- ❖ To have an in depth understanding of QA/QC process
- ❖ To learn about the IPCC good practice guide
- ❖ To know more about how the IPCC good practice guide is linked with the BUR

- ❖ Adopt robust means of filling data gaps
- ❖ To understand the application of QA/QC in my line of duty
- ❖ To acquire adequate skills in data management which can be enhanced for accurate decisions and policies to be met

(b) Worries;

- ❖ The achieving of targets set for the reduction of GHG emissions
- ❖ Are we on course in rolling out programmes aimed at reducing CFC?
- ❖ Time constraints
- ❖ How can QA/QC be applied whiles resource constraints are not being addressed?
- ❖ The credibility of modern software which make projections can be made into the future without necessarily collecting raw data
- ❖ Overcoming and identifying gaps in data collection and tracking
- ❖ Sustainability of this exercise on a national level
- ❖ Fitting this exercise into existing programmes and systems ongoing in this area, i.e. GHG inventory and other programmes
- ❖ Lack of institutional coordination in tracking GHG inventory

2. Workshop Presentations

2.1 Setting the Scene: About the Information Matters Project

The presentation was made by Ms. Kirsten Orschulok, GIZ HQ, about IM on the global perspective. Her presentation was divided in three parts: a) Global structure, global goal and cooperation partners, b) project activities and the project countries and c) the first outcome of the project.

She stated that the project is supported by the German Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The participating countries include Dominican Republic, Chile, Ghana and the Philippines. She mentioned project synergies with the UNDP-LECB, West Africa GHG Project, UNEP in partner countries, as well as with the WRI and the International Partnership on Mitigation and MRV.

The Global Project Goals are as listed:

- Identification of specific needs and priorities of the MRV systems and GHG monitoring in the partner countries
- Strengthen in-country capacities for enhanced reporting (BURs and NCs) of climate relevant information to UNFCCC
- Provision of tailored-made capacity-building trainings and workshops (in-country)
- Support the process through peer-to-peer exchange and generation of lessons learnt

She talked about some of the roles and responsibilities for the various project partners such as BMUB IKI, GIZ, Ricardo-AEA, UNDP, WRI and the UBA. She highlighted that the projects started with a kick-off workshop, which is

followed by two (2) capacity building in-country workshops and a final peer-to-peer exchange workshop in Germany. Subsequently, she mentioned the workshops which have been carried out so far including a Regional Workshop on BURs. She also spoke about the finalization of the BUR template which will come out in January, being available in French and Spanish as well.

2.2 QA/QC System Overview

This presentation was made by Ross Hunter and Raul Salas. Mr. Hunter started by defining Quality Assurance (QA) as a system to ensure regular and adequate checking of data and information and Quality Control (QC) as a system of regular independent reviews. TACCC ensures that these principles are carried out for the GHG inventories.

