ANNEX II

CYPRUS'
QA/QC AND VERIFICATION SYSTEM MANUAL

Department of Environment
Ministry of Agriculture, Rural Development and Environment

November 2017

Contents

1 Introduction

The implementation of quality assurance/quality control (QA/QC) and verification procedures in the development of national greenhouse gas inventories is recommended by the 2006 IPCC guidelines to ensure that the inventories can be readily assessed in terms of quality. A QA/QC and verification system contributes towards the improvement of transparency, consistency, comparability, completeness, and accuracy of the national greenhouse gas inventories.

This is a manual for the QA/QC and verification procedures for the Cyprus' greenhouse gas emission inventory performed by the Department of Environment, Ministry of Agriculture, Rural Development and Environment (DoE). The quality procedure is continuously improved as part of the on-going process of improving the GHG inventory. The manual is thus periodically updated.

This is the third version of the manual. The manual is in accordance with the guidelines provided by the 2006 IPCC guidelines for the preparation of greenhouse gas emissions inventories (IPCC, 2006) and in accordance with decisions 19/CMP.1 and 3/CMP.11.

This manual sets up guidelines for the work by inventory team. The inventory team is currently located in the Department of Environment, Ministry of Agriculture, Rural Development and Environment, Cyprus.

The terms 'quality control', 'quality assurance', and 'verification' for the purposes of this document are used as defined in the 2006 IPCC Guidelines (vol. 1, pg. 6.5, Box 6.1).

2 Elements of a QA/QC and verification system

The following are the major elements of a QA/QC and verification system to be implemented in tracking inventory compilation, which are covered in detail in the following sections:

- Definition of roles/responsibilities within the inventory;
- A QA/QC plan;
- General QC procedures that apply to all inventory categories ;
- Category-specific QC procedures;
- QA and review procedures;
- QA/QC system interaction with uncertainty analyses;
- Verification activities;
- Reporting, documentation, and archiving procedures.

Cyprus' QA/QC and verification system consists of the elements mentioned above. General QC procedures are applied annually to all categories and to the inventory compilation as a whole. Category-specific procedures based on the prioritisation considerations are discussed in Section 7. Verification activities are directed at specific categories as a whole, and their application depends on the availability of independent estimation methodologies that can be used for comparison.

3 Institutional Arrangements

In article 5, paragraph 1 of the Protocol, it is specified that "Each Party included in Annex I shall have in place, no later than one year prior to the start of the first commitment period, a national system for the estimation of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol". A national system includes all institutional, legal and procedural arrangements made within an Annex I Party of the Convention that is also a Party to the Protocol for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information.

The Department of Environment of the Ministry of Agriculture, Rural Development and Environment (DoE), is the governmental body responsible for the development and implementation of environmental policy in Cyprus, as well as for the provision of information concerning the state of the environment in Cyprus in compliance with relevant requirements defined in international conventions, protocols and agreements. Moreover, the DoE is responsible for the co-ordination of all involved ministries, as well as any relevant public or private organization, in relation to the implementation of the provisions of the Kyoto Protocol, according to the Law 29(III)/2009 with which Cyprus ratified the Kyoto Protocol.

In this context, the DoE has the overall responsibility for the national GHG inventory, and the official consideration and approval of the inventory prior to its submission. (Contact person: Dr. Nicoletta Kythreotou, Environment Officer, Department of Environment, Ministry of Agriculture, Rural Development and Environment, Offices' address: 20-22 28th Oktovriou Ave., Engomi, 2414, Nicosia, Cyprus, Postal address: Department of Environment, 1498 Nicosia, Cyprus, Tel. +357 22 408 947, Fax. +357 22 774 945, Web. www.moa.gov.cy/environment).

Figure 1 provides an overview of the organisational structure of the National Inventory System. The entities participating in the National Inventory System are:

- The DoE designated as the national entity responsible for the national inventory, which keeps the overall responsibility, and an active role in the inventory planning, preparation and management, including technical and scientific responsibility for the compilation of the annual inventory.[1]
- Governmental ministries and agencies through their appointed focal persons, ensure the data provision.

[1] *For 2017, there is a contract with an external expert for scientific and technical support to the inventory team of the DoE and the QA of the GHG inventory.*

As of 2018, according to the recent Council of Ministers' Decision, the technical and scientific responsibility for the compilation of the annual inventory for all sectors will be assigned, on a contract basis, to an independent consultant by DoE.

International or national associations, along with individual public or private industrial companies contribute to data providing and development of methodological issues as appropriate.

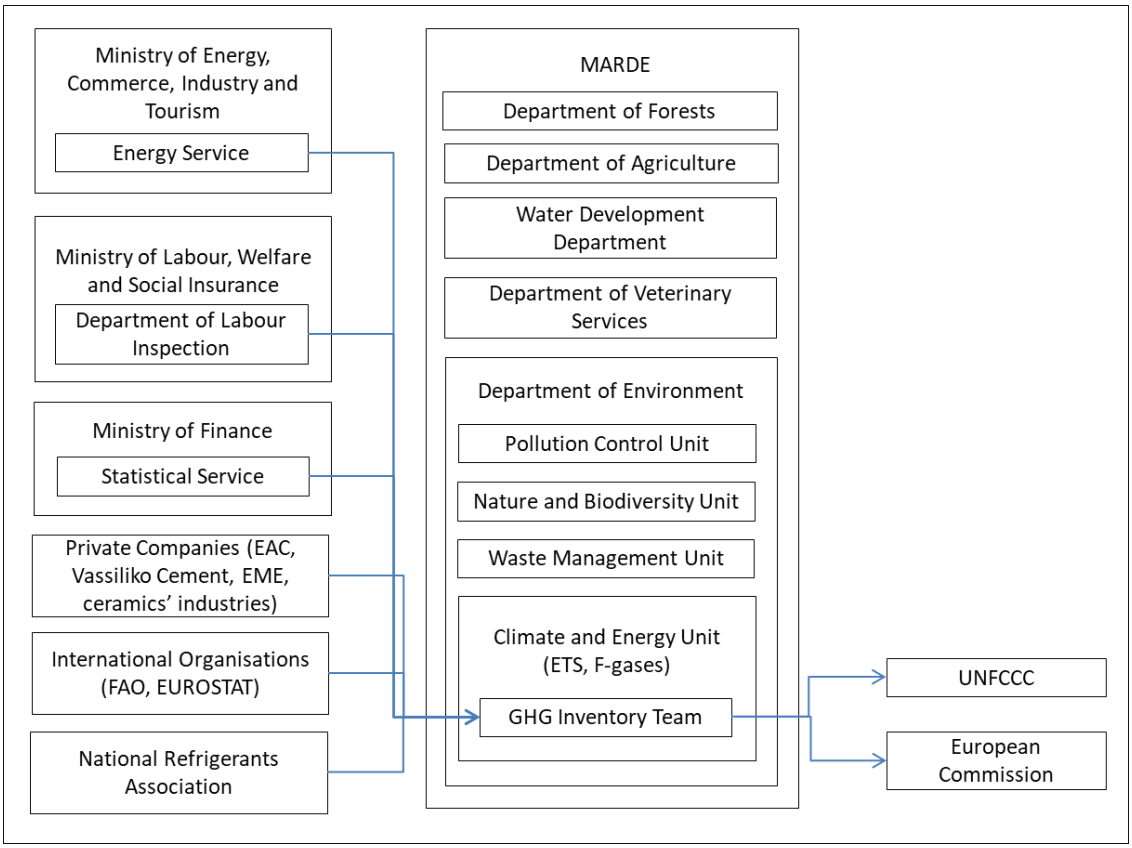

Figure 1. Overview of the organisational structure of the National Inventory System

The legal framework defining the roles-responsibilities and the co-operation between the DoE Inventory team and the designated contact points of the competent Ministries was formalized by Council of Ministers' Decision adopted 17/11/2017 entitled "Structure and operation of the National Greenhouse Gases Inventory System- Roles and Responsibilities". The above-mentioned Decision includes a description of each entity's responsibilities, concerning the inventory preparation, data providing or other relative information. This formal framework has improved the collaboration between the entities involved, assuring the timely collection and quality of the activity data required and solving data access restriction problems raised due to confidentiality issues.

