CYPRUS

National Greenhouse Gases Inventory Report 1990 – 2014
2016 Submission

under the United Nations Convention on Climate Change
and the Kyoto Protocol

Department of Environment
Ministry of Agriculture,
Rural Development and Environment

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Title of report	**Cyprus National Greenhouse Gas Inventory Report 1990 – 2014**
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Disclaimer

According to Decision 13/CP.20 of the Conference of the Parties to the UNFCCC, the CRF Reporter version 5.0.0 was not functioning in order to enable Annex I Parties to submit their CRF tables. In the same Decision, the Conference of the Parties reiterated that Annex I Parties may submit their CRF tables after April 152015, but no longer than the corresponding delay in the CRF Reporter availability.

Decisions 20/CP.21 and 10/CMP.11 further noted that the CRF reporter was still not functioning. "Functioning" software means that the data on the greenhouse emissions/removals are reported accurately both in terms of reporting format tables and XML format. The CRF reporter version 5.12.0, released on 27th November 2015, as well as its subsequent hotfixes, still contain issues in the reporting format tables and XML formats, in particular in relation to Kyoto Protocol requirements.

In 2015, Cyprus made an inventory submission under UNFCCC, but not under Kyoto Protocol because the CRF Reporter could not deliver CRF tables for Kyoto Protocol LULUCF activities without errors. **The present report is the official inventory submission of Cyprus for the year 2016 under the UNFCCC and for the years 2015 and 2016 under the Kyoto Protocol**, despite certain deficiencies indicated above in CRF Reporter and underlining CRF tables.

Cyprus should not beheld liable for errors caused by the CRF Reporter in the review of the submitted information. The inventory data reported in the 2015 submission under the UNFCCC have been revised in this submission. Therefore, **this submission should be considered as a resubmission of the estimates with regard to the 2015 UNFCCC submission**.

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Preface

The differences between NIR2016 v.1.3 (CYP_2016_12_Inventory) submitted on 13h of June 2016 and NIR2016 v.1.2 (CYP_2016_5_Inventory) submitted on 7th of April 2016 are presented in the Table below.

Sector	Comment	Change	TERT ref. number	Change in report	Change in CRF
1A3b Fuel Combustion Activities - Transport - Road transportation	Large differences in Biomass fuel consumption between data in CRF and data reported to the Eurostat for road transportation. There seems to be a systematic difference of 27% lower consumption in CRF each year (2008-2014).	The difference is due to the NCV used: in the CRF, 27 was used according to the IPCC2006 guidelines, whereas in the energy balance reported to EUROSTAT, 37 was used.	CY-1A3b-2016-0003	✓	✓
1A3b Fuel Combustion Activities - Transport - Road transportation	CO2 from urea-based catalysts are reported under 1.A.3.b instead of 2.D.3 as in line with the UNFCCC	Relocation of emissions from urea-based catalyst	CY-1A3b-2016-0004	✓	✓
2D Non-Energy Products from Fuels and Solvent Use	Carbon content of NMVOCs not according to IPCC2006 guidelines	Revised from 85% to 60%	CY-2D-2016-0001	✓	✓
3A Enteric fermentation	Overestimation of emissions caused by 60% digestibility for dairy cattle.	Adopted 68% proposed by the TERT.	CY-3A-2016-0002	✓	✓
3A Enteric fermentation	Mistake identified during calculations in equation (constant milk production used and not varying by year)	Formula corrected	NA	✓	✓
3B Manure management	For estimating CH4 emission from Manure Management Systems (MMS) for cattle is assumed Eastern European conditions and using the default value for CH4 from MMS for Eastern Europe. Proposal to develop T2	Proposal adopted. T2 applied for cattle (dairy and other)	CY-3B-2016-0010	✓	✓
Biological Treatment of Solid Waste	Emissions of N2O from composting are calculated assuming an EF of 0.3 g/kg of waste and not 0.24 as indicated in corrigendum, dated July 2015.	EF revised from 0.3 to 0.24 g/kg	CY-5B-2016-0002	✓	✓
Wastewater Treatment and Discharge	I=1 should be used for septic tanks	Calculations revised to use I=1 for septic tanks	CY-5D-2016-0002	✓	✓

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Executive Summary

Background information

The first National Inventory Report for Cyprus was prepared in 2001 and covered the period 1990-1998. The inventory was prepared in the framework of the project "Strategic Plan for the Limitation of Greenhouse Gas Emissions in Cyprus".

The first Inventory report submitted by Cyprus to the European Commission for the purposes of Decision no. 280/2004/EC[1], was in 2006 for the period 1990-2004. Cyprus at the time was a non-Annex I party and therefore had no obligation to submit annual inventories to the UNFCCC secretariat.