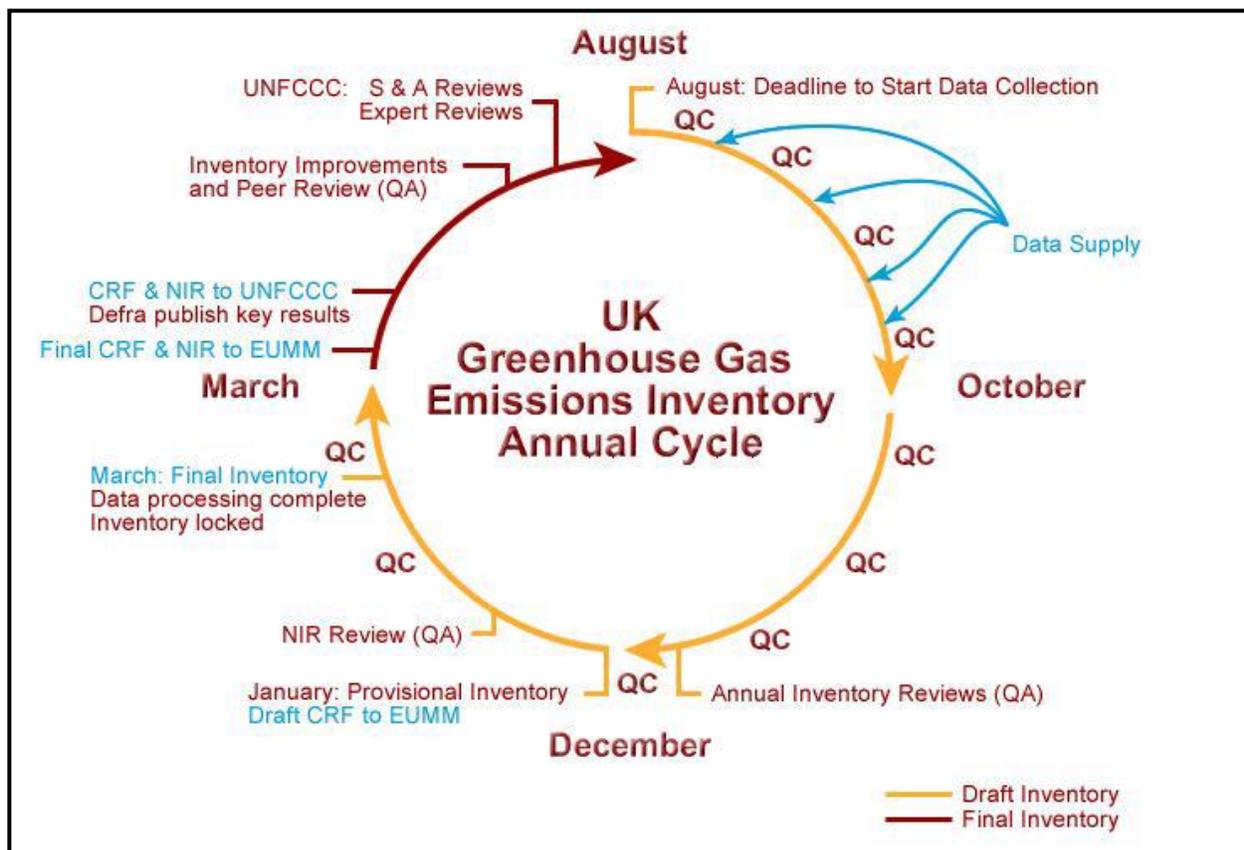
He mentioned key elements of QA/QC such as compiling a QA/QC plan and implement it, defining QA/QC roles and responsibilities, documentation and archiving, data and method review and improvement, and subsequent recalculations, assessment of uncertainties and improvement priorities as well as data and method validation and verification.

He next spoke about the Overarching Requirements of QA/QC. You must first designate an inventory agency, set Quality Objectives (TACCC), compile a QA/QC plan, designate a QA/QC manager, outline QA and QC activities, define reporting documentation and archiving procedures, documentation of methodologies and underlying assumptions and documentation of QA/QC procedures. He

further gave a UK example to explain where you apply QA/QC during the compilation period

using the diagram below.

Source: Ricardo AEA, 2014.



Mr. Hunter named the three core components of QA/QC as the Plan, Implementation and Documentation and Archiving phases. The plan defines the specific Quality Objectives and QA/QC activities needed. It also assigns roles, responsibilities and a timeline for completion of QA/QC activities and is maintained by a QA/QC manager. The implementation phase is the physical undertaking of the QA/QC activities throughout the data gathering, compilation and reporting phases of the inventory compilation cycle and it is in accordance with the QA/QC plan. He further explained the implantation phase with a diagram of the UK process. Documentation and archiving is a crucial aspect. Transparent documentation of all data sources, methods, and assumptions, transparent

documentation of all QA/QC implementation including records of activities undertaken, findings, recommendations and any necessary actions, as well as archiving.

He defined verification in the process as comparison with data compiled by bodies completely outside of the GHG Programme (i.e. 'fully independent data'), comparison with higher or lower tier compilation methods – or completely different methods and comparisons with atmospheric measurements.

He said it is important to know how to handle confidential data. Also outlining how data is used whilst ensuring sensitive data is not published is important. One example is to ensure confidential data is not reported (whilst not impacting on

GHG emissions data): Industrial production data can be commercially sensitive, e.g. cement and adipic acid production – data is not reported although emissions are reported. Another example is aggregating Data: EU-ETS data are supplied is aggregated to sector level to ensure data for individual sites cannot be identified.

He concluded with a summary that QA/QC is a crucial part of the GHG Inventory compilation process and it plays a key role in ensuring TACCC principles are applied. So to develop a QA/QC and implement it, documenting and archiving are also a core part of effective QA/QC.

2.3 Quality Control (QC): Principles and Processes

Raul Salas followed a presentation on principles and processes of quality control. He started by defining the principles of Transparency, Accuracy, Completeness, Comparability and Consistency (TACCC).