3.1 Roles and responsibilities for inventory preparation

3.1.1. Department of Environment

The DoE, has the overall responsibility, as the national entity, for the national GHG inventory. Among its responsibilities are the following:

- The co-ordination of all ministries and other institutions involved, as well as any relevant public or private organization. In this context, it oversees the operation of

the National System and decides on the necessary arrangements to ensure compliance with relevant decisions of the COP and the COP/CMP.
- The official consideration and approval of the inventory prior to its submission.
- The response to any issues raised by the inventory review process under Article 8 of the Kyoto Protocol[2],
- The timely submission of the GHG inventory to the European Commission and to the UNFCCC Secretariat.
- The keeping of the Centralised Inventory File, which is delivered to the inventory team which has the technical responsibility for the inventory planning, preparation and management at the beginning of each inventory cycle. The Centralised Inventory File is kept at the premises of the DoE.
- The administration of the National Registry. Cyprus cooperates with the Member States of the European Union and with the supplementary transaction log and the registry of the European Community by maintaining the national registries in a consolidated system.
- The implementation of Quality Assurance/Quality Control Plan (QA/QC)[3]

In addition, currently, DoE has the technical and scientific responsibility for the planning, preparation and management of the annual national inventory[4], which includes the following tasks:

1. Data collection (activity data and emission factors) for all source categories that are Energy, Industrial Processes, Solvents and Other Product Use, Agriculture, Waste and LULUCF.
2. Reliability check of input data through
    - the comparison of the same or similar data from alternative data sources and
    - time-series assessment in order to identify changes that cannot be explained.
3. Selection of the appropriate methodologies according to the 2006 IPCC guidelines, preparation of GHG emissions estimates by applying the methodologies and models having been selected.
4. Data processing and archiving.
5. Assessment of the consistency of the methodologies applied, inventory improvement –recalculations.
6. Reliability check of results.
7. Key categories analysis.
8. Uncertainty assessment.
9. Preparation of Common Reporting Format (CRF) tables.
10. Preparation of National Inventory Report (NIR).
11. Reporting of the required information according to Regulation 525/2013 of the European Parliament and of the Council and its implementing acts.
12. Preparation and keeping of annual Centralised Inventory File.
13. Development of QA/QC procedures.
14. Implementing the QA/QC procedures.
15. Training the representatives of data providing agencies on inventory issues.

[2] in co-operation with future technical and scientific consultants
[3] Supervision in future when consultants will be involved
[4] As of 2019 a consultant will have these responsibilities.

The names and contact details of the DoE inventory team follows:

(a) Dr. Nicoletta Kythreotou
Environment Officer, Department of Environment, Ministry of Agriculture, Rural Development and Environment, Offices' address: 20-22 28th Oktovriou Ave., Engomi, 2414, Nicosia, Cyprus, Postal address: Department of Environment, 1498 Nicosia, Cyprus, Tel. +357 22 408 947, Email. nkythreotou@environment.moa.gov.cy
BSc Environmental Science, MSc Environmental Engineering, PhD Mechanical Engineering

(b) Ms. Melina Menelaou
Technician, Department of Environment, Ministry of Agriculture, Rural Development and Environment, Offices' address: 20-22 28th Oktovriou Ave., Engomi, 2414, Nicosia, Cyprus, Postal address: Department of Environment, 1498 Nicosia, Cyprus, Tel. +357 22 408 959, Email. mmenelaou@environment.moa.gov.cy
BA Biological Sciences - emphasis in Ecology, Master's degree in Public Administration

3.1.2. Government Ministries/ Government agencies

Data from all the involved parties come in MS Excel spread-sheets and any other additional descriptive information in word documents. The main database maintained by the inventory compiler is also in the form of MS Excel spread-sheets. The collected data is transferred to the main database of the inventory compiler. No special software is used or applied for processing or storage of the data used in the inventory.

The inventory compiler has one MS Excel spread-sheet containing all the data collected and one MS Excel spread-sheet containing the calculations performed for the estimation of the GHG emissions.

Contact points for data collection

Data from the annual ETS submissions from installations participating is the EU-ETS scheme has been obtained since 2006 from the ETS team, which is also part of the Climate Action Unit of the Department of Environment (contact point Ms. Chrystalla Papastavrou, tel. no. +357 22 408962, cpapastavrou@environment.moa.gov.cy). Apart from the fuel consumption data is also obtained for CO2 emissions (combustion and process emissions) and net calorific value (NCV) of fuels consumed.

The energy balance is obtained from the Energy Service of the Ministry of Commerce, Industry and Tourism. The contact point is Dr Christina Karapitta – Zachariadou (tel. no. +357 22409388, ckarapitta@mcit.gov.cy).

The contact point for the energy balance prepared by the National Statistical Service (CYstat) for the submission to EUROSTAT is Ms Nafsika Apostolou (tel. no. +357 22602199, napostolou@cystat.mof.gov.cy). Other contacts at CYstat are: for waste

data Mrs Marilena Kythreotou (tel. no. +357 22602137, mkythreotou@cystat.mof.gov.cy), for population data Ms Loukia Makri (tel. no.+357 22602150, lmakri@cystat.mof.gov.cy), for industrial production Mr Charalambos Alkiviadous (tel. 22602189, calkiviadous@cystat.mof.gov.cy) and for agricultural data (cultivated areas and animal population) Mrs Sofia Pelagia (spelagia@cystat.mof.gov.cy).

Department of Labour Inspection is the competent authority for the preparation of air pollutants inventories under Directive 2001/81/EC. The inventory is communicated to the GHG inventory compiler, Mr Christos Papadopoulos (tel. no. +357 22405683, cpapadopoulos@dli.mlsi.gov.cy).

The activity data for the estimation of emissions from F-gases (sectors 2F) is obtained by Mr Pavlos Pavlou, part of the Climate Action Unit, Department of Environment (tel. no. +357 24 202866, ppavlou@environment.moa.gov.cy).

Other data on municipal solid waste management is obtained from Mrs Elena Christodoulidou, part of the Waste Management Unit, at the Department of Environment (tel. no. +357 22408951, echristodoulidou@environment.moa.gov.cy).

Municipal liquid waste production and management data is obtained from Mrs Stella Perikenti part of the Pollution Control Unit, Department of Environment (tel. no. +357 22408942, sperikenti@environment.moa.gov.cy) and Ms. Lia Georgiou, Senior Sanitary Engineer at the Water Development Department (tel. no. +357 22409186, lgeorgiou@wdd.moa.gov.cy)

Agricultural waste management information on practices applied is obtained from Mr Antis Athanasiades part of the Pollution Control Unit, Department of Environment (tel. no. +357 22408935, aathanasiades@environment.moa.gov.cy).

Industrial liquid waste management data is obtained from Dr Chrystalla Stylianou head of the Pollution Control Unit, Department of Environment (tel. no. +357 22408941, cstylianou@environment.moa.gov.cy).

Fertiliser consumption data is provided by Mr George Theofanous, Department of Agriculture (tel. no. +357 22464028). Details necessary for the implementation of Tier 2 methodology for dairy cattle was obtained from Mr Georgios Papaioannou, Department of Agriculture (tel. no. +357 22408566).

Land cover data (which includes forest cover data) is obtained from Mr Andreas Antoniou, part of the Nature & Biodiversity Unit, Department of Environment (tel. no. +357 22408918, aantoniou@envrironment.moa.gov.cy).

Forest wildfire data is obtained from Mr George Georgiou, Department of Forests (tel. no. +357 22459003, management@fd.moa.gov.cy).

Data is also obtained from International Organizations as the United Nations Food and Agricultural Organization (FAO) and EUROSTAT. This data is supplementary to the data collected from the aforementioned data providers. Furthermore, other

government organisations, associations, and individual public and private industrial companies contribute to data providing and development of methodological issues as appropriate (Lime, cement and ceramics (bricks and tiles) production data is obtained directly from the installations).

4 Inventory planning and preparation

4.1 GHG inventory, data collection, processing and storage

The preparation of Cyprus' GHG emissions inventory is primarily based on the application of the 2006 IPCC Guidelines.

The preparation of the Cyprus' GHG emissions inventory is the responsibility of the Climate Action Unit of the Department of Environment of the Ministry of Agriculture, Rural Development and Environment.

The preparation of the Cyprus' GHG emissions inventory is based on the application of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The compilation of the inventory is completed in three main stages (Figure 2).

- Stage 1: The first stage consists of data collection and checks for all source / sink categories. The main data sources used are the National Statistical Service, the national energy balance, the government ministries / agencies involved, along with the verified reports from installations under the EU ETS. Quality control of activity data include the comparison of the same or similar data from alternative data sources (e.g. National Statistical Service, EU ETS reports and energy balance) as well as time-series assessment in order to identify changes that cannot be explained. In cases where problems and / or inconsistencies are identified, the agency's representative, responsible for data providing, is called to explain the inconsistency and / or help solving the problem.