The first submission of a National Inventory Report to the UNFCCC secretariat as an Annex I party was made in April 2013.

Institutional, legal and procedural arrangements

The Ministry of Agriculture, Rural Development and Environment (MARDE) is the governmental body responsible for the co-ordination of all involved ministries, as well as any relevant public or private organisations, in relation to the implementation of the provisions of the national and European legislation associated with climate change. In this context, the MARDE has the responsibility for the planning, preparation, management, compilation of the national greenhouse gas emissions (GHG) inventory report[2].

No legal framework is available that defines the roles, responsibilities and the co-operation between the MARDE and contact points of the involved ministries and agencies.

GHG inventory preparation

The compilation of the inventory starts with the collection of the ETS data in June before the submission deadline (year X-1). After the first comments on the inventory are received by the European Commission and the UNFCCC for the submission of the previous year (approximately June), the necessary changes are made to the calculation sheets by the inventory compiler. Other data is made available from other governmental departments starting in the month of November before the submission deadline (year X-1). In December the final National Inventory Report for air pollutants under Directive 2001/81/EC, prepared by the Department of Labour Inspection (DLI) of the Ministry of Labour, Welfare and Social Insurance, is available and communicated to the inventory compiler.

[1] Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. Official Journal of the European Union 1.9.2004 L 49/1-8

[2] Contact person: Dr Nicoletta Kythreotou, Address: Department of Environment, 1498 Nicosia, Cyprus, tel.: +357 22 408947, e-mail: nkythreotou@environment.moa.gov.cy

Data reliability checks

Data for some activities is available from multiple sources, and in cases where differences exist, they are discussed with the dataset compilers. In several cases the data providers may confirm the error and correct the dataset appropriately.

Quality control/ quality assurance

When the calculations have been completed the MS Excel files used for the data collection and the calculations are sent to Ms Niki Papaki (Environment Technician, tel. +357 22408946, email npapaki@environment.moa.gov.cy) and Mr Giorgos Ioannou (Statistics Officer, tel. +357 22602171, email geioannou@cystat.mof.gov.cy) to check the data collected and the calculations. In case any mistakes are identified, these are corrected accordingly by the inventory compiler.

Compilation of inventory report

The compilation of the report starts when the emissions are finalised and the CRF tables are available. Once the final draft is available, the report is sent to Ms Niki Papaki (Environment Technician, tel. +357 22408946, email npapaki@environment.moa.gov.cy), Mr Giorgos Ioannou (Statistics Officer, tel. +357 22602171, email geioannou@cystat.mof.gov.cy) and all the data providers for comments. The comments are taken into consideration for the finalisation of the report.

Approval and submission of report

When the report is finalised, it is reviewed by Dr Theodoulos Mesimeris, Head of climate Action Unit and thereafter to the Director of the Department of Environment Mr Costas Hadjipanayiotou (chadjipanayiotou@environment.moa.gov.cy, tel. no.+357 22 408900) for the final approval. The inventory accompanied by the inventory report is submitted to the European Commission annually by 15 January.

Inventory preparation team

The calculations, report preparation, and overall management of the compilation of the inventory (inventory compiler), is the responsibility of Dr Nicoletta Kythreotou, Environment Officer at the Department of Environment. Dr Kythreotou holds a BSc in Environmental Science, an MSc in Environmental Engineering, and a PhD in Mechanical Engineering. Nicoletta has been preparing Cyprus' NIR since 2006.

The final assessment of the national inventory is performed by Dr Theodoulos Mesimeris, who is a Senior Environment Officer and the Head of Climate Action Unit at the Department of Environment. Dr Mesimeris has been an Officer at the Department of Environment since 2002 and has been dealing with climate change since then. The academic background of Dr Mesimeris includes an MEng in Chemical Engineering, an MSc in Environmental Management and a PhD in Chemical Engineering.

Dr Mesimeris and Dr Kythreotou are the national contact points of the UNFCCC and the DG Climate Action of the European Commission.

Ms Melina Menelaou (BA Biological Science with emphasis on ecology) is responsible for the Land Use issues.

Data collection, processing and storage

Data from all the involved parties come in MS Excel spreadsheets. The main database maintained by the inventory compiler is also in the form of MS Excel spreadsheets. The collected data is, then, transferred to the main database of the inventory compiler. No special software is used or applied for processing or storing the data used in the inventory.