Transparency: Means clear documentation and reporting at a level that allows individuals or groups other than experts or compilers of inventory to understand how the inventory was compiled and ensure that it meets good practice requirements.

Consistency means that estimates are reported for every different inventory years, pollutants and source categories are made in such a way that differences in the results between years and source categories reflect real differences in emissions.

Comparability means that the national inventory is reported in such a way that allows it to be compared with national inventories of other Parties.

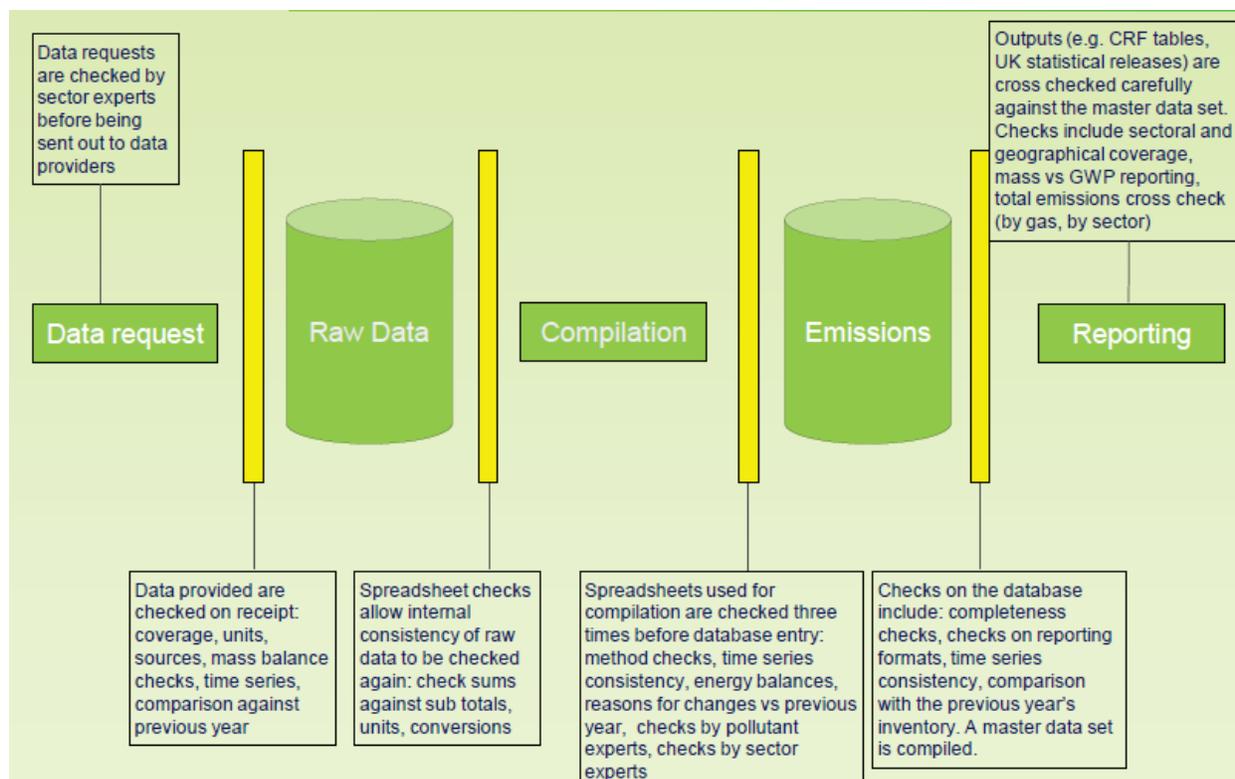
Completeness means that estimates are reported for all pollutants, all relevant source categories and all years and for the entire territorial areas of Parties covered by the reporting requirements set forth in the provisions of the UNFCCC and its protocols.

Accuracy means that emissions are neither systematically overestimated nor underestimated, as far as can be judged and with uncertainties reduced as far as practicable.