- Stage 2: Once the reliability of input data is checked and certified, emissions / removals per source / sink category are estimated. Emissions estimates are then transformed to the format required by the CRF Reporter. This stage also includes the evaluation of the emission factors used and the assessment of the consistency of the methodologies applied in relation to the provisions of the IPCC Guidelines, the IPCC Good Practice Guidance and the LULUCF Good Practice Guidance. Quality control checks, when at this stage, are related to time-series assessment as well as to the identification and correction of any errors / gaps while estimating emissions / removals and entering the data in the CRF Reporter.

- Stage 3: The last stage involves the compilation of the NIR and its internal check. During this period, the Inventory Team has to revise the report according to the observations and recommendations of the QA. On the basis of this interaction process, the final version of the report is compiled. The Director of the Department of Environment approves the inventory and then the contact points submit the NIR to the European Commission for compliance with Regulation (EU) No 525/2013 and thereafter to the UNFCCC secretariat.

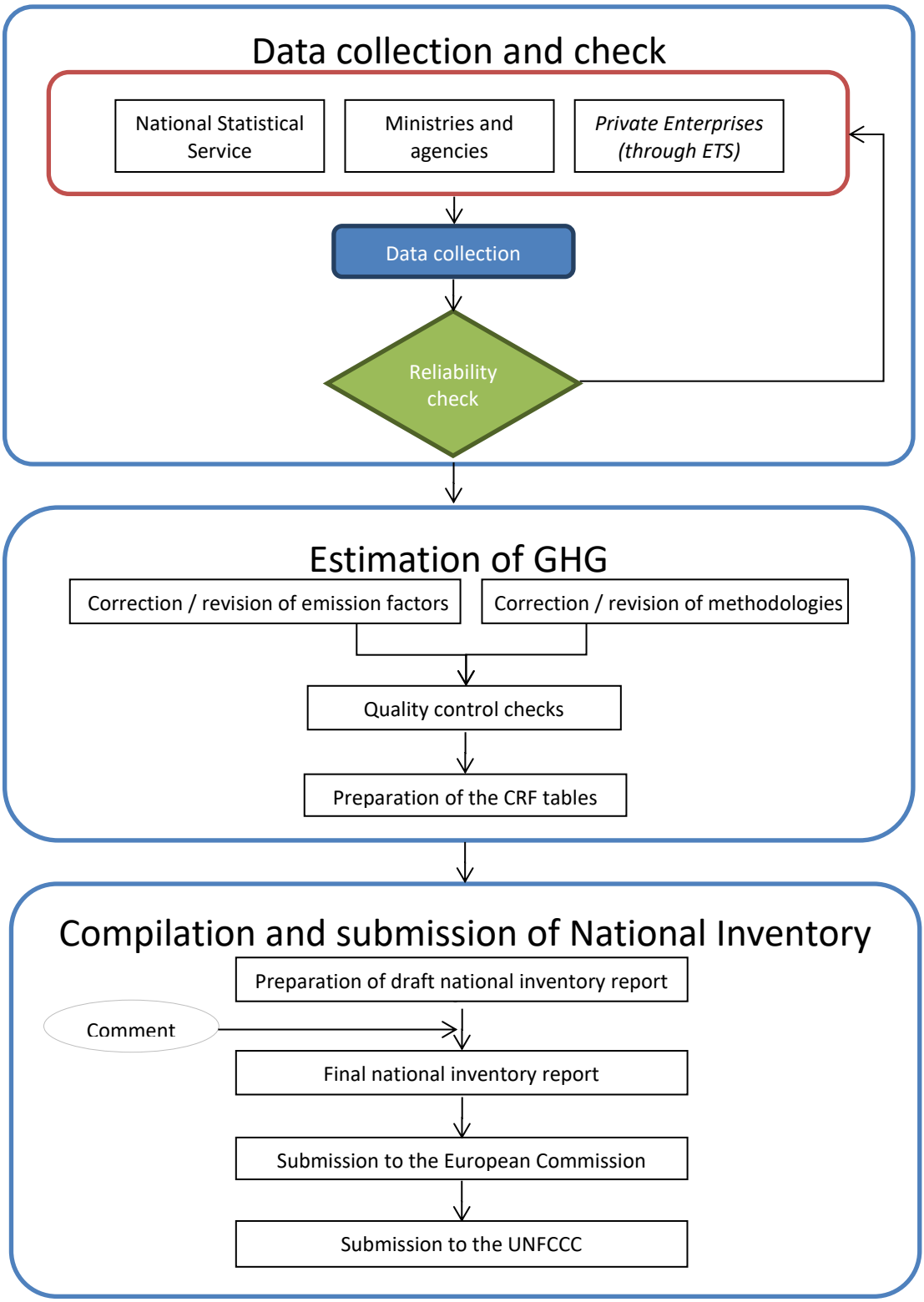

Figure 2. GHG emissions inventory preparation process in Cyprus

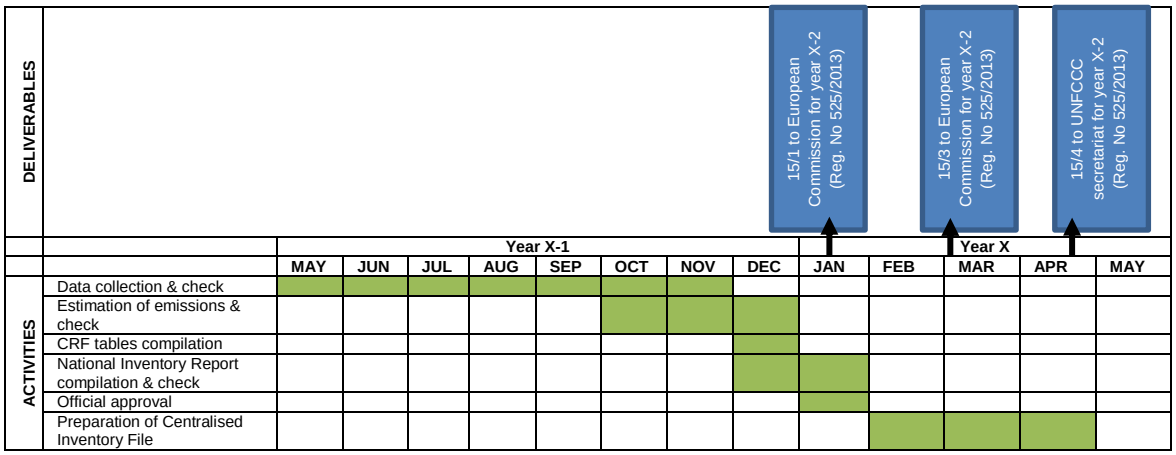

Figure 3. Timetable for inventory preparation

As shown in the timetable (Figure 3), the government ministries and agencies and the individual private or public industrial companies referred previously should have collected and delivered to the Inventory Team [5] the respective activity data needed for the inventory (for year X-2) and any changes in activity data for the period 1990 to year X-2, within the time period of May to November of year X-1 (X is the submission year of CRF tables and NIR referred to X-2 GHG emissions inventory).

The information that is related to the annual GHG emissions inventory (activity data, emission factors, analytic results, compilation in the required analysis level of the CRF tables) is stored in MS Excel spreadsheets. Moreover, the final results (NIR and CRF tables) are available in the DoE website[6].

In addition, and within the context of the Quality Assurance/Quality Control system developed, two master files have been organized aiming at the systematic and safe archiving of inventory information: the Input Data File and the Centralised Inventory File.

- The Input Data File contains (in electronic format and/or hard copy) all input data and parameters that are necessary for the estimation of GHG emissions/ removals. Data is stored in sheets by sector and reference year.
- The Centralised Inventory File includes all information relevant to the GHG emissions/removals inventory. At the end of each cycle of the inventory preparation, all inventory related information is handled by the inventory team to the person responsible for keeping the Centralised Inventory File (member of the Climate Team) in DoE, who in turn provides the latest version of all relevant files (calculation files and NIR) to the Inventory Team at the beginning of the next inventory cycle.

More specifically the information stored in the Centralised Inventory Files includes:

- A list of the reports, the input data files and the calculation/estimation files.
- The members of the Inventory Team.
- Final versions, in electronic format and hard copy, of the NIR.

[5] and the technical consultants (in the future)
[6] http://www.moa.gov.cy/moa/environment/environmentnew.nsf/All/21395032E3B9BB6CC2257FF0003813DD?OpenDocument

- CRF tables in electronic format and a hard copy of the CRF tables for the last year covered by each submission.
- XML file and database of CRF reporter
- Calculation files, including the uncertainty estimation files.
- Expert review reports.
- Any comments from the public review of the inventory.
- Documentation derived from the implementation of the QA/QC procedures.