The inventory compiler has one MS Excel spreadsheet containing all the data collected and one spreadsheet containing the calculations performed for the estimation of the GHG emissions. Separate spreadsheets are used for the calculation of emissions from Solid Waste Disposal (4A) and Product Uses as Substitutes for Ozone Depleting Substances - Refrigeration and Air Conditioning (2F1), following the MS Excel spreadsheets provided in the 2006 IPCC Guidelines[3].

Brief general description of methodologies and data sources used

Emission factors

The estimation of GHG emissions / removals per source / sink category is predominately based on the methods described in the revised 2006 IPCC Guidelines. The emission factors used derive from the 2006 IPCC Guidelines and special attention was given to selecting the emission factors that are most representative of practices and conditions in Cyprus. Furthermore, emission factors were obtained from plant-specific information contained in the EU ETS reports. For 2F and 2G, activity data was not available to estimate the emissions using the IPCC methodologies, therefore: (a) the emissions from sectors 2F1, 2F2, 2F3 and 2F4 were estimated using the implied emission factor per capita from the average of Greece, Italy, Malta and Spain; (b) the emissions from sectors 2G1 and 2G3, the implied emission factor per capita from Greece was used. Details on the methods applied for the calculation of emissions / removals are given in the following.

The key categories analysis (see Section 1.5) constitutes the basic tool for methodological choice and for the prioritisation of the necessary improvements. In addition, the results of the various review processes (at a national and EU level) represent key input information for the identification of possible improvements. It should be mentioned however, that data availability, as well as availability of resources (both human and financial) also have to be considered.

- Data availability could become a significant restrictive parameter when selecting an estimation methodology. The accuracy and the consistency of the emissions estimated depend on the availability of the data needed for the correct application of the selected methodology.
- Availability of resources also needs to be considered as the data availability and collection is essential in applying a detailed methodology for a source category should not affect the completeness and the on-time preparation of an inventory submission.

[3] IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan

Activity data

Data collection, processing, and checks constitute the activity with the longest duration in the annual inventory cycle. The duration of this activity is related to the amount of the required data and the number of the entities involved. The on-time and successful completion of this activity has a major effect on the timely preparation and submission of the inventory as well as on its accuracy, completeness, and consistency.

Data from international organisations and databases are supplementary to the data collected from the above data providers. It should be noted that information and data collected (through questionnaires developed according to the guidelines described in the Commission Decision 2004/156/EC) in the framework of the formulation of the National Allocation Plan (NAP) for the period 2005-2007, according to the Directive 2003/87/EC (and its transposition to the national Law, 110(I)/2011) along with the data from the verified reports from installations under the EU ETS for years 2005-2013 constituted a significant source of information and an additional quality control check.

General assessment of the completeness

In the present inventory report, estimates of GHG emissions in Cyprus for the years 1990-2014 are presented. Emissions estimates included in the CRF tables submitted and discussed in the present report, cover the areas of the Republic of Cyprus under the effective control of the Government of the Republic of Cyprus. All major sources are reported including emissions estimates for indirect greenhouse gases and SO_2.

Completeness in the present inventory submission will be further discussed in the relevant chapters.

Further details on deficiencies are provided in the appropriate chapter. A national inventory improvement plan is available and implemented.

Description and interpretation of emission trends for aggregated greenhouse gas emissions

The GHG emissions in 2014 were 7743 Gg CO2 eq. including LULUCF and 8394 Gg CO2 eq. excluding LULUCF. Between 1990 and 2014, the total national emissions excluding LULUCF increased by 49%.

Carbon dioxide emissions accounted for 82% of total GHG emissions in 2014 without LULUCF and increased by 47% from 1990. Methane emissions accounted for 10.3% of total GHG emissions in 2014 without LULUCF and increased by 30% since 1990, while nitrous oxide emissions accounted for 3.9% of the total GHG emissions in 2014 without LULUCF and increased by 6.7% since 1990. Finally, F-gases and SF6 emissions accounted for 3.8% of total GHG emissions in 2014.

The emissions by gas and sector are presented in Table E1. The GHG emissions in 2014 were 7743 Gg CO2 eq. including LULUCF and 8394 Gg CO2 eq. excluding LULUCF. Between 1990 and 2014, the total national emissions excluding LULUCF increased by 48.9%.

The emissions by gas and sector are presented in Table E1. The summary tables for each year of the inventory by gas and source as these were generated by CRF reporter v5.14.2 are presented in Annex II. Total emissions by sector are also presented in Figure E1.

Table E1. Total GHG emissions in Cyprus with and without LULUCF for the period 1990-2014, Gg CO2 eq.