He then talked about quality control as a system of routine technical activities designed by inventory experts/compilers to measure and control the quality of data/inventory developed. A QC system is designed to:

- ✓ Check consistency of inventory so as to verify data integrity, correctness and completeness
- ✓ Identify and reduce errors and omissions
- ✓ Maximize consistency within the inventory preparation process
- ✓ Facilitate internal and external inventory review process

QC Activities involve technical reviews, accuracy checks and use of approved standardized procedures for emissions calculations and measurements. Core elements of QC are referencing (What is used?), documentation (How is it used?) and checking (Are we sure?). QC Procedures: Preferably, the check should be done manually by either recalculating by the hand or visual inspection. Manual checks avoid or eliminates the possibility of introducing errors into the QC check itself which may be possible if automated programmes are utilized. An example was given of QA/QC of data gathering in the UK Inventory. The following diagram explained it:



2.4 Quality Assurance (QA): Principles and Processes

Quality control is a system put in place to ensure regular and adequate checking of data and information whilst quality assurance is a routine review of data to check the quality of data received for an effective QA/QC process in GHG inventory. To achieve its objectives these principles the IPCC principle TACCC cannot be left out. These principles were redefined.

Data quality was defined as a multi-dimensional concept used to ensure that data set is relevant, complete, consistent, reliable, current, accurate and objective.

Quality assurance is a planned system of review normally done by independent third parties following finalised inventory implementation of

QC procedures. An activity outside the good practice of QA process includes reviews and audits.

The basic objective is to engage reviewers who are independent and unbiased and who have not been involved in the inventory compilation process; preferably reviewers of different expertise.

It has to do with compilers conducting basic expert peer review of all key categories before completing the inventory in order to identify potential problems and make corrections where possible; this is however not practicable due to timing and resource constraints.

Again all key categories should be prioritised and where significant changes in method or data have been made inventory compilers may choose to perform an extensive peer review or audits by

contacting inventory compilers from other countries as part of an external review within the QA procedures with the available resources.

QA and verification activities take more independent view on the choice of inputs and assumptions used in the inventory estimation. This is done to ensure that the inventory's results, assumptions and methods are reasonable.

Audits may be used to assess how effective and useful the QA have been in accordance with QC outlined plans. It can also be used to verify the implementation of the QC plans and that data quality objectives have been met.

2.5 Key Category Analysis and Uncertainty

Ross Hunter started his presentation by defining key category as one that is prioritised within the national inventory system because its estimate has a significant influence on a country's total inventory of GHG. In simple terms, these categories are emission or removal categories that contribute the most to the total or trend of emissions.

Types of KCA Analysis were listed as Quantitative Analysis and Qualitative Analysis. Quantitative Analysis is numerical values that describe the

contribution of a category to the national total emissions and their trend (Level and Trend Assessments). Qualitative Analysis considers other criteria that are not easily accessed through a quantitative analysis

He listed criteria Qualitative Analysis for KCA as mitigation techniques and technologies, expected growth of emissions in the future, unexpectedly high or low emissions, no quantitative assessment of uncertainties performed and completeness. Steps for Key Category Analysis:

1. Prepare the list of categories based on the IPCC categories;
2. Perform quantitative analysis of the relationship between the level and the trend of each category emissions and total national emissions;
3. Consider any qualitative considerations that would add additional key categories;
4. Document the results and use to inform inventory.

There are two approaches to Quantitative KCA. Approach one (1) is based on contribution to total and trend. This is simple and uses only data from emission estimates. Approach two (2) is based on contribution to overall uncertainty. This is more complex, needs a complete performed uncertainty analysis. The two approaches can be used together when setting priorities.

Possible approaches to KCA were explained with the table below:

Possible approaches to KCA Tier/Approach	Country specific uncertainty estimates used for each source category?	Key Categories identified according to...
1	no	Level Trend
2	yes	Level Trend

Ghana currently completes a Tier/Approach one (1) KCA (for level and trend).

Uncertainty estimates are an important element of creating a GHG inventory. Uncertainty information is not intended to dispute the validity of the inventory, but to assess accuracy. This helps prioritise future efforts to improve the accuracy of the inventory and guide decisions on sourcing suitable data and methodological choice.

The uncertainty analysis results can be presented as a percentage, and the 95% confidence range is shown. But sometimes all you might be able to do is categorize into high, medium and low.

Uncertainty guidance for inventories are described in the IPCC 2000 Good Practice Guidance and extended information included in the IPCC 2006 Guidelines, with revised terminology.

“Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, so far as can be judged, and that uncertainties are reduced so far as is practicable.” Biases are not dealt with by the uncertainty analysis – following the IPCC Guidelines and good practice QA/QC procedures should eliminate most sources of bias.