5 QA/QC plan

A QA/QC plan is an internal document to organise and implement all activities across all of the emissions inventory activities including:

- stakeholder engagement (stakeholders = e.g. suppliers of data, reviewers, recipients, other inventory compiling institutes (e.g. NFR))
- data collection
- data management
- inventory compilation
- consolidating the inventory estimates (e.g. into a single national database)
- reporting.

The QA/QC plan is a fundamental element of an inventory management system. The plan needs to clearly identify all important activities used by the inventory compiler and ensure that the minimum data quality objectives required under any relevant reporting obligations are met.

The development and the implementation of an inventory QA/QC plan represents a key tool for meeting the objectives of National Systems under Article 5 Paragraph 1 of the Protocol as described in Decision 20/CP.7.

Quality management is essential in order to comply with the requirements of (a) producing transparent, consistent, comparable, complete and accurate emissions estimates, (b) establishing a reliable central archiving system concerning all necessary information for GHG emissions inventories development and (c) compiling national reports according to the provisions of the CMP adopted decisions.

In this framework, a QA/QC system was first prepared in 2012, and is currently revised after 2016 and 2017 ERT recommendations.

Any external experts (through contracts) in close co-operation with the DoE are responsible for the implementation of the QA/QC system. The quality objectives of the system are the following:

1. Compliance with the 2006 IPCC guidelines and the UNFCCC reporting guidelines while estimating and reporting emissions/removals.
2. Continuous improvement of GHG emissions/removals estimates.
3. Timely submission of necessary information in compliance with relevant requirements defined in international conventions, protocols and agreements.

The accomplishment of these objectives can only be ensured by the implementation of the following QA/QC procedures, from all the members of the Inventory Team (see Figure 4 for the flow chart of activities concerning emissions inventory):

- data collection and processing,
- applying methods consistent with 2006 IPCC Guidelines for calculating / recalculating emissions or removals, and 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol
- making quantitative estimates of inventory uncertainty,
- archiving information and record keeping and
- compiling national inventory reports.

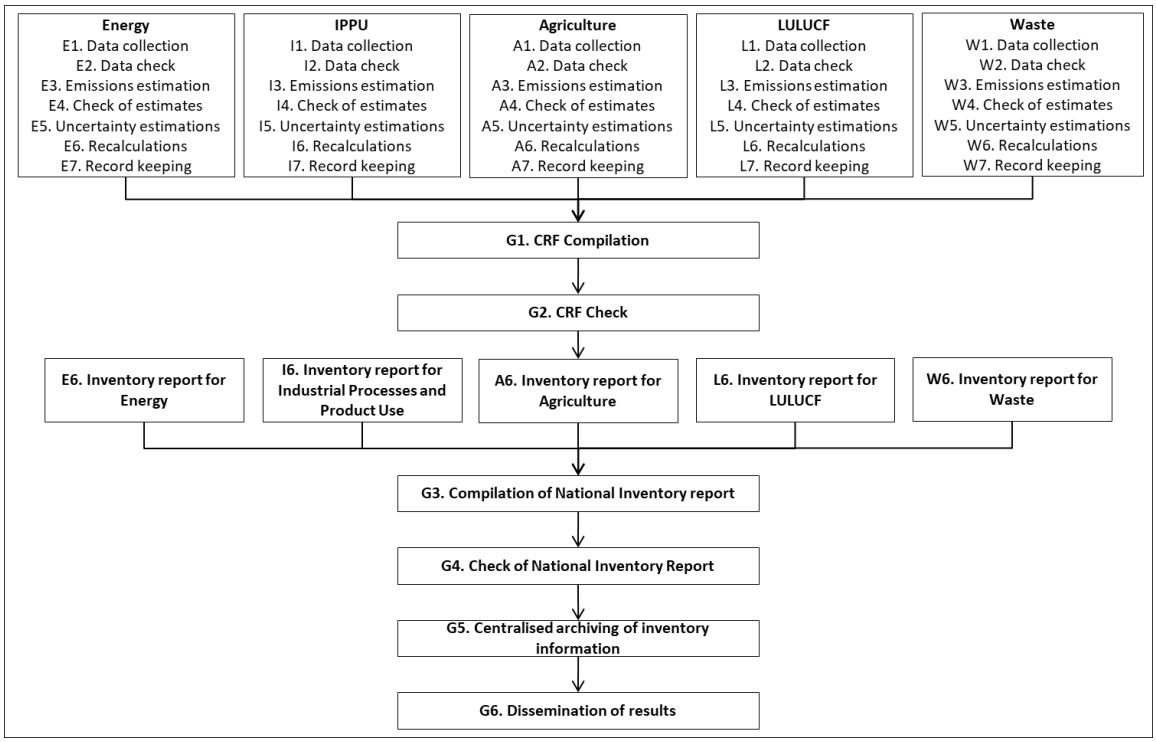

Figure 4. Flow chart of activities concerning emissions inventory

The QA/QC system developed covers the following processes:

- *QA/QC system management*, comprising all activities that are necessary for the management and control of the inventory team in order to ensure the accomplishment of the abovementioned quality objectives.
- *Quality control*, which is directly related to the estimation of emissions. The process includes activities related to (a) data inquiry, collection and documentation, (b) methodological choice in accordance with the 2006 IPCC Guidelines, (c) quality control checks for data from secondary sources and (d) record keeping.
- *Archiving inventory information*, comprising activities related to centralised archiving of inventory information and the compilation of the national inventory report.

- *Quality assurance*, comprising activities related to the different levels of review processes including the review of input data from experts, if necessary, and comments from the public
- *Estimation of uncertainties*, defining procedures for estimating and documenting uncertainty estimates per source / sink category and for the whole inventory.
- *Inventory improvement*, that is related to the preparation and the justification of any recalculations made.

Table 1 presents the list of procedures within each process and Figure 5 the relationship between the processes and the activities of the inventory team.

Table 1. QA/QC procedures for the GHG emissions inventory

Process	Procedure code	Procedure
Quality management	QM01	System review
	QM02	System improvement
	QM03	Training
	QM04	Record keeping
	QM05	Internal reviews
	QM06	Non-compliance-corrective and preventing actions
	QM07	Quality management system
	QM08	Documents control
	QM09	Internal communication
Quality control	QC01	Data collection
	QC02	Estimation of emissions/removals
	QC03	Data quality control check
	QC04	Input data record keeping
Archiving of inventory information	AI01	Centralised archiving of inventory information
	AI02	Compilation of reports
Quality assurance	QA01	Expert review of input data and parameters
	QA02	Expert review of GHG emissions/removals inventory
	QA03	Review from public
Uncertainty estimation	UE01	Uncertainty analysis
Inventory improvement	II01	Recalculations management

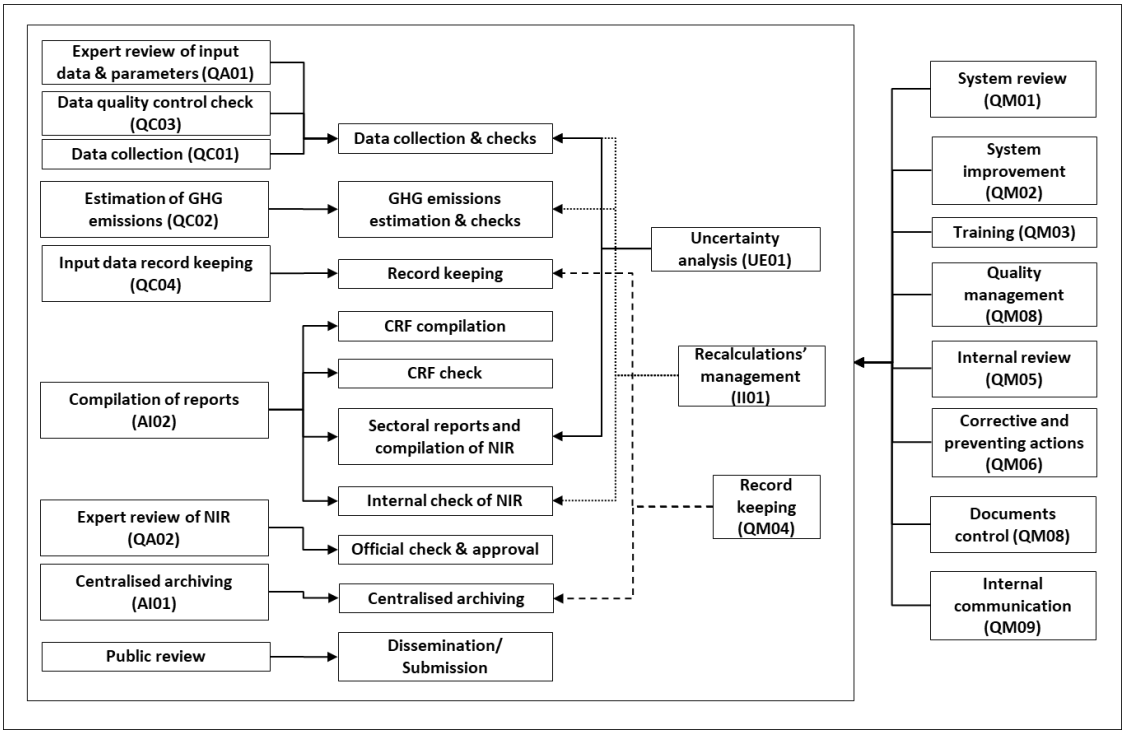

Figure 5. QA/QC process and procedures and inventory related activities

5.1 QA/QC Processes

The flow of data has to take place in a transparent way by making the transformation of data detectable. It needs to be easy to find the original data background for any calculation and to trace the sequence of calculations from the raw data to the final emission result. Realistic uncertainty estimates are necessary for securing accuracy, but they can be difficult to make, due to the uncertainty of the uncertainty estimates itself. It is therefore important to include the uncertainty calculation procedures into the data structure as much as possible. The QC needs to be supported to as wide an extent as possible by the data structures, otherwise the procedure can easily become difficult.

Both data processing and data storage forms the data structure. The data processing is done using mathematical operations or models. It may be complicated models for human activity or simple summations of disaggregated data. The data storage includes databases and file systems of data that are either calculated using the data processing at the lower level or using input to new processing steps or even both output and input in the data structure. The measure for quality is basically different for processing and storage so this needs to be kept separate in a well-designed quality manual.

The data storage takes place for the following types of data:

- External Data: a single numerical value of a parameter derived from an external source. This is thus basic input, as the inventory team does not measure any new data. These data govern the calculation of Activity-Release Data.
- Activity-Release Data: Data for input to the final emission calculation in terms of data for release source strength and activity. The data is directly applicable for

use in the standardised forms for calculation. These data are calculated using external data or represent a direct use of External Data when they are directly applicable for Emission Calculations.
- Emission Data: Estimated emissions based on the Activity Release Data.
- Emission Reporting: Reporting of emission data in requested formats and aggregation level.

The objectives for the Quality Management as formulated by 2006 IPCC Guidelines are to improve elements of transparency, consistency, comparability, completeness and confidence:

- Accuracy is a relative measure of the exactness of an emission or removal estimate. 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. Appropriate methodologies conforming to guidance on good practices should be used to promote accuracy in inventories.
- Comparability means that estimates of emissions and removals reported by countries in inventories should be comparable among countries. For this purpose, countries should use agreed methodologies and formats for estimating and reporting inventories.
- Completeness means that an inventory covers all sources and sinks and gases included in the IPCC Guidelines for the full geographic coverage in addition to other existing relevant source/sink categories which are specific to individual countries (and therefore may not be included in the IPCC Guidelines).
- Consistency means that an inventory should be internally consistent in all its elements over a period of years. An inventory is consistent if the same methodologies are used for the base year and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. An inventory using different methodologies for different years can be considered to be consistent if it has been estimated in a transparent manner taking into account the guidance in IPCC Guidelines on good practice in time series consistency.
- Transparency means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of information.

Table 2 presents the tasks implemented during the inventory preparation process to meet the necessary quality requirements.

Table 2. Tasks implemented during the inventory preparation process to meet the necessary quality requirements

Stage of Inventory preparation	**Objective**	**ID**	**Description**	
Data collection &	1. Accuracy	DC1	General level of uncertainty for every dataset including the reasoning for the	Sectoral

Stage of Inventory preparation	Objective	ID	Description	
checks			specific values.	
		DC2	Uncertainty assessment for every data source not part of DC1.	Sectoral
		DC3	Check if a correct data import has been made	Sectoral
	2. Comparability	DC4	Comparability of the emission factors/calculation parameters with data from international guidelines, and evaluation of major discrepancies.	Sectoral
		DC5	The methodologies have to follow the international guidelines suggested by UNFCCC and IPCC.	Sectoral
	3. Completeness	DC6	Ensuring that the best possible national data for all sources are included, by setting down the reasoning behind the selection of datasets.	Sectoral
		DC7	Identification of data gaps with regard to data sources that could improve quantitative knowledge.	Sectoral
	4. Consistency	DC8	The original external data has to be archived with proper reference.	Sectoral
		DC9	Documentation and reasoning of methodological changes during the time series and the qualitative assessment of the impact on time series consistency.	Sectoral
		DC10	Identification of parameters (e.g. activity data, constants) that are common to multiple source categories and confirmation that there is consistency for these parameters in the emission calculations.	General
		DC11	All persons in the inventory team must be able to handle all data.	General
	5. Transparency	DC12	Listing of all archived datasets and external contacts.	Sectoral
		DC13	The archived datasets shall be easily accessible for any person within the emission inventory team.	General
		DC14	The calculation principle, the equations used and the assumptions made must be described.	Sectoral
		DC15	Clear reference to dataset	Sectoral
		DC16	Verification of calculation results using time-series	Sectoral
		DC17	The time trend for every single parameter must be available and any major dips/jumps in the time series are investigated and documented.	General
		DC18	Check if a correct data import has been made	Sectoral
GHG emissions estimation & check	1. Accuracy	EE1	Documentation of the methodological approach for the uncertainty analysis.	General
		EE2	Quantification of uncertainty	General
		EE3	Comparison with inventories of the previous years on the level of the categories of the CRF Any major changes are checked, verified, etc.	General
		EE4	Checking of time-series of the CRF. Considerable trends and changes are checked and explained.	General
	2.Comparability	EE5	The inventory calculation shall follow the international guidelines suggested by	General

Stage of Inventory preparation	Objective	ID	Description	
			UNFCCC and IPCC	
	4. Consistency	EE6	Any calculation must be anchored to two responsible persons who can replace each other in performing the calculations.	General
	5. Transparency	EE7	Reporting of the calculation principle and equations used	General
		EE8	The reasoning for the choice of methodology for uncertainty analysis needs to be explicitly reported.	General
		EE9	The databases and other software used shall be clearly documented. The documentation should include a description that the appropriate data processing steps are correctly represented in the database; that data relationships are correctly represented in the database and that data fields are properly labelled and have the correct design specifications.	General
		EE10	The documentation referred to under EE9 should be archived at the same network folder as the program is located in.	General
Compilation of reports	2. Comparability	CR1	National and international verification for the methodological approach, activity data and implied emission factors.	General
	3. Completeness	CR2	National and international verification including explanation of the discrepancies.	General
		CR3	Check that no sources where a methodology exists in the IPCC guidelines are reported as NE.	General
	4. Consistency	CR4	The process of generating the official submissions must be anchored by at least two responsible persons who can replace each other in generating CRF tables	General
		CR5	The inventory reporting shall follow the international guidelines suggested by UNFCCC and IPCC.	General
		CR6	The IEFs from the CRF are checked both regarding level and trend. The level is compared to relevant emission factors to ensure correctness. Large dips/jumps in the time-series are explained.	Sectoral
		CR7	The reporting to the UNFCCC must be anchored to two responsible persons who can replace each other in the technical issue of reporting to and communicating with the UNFCCC secretariat.	General
	5. Transparency	CR8	The databases and other software used shall be clearly documented. The documentation should include a description that the appropriate data processing steps are correctly represented in the database; that data relationships are correctly represented in the database and that data fields are properly labelled and have the correct design specifications.	General
		CR9	The documentation referred to under EE9 should be archived	General

Stage of Inventory preparation	Objective	ID	Description	
			at the same network folder as the program is located in.	

As part of the general QC procedures the 2006 IPCC guidelines recommends a number of standardised checks. These are included in Table 3.

Table 3. IPCC recommended general QC procedures and the connection to tasks in Cyprus QC.