There are many causes of uncertainty. Some of these were listed as uncertainties in activity data or choice of emission factors, uncertainties in definitions, uncertainties from the natural variability in processes that produce emissions as well as uncertainties from the assessment of the process or quantity.

2.6 Improving Data Quality – Dealing with Data Gaps and Problems

This presentation was on how to fill data gaps using four methods. It was conducted by Raul Salas.

He started asking the following questions „*What do we do when there are gaps in the data?*” “*We only have data for 1995 and 2000.*” “*We want to switch to a Tier 2 method, but we only have disaggregated livestock data starting last year.*” “*The Energy Ministry stopped collecting data on natural gas flaring. What do we do?*”

He stated barriers to obtaining available data as lack of awareness of what data might be available, lack of structured data sharing processes. Timeliness – key datasets are not available at the time required. Sharing data may be viewed as losing power by individuals, departments or

organizations. There may be restrictions on statistics data prior to official release and commercially sensitive data – e.g. from individual companies or installations. Keeping up with the policy cycle – new measures and targets can be developed and implemented very quickly, sometimes without consulting data and technical experts.

Common data problems: data reported in wrong units, or out by a factor of 100, 1000 etc. Step-changes in a time series due to: change in scope of data (e.g. European Union – Emissions Trading Scheme Phase I, Phase II, Phase III); change in the data gathering systems (e.g. changes in reporting thresholds for industrial sites that used to report data now not having to); change in the provision of reporting guidance (e.g. where sector-specific guidance has been updated so all operators start to use a new EF for a given pollutant and this leads to a major step-change in the reported data); erroneous data that cannot be fixed and must therefore be deleted; additional efforts to conduct stakeholder consultation.

Availability of suitable data will be an issue. It should not be afraid to use data that has gaps, is new or does not provide total coverage – as long as you understand these issues. In many cases data will provide an indication of direction of travel rather than a definitive answer for whether a target has been met or the exact mitigation effect of a policy. In the absence of comprehensive data this is better than nothing. Collecting new data should be a last resort as it is time-consuming and

costly. Data availability, range, quality, accuracy often improves over time – and it is important to adapt/react to this. You start with what you have and improve it yearly with your inventories.

These data barriers can be overcome by first undertaking a systematic review of data available to establish who may hold what data that you require. Followed by the establishment of a working group for data management, key data providers can develop data provision arrangements and resolve compliance issues. Then implement data supply agreements (DSA's) with key data providers outlining what they will provide and when (Ghana already uses DSA's to help compile the GHG Inventory) and finally aggregate data to a level where it no longer is deemed as commercially.

He said visualization of the Data is a key issue. It allows seeing the trend. Visualising data on a graph issues, can clarify comparisons and potential solutions. It allows you to identify outliers or step changes – to trigger further investigation. It can be done in MS Excel or similar.

Data gaps can be dealt with using splicing and surrogate or proxy data techniques. Splicing is combining or joining more than one method or data series to form a complete time. Surrogate or proxy data to “create” data that are otherwise missing. The following methods are used in splicing: Overlap, Surrogate Data, Interpolation and Trend Extrapolation.

In overlap, an assessment of comparability of two datasets over a time series is made looking for consistent overlap or difference. Preferably for multiple years to avoid bias. It is possible to either use comparable dataset or recalculate existing data on the basis of consistency. Where there is a consistent relationship, the default is to use a proportional adjustment of old estimates/data to be consistent with new. You must remember that it is crucial to have multiple years of overlap to apply properly. This method should not be applied blindly.

In surrogate data, you use a dataset that is indicative of changes or trends to ‘fill in’ (or as a surrogate) data gaps. You need to understand relationship prior to using surrogate data, e.g. using regression analysis. Again multiple years’ data are desirable to avoid bias.

In interpolation, gaps are filled within datasets by estimating trends between two or more data

points, e.g. intermediate years where no data is available. This is useful for datasets with regular gaps, e.g. periodic surveys. Comparing interpolated data with surrogate data increases confidence and it is a good QA/QC practice.