QC Activity	Procedures	Relevant tasks
Check that assumptions and criteria for the selection of activity data and emission factors are documented.	Cross-check descriptions of activity data and emission factors with information on source categories and ensure that these are properly recorded and archived.	DC6 DC8 DC12
Check for transcription errors in data input and reference	Confirm that bibliographical data references are properly cited in the internal documentation. Cross-check a sample of input data from each source category (either measurements or parameters used in calculations) for transcription errors.	DC8 DC15 DC17
Check that emissions are calculated correctly.	Reproduce a representative sample of emissions calculations. Selectively mimic complex model calculations with abbreviated calculations to judge relative accuracy.	DC16 DC18 EE3 EE4
Check that parameter and emission units are correctly recorded and that appropriate conversion factors are used.	Check that units are properly labelled in calculation sheets. Check that units are correctly carried through from beginning to end of calculations. Check that conversion factors are correct. Check that temporal and spatial adjustment factors are used correctly.	DC3 EE3 EE4
Check the integrity of database files.	Confirm that the appropriate data processing steps are correctly represented in the database. Confirm that data relationships are correctly represented in the database. Ensure that data fields are properly labelled and have the correct design specifications. Ensure that adequate documentation of database and model structure and operation are archived.	EE9 EE10 CR8 CR9
Check for consistency in data between source categories.	Identify parameters (e.g. activity data, constants) that are common to multiple source categories and confirm that there is consistency in the values used for these parameters in the emissions calculations.	DC10
Check that the movement of inventory data among processing steps is correct.	Check that emissions data are correctly aggregated from lower reporting levels to higher reporting levels when preparing summaries. Check that emissions data are correctly transcribed between different intermediate products.	DC3
Check that uncertainties in emissions and removals are estimated or calculated correctly.	Check that qualifications of individuals providing expert judgement for uncertainty estimates are appropriate. Check that qualifications, assumptions and expert judgements are recorded. Check that calculated uncertainties are complete and calculated correctly.	DC1 DC2 EE1 EE2 EE8
Undertake review of internal documentation.	Check that there is detailed internal documentation to support the estimates and enable duplication of the emission and uncertainty estimates. Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review. Check integrity of any data archiving arrangements of outside	DC9 DC12 DC13 DC14 DC17

QC Activity	Procedures	Relevant tasks
	organisations involved in inventory preparation.	
Check methodological and data changes resulting in recalculations.	Check for temporal consistency in time series input data for each source category. Check for consistency in the algorithm/method used for calculations throughout the time series.	DC9 DC17 CR6
Undertake completeness checks.	Confirm that estimates are reported for all source categories and for all years from the appropriate base year to the period of the current inventory. Check that known data gaps that result in incomplete source category emissions estimates are documented.	DC10 CR2 CR3
Compare estimates to previous estimates.	For each source category, current inventory estimates should be compared to previous estimates. If there are significant changes or departures from expected trends, recheck estimates and explain any difference.	EE3

All the procedures described in the QA/QC manual are followed by any consultants (where applicable) and the DoE. Audits by independent local experts are planned and implemented at least once every five years.

Each year the EU performs QA/QC checks (called initial checks) to its Member States as a part of EU QA/QC system. These tests are performed annually between 15/1 and 28/2. These checks have been designed to verify the transparency, accuracy, consistency, comparability and completeness of the information submitted and include:

(a) an assessment whether all emission source categories and gases required under Regulation (EU) No 525/2013 are reported;
(b) an assessment whether emissions data time series are consistent;
(c) an assessment whether implied emission factors across Member States are comparable taking the IPCC default emission factors for different national circumstances into account;
(d) an assessment of the use of 'Not Estimated' notation keys where IPCC tier 1 methodologies exist and where the use of the notation key is not justified in accordance with paragraph 37 of the UNFCCC reporting guidelines on annual greenhouse gas inventories as included in Annex I to Decision 24/CP.19;
(e) an analysis of recalculations performed for the inventory submission, in particular if the recalculations are based on methodological changes;
(f) a comparison of the verified emissions reported under the Union's Emissions Trading System with the greenhouse gas emissions reported pursuant to Article 7 of Regulation (EU) No 525/2013 with a view of identifying areas where the emission data and trends as submitted by the Member State under review deviate considerably from those of other Member States;
(g) a comparison of the results of Eurostat's reference approach with the Member States' reference approach;
(h) a comparison of the results of Eurostat's sectoral approach with the Member States' sectoral approach;
(i) an assessment whether recommendations from earlier Union or UNFCCC reviews, not implemented by the Member State could lead to a technical correction;

(j) an assessment whether there are potential overestimations or underestimations relating to a key category in a Member State's inventory.

Moreover, EU carries out comprehensive reviews (similar to centralised UNFCCC reviews) of the national inventory data submitted by Member States. Two comprehensive reviews of Cyprus' inventory, for all sectors except LULUCF, have been performed by the EU, in 2012 and 2016.

5.1 Roles, responsibilities and timing

This section presents the allocation of inventory activities in relation to QA/QC activities to the members of the inventory team and other experts involved in the QA/QC process of Cyprus. The activities are presented schematically in Figure 4 and Figure 5.

Table 4 and Figure 6 present timing and responsibilities of team members.

Table 4. Timing and responsibilities[7]

	Responsible	**Timing**
Data collection (E1, I1, A1, L1, W1)	Data providers (see section 3.1) Nicoletta Kythreotou[8]	by 30/11 of year X-1
Data check (E2, I2, A2, L2, W2)	Nicoletta Kythreotou[9]	by 30/11 of year X-1
Emissions estimation (E3, I3, A3, L3, W3)	Nicoletta Kythreotou (Energy, IPPU, Agriculture, Waste) Melina Menelaou (LULUCF)	1/10-15/12 of year X-1
Check of estimates (E4, I4, A4, L4, W4)	Niki Papaki	1/10-15/12 of year X-1
Uncertainty estimations (E5, I5, A5, L5, W5)	Nicoletta Kythreotou (Energy, IPPU, Agriculture, Waste) Melina Menelaou (LULUCF)	1-30/12 of year X-1
Recalculations (E6, I6, A6, L6, W6)	Nicoletta Kythreotou (Energy, IPPU, Agriculture, Waste) Melina Menelaou (LULUCF)	1-30/12 of year X-1
Record keeping (E7, I7, A7, L7, W7)	Nicoletta Kythreotou (Energy, IPPU, Agriculture, Waste) Melina Menelaou (LULUCF) Niki Papaki (checks)	1/10-30/12 of year X-1
CRF compilation (G1)	Nicoletta Kythreotou (Energy, IPPU, Agriculture, Waste) Melina Menelaou (LULUCF)	1-27/12 of year X-1
CRF check (G2)	Niki Papaki	27-30/12 of year X-1
Sectoral reports	Nicoletta Kythreotou (Energy,	1-30/12 of year X-1

[7] Shall be revised upon the recruitment on contract basis the consultants for future submissions according to Council of Ministers' Decision

[8] According to the relevant Council of Ministers' Decision, all data shall be sent electronically/via email to the email addresses info@environment.moa.gov.cy, nkythreotou@environment.moa.gov.cy and tmesimeris@environment.moa.gov.cy.

[9] If any discrepancies exist/ noticed, these are discussed with the data providers for explanations/correction

(E6, I6, A6, L6, W6)	IPPU, Agriculture, Waste) Melina Menelaou (LULUCF)	
Compilation of NIR (G3)	Nicoletta Kythreotou	20-30/12 of year X-1
Check of NIR (G4)		
- internal	Xanthippi Valanidou (text) Niki Papaki (crf Vs. NIR)	31/12 of year X-1 – 5/1 of year X
➔ corrections of any errors found	Nicoletta Kythreotou Melina Menelaou	5-8/1 of year X
- official (expert review)	External expert	8-11/1 of year X
➔ corrections of any errors found	Nicoletta Kythreotou Melina Menelaou	11-13/1 of year X
- Official check & approval	Theodoulos Mesimeris	13-15/1 of year X
Submission to European Commission	Nicoletta Kythreotou	15/1 of year X
Centralised archiving	Nicoletta Kythreotou	15/1 of year X
EU QA/QC procedure		15/1-28/2 of year X
Review by stakeholders & public		15/1-28/2 of year X
Corrections to NIR/calculations	Nicoletta Kythreotou Melina Menelaou	28/2-15/3 of year X
Final Submission to European Commission	Nicoletta Kythreotou	15/3 of year X
Submission to UNFCCC secretariat	Nicoletta Kythreotou	15/4 of year X