Trend Extrapolation estimates trend and therefore actual value for a baseline by extending or ‘extrapolating’ trend backwards. This method can also extrapolate forwards for projections. It is similar to interpolation – although less known about the trend. It should not be used for extended periods of time – the longer the period the greater the uncertainty. Again other splicing techniques should be used alongside to improve confidence. ‘Actual’ data (when available) may differ from extrapolation

A summary of Splicing and Gap-filling methods/approaches were given in the table below:

Approach	Applicability	Comments
Overlap	Data necessary to apply both old and new method must be available for at least one year, preferably	Only use when overlap shows pattern that appears reliable
Surrogate data	Missing data is strongly correlated with proxy data	Should test multiple potential proxy data variables
Interpolation	For periodic data or gap in time series	Linear or non-linear interpolation. Only use where data shows steady trend

Trend extrapolation	Beginning or the end of the time series is missing data	Only use where trend is steady and likely to be reliable. Should only be used for a few years
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He concluded by saying that the preferred approaches are overlap and surrogate, because they are based on actual data. Interpolation and extrapolation are effectively projections that assume certain trends in the absence of data. Similarly in research, it is not good practice to simply apply a gap-filling method blindly. You should understand why your approach is justified and be able to explain it transparently.

3. Conclusions and Way Forward

First, a roadmap was set out as follows:

1. A coordinator needs to be appointed
2. A team should be formed comprising the Ghana Statistical Service (GSS), National Development and Planning Commission (NDPC), Environmental Protection Agency (EPA), Forestry Commission (FC) and the Universities.

- i. Liaise with sector universities
- ii. Team to review and come out with a proposal for plan
- iii. Hold a stakeholder meeting
- iv. Develop a draft plan and share it with stakeholders
- v. Seek for financial resources
- vi. Finalise the plan
- vii. Sustainable capacity building (involve young experts)

The following activities were to be carried out



4. Annex

Annex 1: Training Agenda

| TRAINING-WORKSHOP ON QA/QC OF GREENHOUSE GAS INVENTORIES

Tills Hotel, Gomoa Fetteh, Ghana 12-13 November 2014

Objectives:

- Participants to understand the role and importance of QA/QC processes in the development of GHG Inventories
- Participants to understand what is meant by and contained within a QA/QC system and plan for the GHG Inventory
- Participants to understand what 'Quality Control' procedures are, the types of processes and activities that can be undertaken and how these can be applied in practice to implement effective quality control within a GHG Inventory.
- Participants to understand what 'Quality Assurance' procedures are, the types of processes and activities that can be undertaken and how these can be applied in practice to implement effective quality assurance within a GHG Inventory.
- Participants to have an overview of and a basic understanding of how to undertake Key Category Analysis
- Participants to have an overview of and a basic understanding of how to undertake Tier 1 Uncertainty Analysis and have had an introduction to What Tier 2 processes involve.
- Participants to be familiar with the principles of data quality issues and how to apply data management practices and gap filling techniques to resolve this.
- Participants to understand the key QA/QC issues and challenges in the Ghana GHG Inventory, what actions and next steps are required to develop and resolve these and their role in this.

AGENDA

Time	Activity / Topic	Discussant
Wednesday, 12 November 2014		
08:30 – 09:00	Arrival of participants and Registration	
09:00	Opening ceremonies <ul style="list-style-type: none"> • Prayer 	EPA/Moderator

Time	Activity / Topic	Discussant
	<ul style="list-style-type: none"> • Welcome Remarks • Introduction of Participants <i>(30 minutes)</i> 	
09:30	<p>Setting the scene</p> <p>About the Information Matters Project <i>(15 minutes)</i></p>	GIZ HQ
09:45	<p>Overview and objectives of the training</p> <p><i>(10 minutes)</i></p>	<ul style="list-style-type: none"> • Ricardo-AEA
09:50	<p>Overview of existing and planned developments for QA/QC in Ghana's GHG Inventory <i>(20 minutes)</i></p> <ul style="list-style-type: none"> • Overview of existing plans and processes in place to perform QA/QC on Ghana's GHG Inventory • Ongoing issues – in terms of QA/QC processes and quality of data • Plans for developing and enhancing QA/QC in the GHG Inventory in the future <p>Questions <i>(10 minutes)</i></p>	<ul style="list-style-type: none"> • EPA
10:20	<p>Plenary Discussion: What does QA/QC mean to you? <i>(40 minutes)</i></p> <ul style="list-style-type: none"> • What does QA and QC mean to you? • Do you apply QA/QC to the data and information you use? • If so what? Give some examples of QA and QC processes that you have used • To what extent are these processes reflected or documented within the GHG Inventory QA/QC system? 	<ul style="list-style-type: none"> • Whole group discussion facilitated by Ricardo-AEA