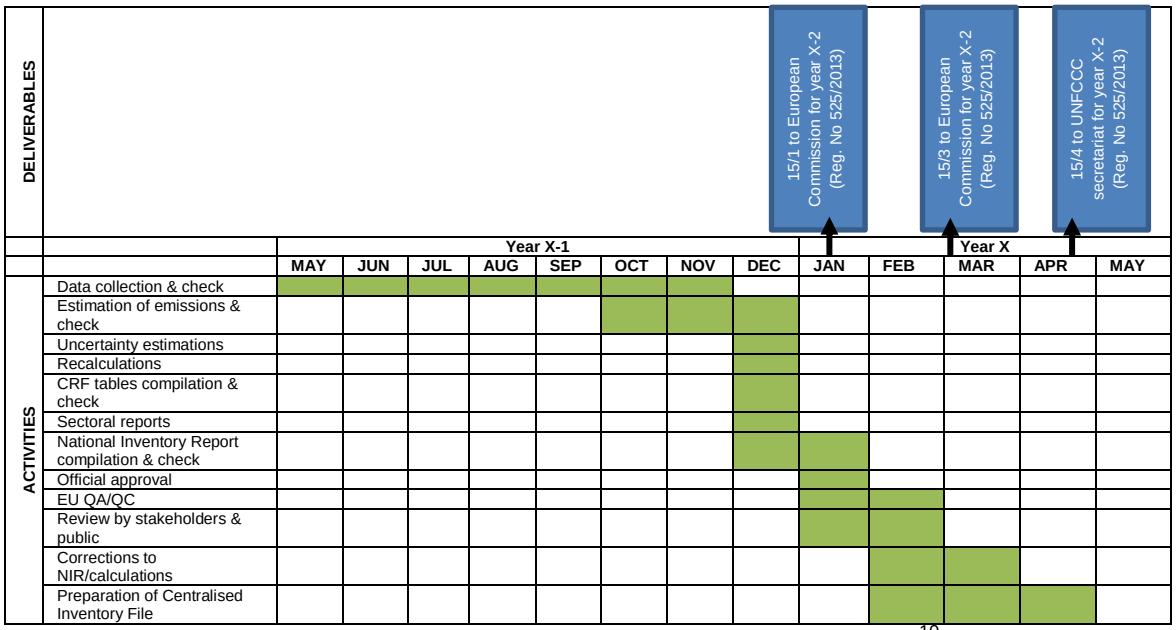

Figure 6. Timing and responsibilities of QA/QC tasks[10]

[10] Shall be revised upon the recruitment on contract basis of the consultants for future submissions according to Council of Ministers' Decision.

6 General QC procedures

General QC procedures include generic quality checks related to calculations, data processing, completeness, and documentation that are applicable to all inventory source and sink categories. The general QC checks proposed by the 2006 IPCC Guidelines, that the inventory compiler should use annually throughout the preparation of the inventory have already been presented in Table 3. These checks should be applied irrespective of the type of data used to develop the inventory estimates. They are equally applicable to categories where default values or national data are used as the basis for the estimates.

Although general QC procedures are designed to be implemented for all categories and on a routine basis, it is not necessary or possible to check all aspects of inventory input data, parameters and calculations every year. Checks are performed on selected sets of data and processes. A representative sample of data and calculations from every category is subjected to general QC procedures each year.

In establishing criteria and processes for selecting sample data sets and processes, the inventory compiler plans to undertake QC checks on all parts of the inventory over an appropriate period of time as determined in the QA/QC plan.

The inventory compiler ensures that the consultants (where applicable) and any other member of the inventory team are aware of the QC procedures listed in Table 3 and that these procedures are performed and recorded. In cases where the inventory relies upon official national statistics (activity data) QC procedures have been implemented on these national data prior to its submission to the inventory compiler[11].

7 Category-specific QC procedures

Category-specific procedures are applied on a case-by-case basis focusing on key categories and on categories where significant methodological and data revisions have taken place. In particular, inventory compilers applying higher tier methods in compiling national inventories should utilise category specific QC procedures to help evaluate the quality of national approaches. These category specific QC procedures will be developed for future inventories for specific categories for which it will be assessed as necessary.

7.1 Emissions factor QC

7.1.1 IPCC default emission factors

When using IPCC default emission factors, the inventory compiler assesses the applicability of these factors to national circumstances. This assessment includes an evaluation of national conditions compared to the context of the studies upon which the IPCC default emission factors were based. If there is insufficient information on the context of the IPCC default emission factors, the inventory compiler takes

[11] Further detail will be provided in future updates of the plan on the relevant national/EU/international legislation of data collections – case by case based on data sets

account of this in assessing the uncertainty of the national emissions estimates based on the IPCC default emission factors.

7.1.2 Country-specific emission factors

Country-specific emission factors may be developed at a national based on prevailing technology, science and other criteria. These factors are not necessarily site-specific, but are used to represent a source/sink category or subcategory of the country. The following types of QC checks are used to evaluate the quality of country-specific factors.

- *QC checks on the background data used to develop emission factors*

  The adequacy of the emission factors and the QA/QC performed during their development is assessed. Where emission factors are based on site-specific testing, the inventory compiler checks if the measurement programme includes appropriate QC procedures.

  In cases that country-specific emission factors are based on secondary data sources, such as GHG inventories of other Annex I Parties (e.g. for estimation of F-gases emissions the use of Greece, Malta, Spain and Italy inventories), it is considered by the inventory compiler that QC activities have been conducted during the preparation of the inventories in line with the recommendations of the 2006 IPCC guidelines and the relevant CMP decisions. It is also considered that these inventories have undergone peer review (European Commission and UNFCCC review processes). For comparison estimates are also made with the IPCC default EFs.

- *QC checks on Models*

  In cases that models are used for the compilation of Cyprus' inventory (extrapolation and/or interpolation from a limited set of known data) they require certain assumptions to represent the entire inventory area. Checks on the models and data are performed since it is considered that QA/QC associated with models is inadequate. In particular, the inventory compiler checks the following:

  - Appropriateness of model assumptions, extrapolations, interpolations, calibration-based modifications, data characteristics, and their applicability to the greenhouse gas inventory methods and national circumstances;
  - Availability of model documentation, including descriptions, assumptions, rationale, and scientific evidence and references supporting the approach and parameters used for modelling;
  - Plans to periodically evaluate and update or replace assumptions with appropriate new measurements.
  - Key assumptions may be identified by performing sensitivity analyses;
  - Completeness in relation to the IPCC source/sink categories.

- *Comparison with IPCC default factors*

Country-specific factors are compared with relevant IPCC default emission factors during the peer review process of the European Union. The intent of this comparison is to determine whether country-specific factors are reasonable, given similarities or differences between the national source/sink category and the 'average' category represented by the defaults.

- *Comparisons of emission factors between countries*

  Between-country emission factor comparisons are also performed during the peer review process of the European Union. This analysis is made for each source/sink category and possible aggregations. Comparison between countries is also performed using aggregate emissions divided by activity data (implied emission factors). When using between-country emission factor comparisons as a QC check, similarities and differences in national circumstances for the relevant category are taken into consideration.

7.1.3 Direct emission measurements

Direct measurements of emissions are not implemented in Cyprus.

7.2 Activity data QC

The estimation methods for many categories rely on the use of activity data and associated input variables that are not directly prepared by the inventory compiler. Activity data at a national level are normally drawn from the national statistics or the data collected from the implementation of the ETS legislation.

7.2.1 QC checks of reference source for national activity data

When using national activity data from secondary data, the inventory compiler evaluates and documents the associated QA/QC activities[12]. This is particularly important with regard to activity data, since most activity data are originally prepared for purposes other than as input to estimates of greenhouse gas emissions. The Statistical Service has their own procedures for assessing the quality of the data independently of what the end use of the data may be.

7.3 Calculation-related QC

The principles described above for the input data are similarly applicable to all calculation procedures used to prepare a national greenhouse gas inventory. Checks of the calculation algorithm safeguard against duplication of inputs, unit conversion errors, or similar calculation errors. These checks can be independent 'back-of-the-envelope' calculations, which simplify the algorithms to arrive at an approximate method. If the original calculation and the simple approximate method disagree, both approaches are examined to find the reason for discrepancy. Further checks on the calculation procedure will require external data.

It is a prerequisite that all calculations leading to emission or removal estimates should be fully reproducible. Input data, the conversion algorithm of a calculation and

[12] These will be developed in future updates of the plan.

the output are clearly discriminated. The output is recorded, but also the input, the conversion algorithm, and how this algorithm accesses the input.

8 QA procedures

Cyprus' QA plan follows closely the guidance by the IPCC. Peer reviews are carried out both for the inventory as a whole (UNFCCC and EU reviews) and for specific source categories.

For 2018 submission reviewers that have not been directly involved in the inventory preparation and are independent international experts not closely connected with national inventory compilation will also contribute to the QA procedures of Cyprus GHG inventory.

9 QA/QC and uncertainty estimates

The application of QC procedures to uncertainty estimation confirming that calculations are correct and data and calculations well documented is considered good practice by the 2006 IPCC guidelines. The assumptions on which uncertainty estimation has been based should be documented for each category. Calculations of category-specific and aggregated uncertainty estimates should be checked and any errors addressed. For uncertainty estimates involving expert judgement, the qualifications of experts should also be checked and documented, as should the process of eliciting expert judgement, including information on the data considered, literature references, assumptions made and scenarios considered.

This documentation and full application of the QA/QC procedures for the estimation of uncertainty shall be developed by 2020 submission.

10 Verification

The verification process can help evaluate the uncertainty in emissions estimates, taking into account the quality and context of both the original inventory data and data used for verification purposes.

For many of the verification processes described in the IPCC good practice guidance, it is difficult to find suitable independent data. In many cases the alternative datasets are not completely independent since they to some extent are based on the same raw data. Nevertheless, these checks can be used to some degree to assess the completeness and the correctness of the emission inventory.

- **Comparisons with other national emissions data**

There are very limited options for making comparisons with other national data. There are no regional emission inventories that can be used. All national statistical data have been used in the process of inventory preparation and there is therefore no possibility to compare with independent national emission estimates.

For large point sources there is in theory a possibility for verifying greenhouse gas emissions. Large point sources are obligated to report emissions under the European Union Emission Trading Scheme (EU ETS) and the European Union E-PRTR

(Electronic Pollutant Release and Transfer Registry) Directive. However, Cyprus' inventory directly utilises the data reported under the EU ETS if the plants have based the reporting on plant/fuel specific measurements. For the remaining plants country-specific emission factors developed as part of the greenhouse gas inventory are used and hence there is no verification of the inventory in performing this comparison. Comparisons are made but mostly to identify erroneous reporting under the EU ETS.

Similarly, the data reported under the E-PRTR are of no use for verification. For CO2 the data are either identical to the EU ETS data or are based on the emission factors used in Cyprus' greenhouse gas inventory. For the other greenhouse gases the E-PRTR data are almost exclusively based on the emission factors published by DoE annually as part of the emission inventory work. Therefore, the comparisons usually serve to identify errors in the EPRTR reporting and not as a verification of Cyprus' greenhouse gas inventory.

- **Comparison with national scientific and other publications**

The DoE continuously monitor the publication of relevant information by other institutions. This includes e.g. the publication of research papers and dissertations from universities and research institutions. Also technical reports elaborated for e.g. the Energy Service are examined for any knowledge that can be used to verify or improve Cyprus' greenhouse gas emission inventory.

- **Bottom-up, top-down comparisons**

Some checks of this nature are done annually as part of the mandatory reporting requirements. This is for instance the case for the comparison between the reference and sectoral approaches for CO2 emissions from fuel combustion. The result of the check is reported annually in the NIR and any major differences are investigated and explained.

Another check is done for road transport where the fuel consumption is calculated bottom-up annually based on a complex model taking into account vehicle stock data, mileage data and trip speeds (COBERT model). The bottom-up estimated emissions are compared to the estimated emissions as estimated for Cyprus' inventory. The result of the comparison is reported annually in the NIR.

- **Comparisons of national emission inventories with independently compiled, international datasets**

There are available global databases of emissions. Examples are the CO2 emissions estimates from combustion of fossil fuels that are compiled by the International Energy Agency (IEA) and the Carbon Dioxide Information and Analysis Centre (CDIAC).

Global total anthropogenic inventories of all greenhouse gases are compiled by the Global Emission Inventory Activity (GEIA) and the Emission Database for Global Atmospheric Research (EDGAR).

Potentially, these comparisons can assist in checking completeness, consistency, source allocation and accuracy to within an order of magnitude. However, it must be noted that the data sources are not independent; e.g. the official national energy statistics are used in the greenhouse gas emission inventory and are also the basis of the reporting to the IEA which is the basis for the emission estimates made by IEA and EDGAR.

As a consequence of this weakness this area has not been prioritized for Cyprus' verification activities. There are currently no plans to implement a check of Cyprus' emission inventory with the international emission estimates prepared by GEIA or EDGAR.

- **Comparisons of activity data with independently compiled datasets**

Similarly to the checks for emissions described above, checks can also be made concerning activity data, e.g. using IEA data for fuel consumption or FAO data for number of livestock. Checks can also be made using data published by Eurostat that is the statistical office of the European Union. Again there should not be any large differences as the activity data used in Cyprus' inventory are based on the official statistics also reported to international organisations, e.g. IEA, FAO and Eurostat.

The energy data reported by Cyprus in the CRF tables are annually compared to the IEA data as part of the standardised checks done by the UNFCCC during part II of the synthesis and assessment report.

FAO data has been used as verification of the activity data used for calculating emissions from the agricultural sector in Cyprus in cases where data is available from national sources.

- **Comparisons of emission factors between countries**

This activity covers three main aspects: direct comparison of applied emission factors, comparison of implied emission factors (IEFs) and comparison with IPCC default values.

Comparing emission factors directly is difficult due to few countries reporting the applied emission factors. Therefore, the most feasible verification is to compare IEFs from the CRF reporting made by countries to the UNFCCC.

- **Comparisons based on estimated uncertainties**

The work of collecting the uncertainties associated with specific emission factors for other countries has been deemed too excessive compared to the possible benefits. Therefore, this type of comparison is not considered to be feasible for implementation in Cyprus' quality work.

- **Comparisons of emission intensity indicators between countries**

The most extensive verification work of Cyprus' greenhouse gas inventory is performed annually through the EU review process by comparing emission density indicators between countries of the European Union.

- **Comparisons with atmospheric measurements at local, regional and global scales**

The IPCC good practice guidance mentions several options that can be used in comparing emission inventories with atmospheric measurements. These include: local and regional atmospheric sampling, continental plumes, satellite observations and global dynamic approaches.

Most of these options are more suited for regional or global verification than national verification, in particular for a small country like Cyprus. Both continental plumes and global dynamic approaches are not applicable for Cyprus. The use of satellite monitoring to estimate emissions is not feasible due to the cost of such verification and also the high uncertainty associated with such estimates.

There are no plans of using atmospheric measurements or inverse modelling as a means of verification of Cyprus' greenhouse gas inventory.

- **Comparisons with international scientific publications, global or regional budgets and source trends**

No comparisons have been made with global or regional emission budgets. Furthermore, it is not believed that any such activities could contribute to the verification and/or improvement of Cyprus' greenhouse gas inventory. Therefore, there are no plans to undertake such activities.

11 Documentation, Archiving and Reporting

11.1 Internal documentation and archiving

By the 2020 submission, all information relating to the planning, preparation, and management of inventory activities will be documented and archived. This will include:

- Responsibilities, institutional arrangements, and procedures for the planning, preparation, and management of the inventory process;
- Assumptions and criteria for the selection of activity data and emission factors;
- Emission factors and other estimation parameters used, including references to the IPCC document for default factors or to published references or other documentation for emission factors used in higher tier methods;
- Activity data or sufficient information to enable activity data to be traced to the referenced source;
- Information on the uncertainty associated with activity data and emission factors;
- Rationale for choice of methods;
- Methods used, including those used to estimate uncertainty and those used for recalculations;
- Changes in data inputs or methods from previous inventories (recalculations);
- Identification of individuals providing expert judgement for uncertainty estimates and their qualifications to do so;

- Details of electronic databases or software used in the production of the inventory, including versions, operating manuals, hardware requirements and any other information required to enable their later use;
- Worksheets and interim calculations for category estimates, and aggregated estimates and any recalculations of previous estimates;
- Final inventory report and any analysis of trends from previous years;
- QA/QC plans and outcomes of QA/QC procedures;
- Secure archiving of complete datasets, to include shared databases that are used in inventory development. This is particularly important for categories that rely on the multi-step development of emissions from a large set of primary data from outside sources.

The inventory compiler will maintain this documentation for every inventory produced and will provide it for review. This documentation will be maintained and archived in such a way that every inventory estimate can be fully documented and reproduced if necessary.

Records of QA/QC procedures are important information to enable continuous improvement to inventory estimates. Therefore, records of QA/QC activities will include the checks/audits/reviews that were performed, when they were performed, who performed them, and corrections and modifications to the inventory resulting from the QA/QC activity. An example checklist to use for recording QC activities at both the general and category-level is provided in the 2006 IPCC Guidelines.

11.2 Reporting

By 2020 submission, a summary of implemented QA/QC activities and key findings will be reported as a supplement to each country's national inventory. Since however, it will not be practical or necessary to report all the internal documentation that will be retained by the inventory compiler. In this summary, the inventory compiler will focus on the following activities.

- Reference to a QA/QC plan, its implementation schedule, and the responsibilities for its implementation should be discussed.
- Describe which activities were performed internally and what external reviews were conducted for each source/sink category and on the entire inventory.
- Present the key findings, describing major issues regarding quality of input data, methods, processing, or estimates for each category and show how they were addressed or plan to be addressed in the future.
- Explain significant trends in the time series, particularly where trend checks point to substantial divergences. Any effect of recalculations or mitigation strategies should be included in this discussion.

References

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