Time	Activity / Topic	Discussant
	<ul style="list-style-type: none"> • Questions and topics delegates are hoping is covered in the workshop – the ‘Board of Expectations and Hopes’ 	
11:00 to 11:20	AM Break	
11:20	<p>QA/QC System Overview (20 minutes)</p> <ul style="list-style-type: none"> • Requirements for QA/QC within a GHG Inventory • Developing a QA/QC Plan – the key considerations • Handling confidential data and information • Documentation and archiving <p>Questions (10 minutes)</p>	<ul style="list-style-type: none"> • Ricardo-AEA
11:50	<p>Quality Control (QC): Principles and Processes (30 minutes)</p> <ul style="list-style-type: none"> • What is Quality Control? • Types of QC checks/ activities • Implementing QC processes – manual and automated checks • Who should carry out QC checks/activities? • Some worked examples <p>Questions (10 minutes)</p>	<ul style="list-style-type: none"> • Ricardo-AEA
12:30 – 13:30	LUNCH	
13:30	<p>Breakout Session A: Quality Control Exercise (45 mins)</p> <ul style="list-style-type: none"> • Delegates will be provided with example datasets (in a Microsoft Excel document) on which they can carry out some simple QC checks – as discussed in the presentation • A hand out of the presentation slides outlining the types of QC checks and some worked examples will be 	<ul style="list-style-type: none"> • Small breakout groups

Time	Activity / Topic	Discussant
	<p>provided to help delegates</p> <ul style="list-style-type: none"> Delegates will work through the data to identify a number of errors that are present Report back – delegates to present the QC checks and identified errors to the groups <p>Reporting back to plenary and discussion (40 minutes)</p>	
14:50	<p>Quality Assurance: Principles and Processes (30 minutes)</p> <ul style="list-style-type: none"> What is Quality Assurance? Approaching QA – using the TACCC principles Types of QA activities Who should carry out QA activities Some examples <p>Question and discussion (10 minutes)</p>	<ul style="list-style-type: none"> Ricardo-AEA
15:30 to 15:50	PM Break	
15:50	<p>Breakout Session B: Quality Assurance Exercise (45 mins)</p> <ul style="list-style-type: none"> Delegates will be provided with example datasets and descriptions (in Microsoft Excel and Word documents) on which they can carry out a simple QA review A hand out of the presentation slides outlining the types of QA activities and some worked examples will be provided to help delegates Delegates will work through the data and document to identify a number of errors or issues that are present Report back – delegates to present the QA review and identified errors to the groups <p>Reporting back to plenary and discussion (40 minutes)</p>	<ul style="list-style-type: none"> Small breakout groups

Time	Activity / Topic	Discussant
17:15	Closing of Day 1; Expectations for Day 2	Moderator
Thursday, 13th November 2014		
09:00	Preliminaries (15 minutes) <ul style="list-style-type: none"> Recapitulation Overview of Day 2 Agenda 	Moderator
09:15	Key Category Analysis and Uncertainty (30 minutes) <ul style="list-style-type: none"> Overview of the Key category Analysis approach required as part of GHG Inventory compilation Quantitative and qualitative approaches Uncertainty Analysis – the tier 1 approach Uncertainty Analysis – introducing the tier 2 approach Questions and discussion (20 minutes)	<ul style="list-style-type: none"> Ricardo-AEA
10:15	Improving Data Quality – Dealing with Data Gaps and Problems (30 minutes) <ul style="list-style-type: none"> Data barriers and solutions Overcoming these barriers – data management solutions and an introduction to data gap filling techniques How to carry out overlap, surrogate, interpolation and extrapolation data splicing techniques Visualising data Questions and discussion (15 minutes)	<ul style="list-style-type: none"> Ricardo-AEA
11:00 to 11:20	AM Break	
11:20	Breakout Session C: Data Gap Filling (45 minutes) <ul style="list-style-type: none"> Delegates will be provided with some example datasets 	<ul style="list-style-type: none"> Small breakout groups

Time	Activity / Topic	Discussant
	<p>(in Microsoft Excel format) that incorporate gaps and will be tasked with filling these using overlap, surrogate, interpolation and extrapolation splicing techniques</p> <ul style="list-style-type: none"> • A hand out of the presentation slides outlining the different data splicing techniques and some worked examples will be provided to help delegates • Delegates will work through the data and complete gap filling for each dataset • Report back – delegates to present how they have completed the gap filling exercise to the group <p>Report back to plenary (40 minutes)</p>	
12:45 – 13:45	LUNCH	
13:45	<p>Next steps and actions for implementing QA/QC processes within the Ghana GHG Inventory (30 minutes)</p> <ul style="list-style-type: none"> • Recap of existing QA/QC issues and challenges in the Ghana GHG Inventory • How can current QA/QC systems, processes and activities be built upon? • Key QA/QC tasks/actions going forward – by sector • Which organisations will need to be involved in developing/implementing these? <p>Questions (10 minutes)</p>	<ul style="list-style-type: none"> • EPA
14:15	<p>Plenary (1 hour)</p> <ul style="list-style-type: none"> • Discussion of Issues and identification of QA/QC Actions – what, who and when? 	<ul style="list-style-type: none"> • Whole group discussion • EPA/Moderator
15:15 to 15:35	PM Break	

Time	Activity / Topic	Discussant
15:35	<i>Plenary (continued) (1 hour)</i>	<ul style="list-style-type: none"> • Whole group discussion • EPA/Moderator
16:35	Feedback forms <i>(15 minutes)</i>	Moderator
17:00	Closure	Moderator

Mr Oppong-Boadi (EPA) and Mark Fynn (GIZ)
Moderator

Annex 3: Workshop Evaluation

	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
PREPARATION AND COURSE DELIVERY	%	%	%	%	%
1. The invitation for the workshop stated the goals clearly.	42.1	42.1	15.8	0	0
2. The workshop content was organized and easy to follow.	20	70	10	0	0
3. There was sufficient opportunity for interactive participation.	35	50	15	0	0
4. The materials distributed were pertinent and pitched at the right level.	25	55	20	0	0
5. Training schedule provided sufficient time to cover all proposed activities.	0	50	25	5	20
FACILITATOR/MODERATOR					
6. The moderator properly guided the flow of discussions, agenda and time-keeping and was attentive to processes expected by pax.	15	65	20	0	0
7. The facilitator(s) was/were well prepared for the workshop/breakout sessions.	15	80	5	0	0
8. The facilitator(s) provided instructions and directions comprehensively and clearly.	0	75	10	0	15
9. The facilitator(s) encouraged active participation, interaction and ownership of participants to expected outputs.	25	55	20	0	0
SPEAKERS					
10. Dr. Ross Hunter delivered clear, concise and effective presentations.	35	55	10	0	0
11. Mr. Raul Salas delivered clear, concise and effective presentations.	35	55	10	0	0
GENERAL SATISFACTION					
15. Workshop goals/objectives were met.	15	70	15	0	0
16. I learned a lot of new concepts and tools.	30	45	20	5	0
17. I am satisfied with my increased understanding of the topic.	21.1	57.9	15.8	5.3	0
18. This workshop will definitely help me make a difference in the way I do my job.	15	60	20	5	0
19. I plan to share the information I received with other colleagues in my organization.	25	50	25	0	0

FACILITY					
20. The training venue and related facilities provided a comfortable setting.	15	45	25	15	0
21. The location for the training was accessible and convenient for me.	10	35	35	5	15
22. The refreshments and food provided were of good quality.	10	50	20	10	10
23. The tools and equipment during the sessions worked well.	5.3	57.9	31.6	5.3	0
OTHER COMMENTS					
24. What will you do differently in your work/ practice setting as a result of this workshop?	12 participants responded and out of the 12, 9 generally indicated they will adopt measures to ensure QA/QC principles are applied in their institutional data generation. Two mentioned they will do a lot in terms of QA/QC in their organizations.				
25. What aspects of the workshop could be improved?	12 participants responded out of which 4 want times to be extended to allow more elaboration on QA/QC and the breakup section. 3 want invitation letters delivered early and stating materials participants will need for the training. 2 want accommodation and improved with provision of dinner, 1 wants venue to be improved as it was isolated from a main town, 1 wants improvement in the training materials.				
26. Other Remarks: 7 participants provided additional comments. Out of the 7, 3 stated that the workshop was good and well organized and many of such training should be held. 2 also indicated that the accommodation should be relooked in the next session with suggestion that participants be allowed to look for their own accommodation and pay for it. 1 stated that the number of days should be increased to allow more interactive discussions among participants, and 1 also commented that the venue could have been better and different variety of fruit juice could have been served as snacks					

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