Gg CO2 eq.	**1990**	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO2 emissions w/o net CO2 from LULUCF	4662.89	5892.12	7139.53	7961.70	8004.59	6449.42	6878.33
CO2 emissions w/ net CO2 from LULUCF	4049.35	5275.09	6571.05	7314.02	7363.28	5796.98	6226.45
CH4 emissions w/o CH4 from LULUCF	664.24	765.01	814.69	859.73	892.54	860.40	864.44
CH4 emissions w/ CH4 from LULUCF	664.28	765.34	820.39	859.89	893.28	860.63	864.69
N2O emissions w/o N2O from LULUCF	310.71	399.52	363.99	360.09	377.94	328.75	331.57
N2O emissions w/ N2O from LULUCF	310.74	399.74	367.75	360.19	378.43	328.90	331.73
HFCs	0.15	8.95	20.50	90.93	245.43	323.98	319.83
PFCs							
SF6	0.03	0.06	0.08	0.12	0.15	0.15	0.15
NF3							
Total (w/o LULUCF)	5638.01	7065.67	8338.78	9272.57	9520.65	7962.71	8394.32
Total (w/ LULUCF)	5024.54	6449.18	7779.77	8625.14	8880.58	7310.64	7742.85

1. Energy	3940.66	5093.38	6344.87	7128.69	7494.56	5750.89	5959.29
2. Industrial Processes	808.14	907.85	927.75	1057.77	908.75	1159.76	1375.2
3. Agriculture	564.31	707.13	657.5	652.02	661.97	576.81	578.77
4. LULUCF	-613.47	-616.49	-559.01	-647.43	-640.07	-652.07	-651.47
5. Waste	377.11	417.69	452.94	479.84	487.89	502.68	505.2
6. Other	NO	NO	NO	NO	NO	NO	NO
Total (w/o LULUCF)	5690.22	7126.06	8383.07	9318.32	9553.17	7990.14	8418.46
Total (w/ LULUCF)	5076.75	6509.56	7824.06	8670.89	8913.1	7338.07	7766.98

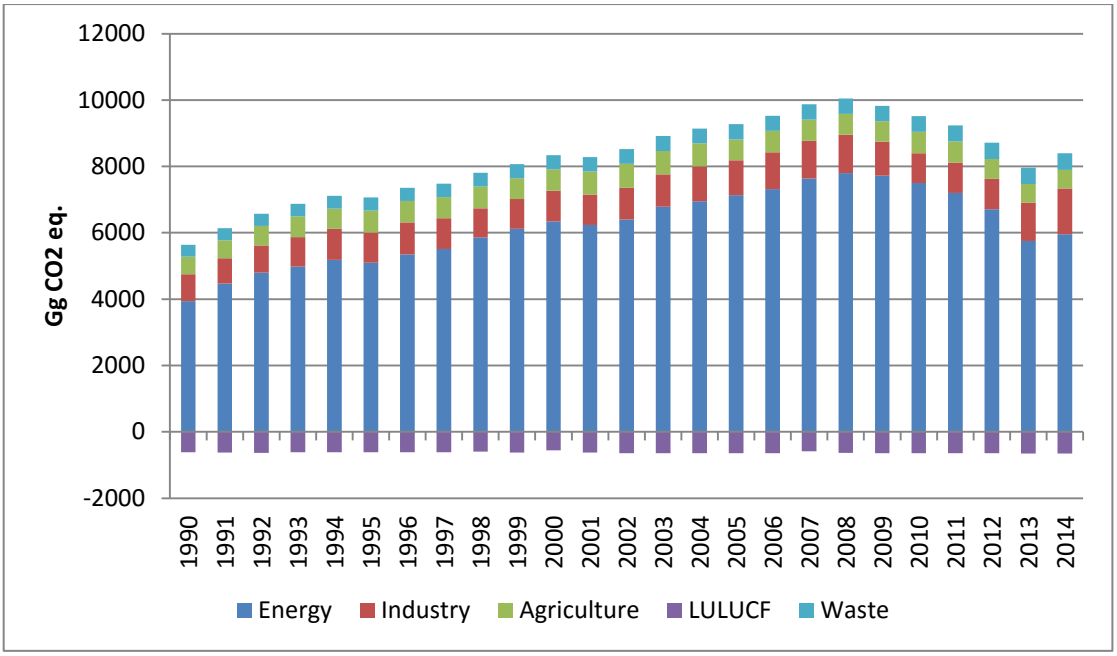

Figure E1. Total GHG emissions in Cyprus for the period 1990-2014, Gg CO2 eq.

Energy

The energy sector in Cyprus relies on fossil fuel combustion for meeting the bulk of energy requirements. Final consumption in 2014 amounted to approximately 78 PJ compared to 77 PJ in 2013 (1.5% increase). 97% of the consumption in 2014 was from liquid fuels, 0.1% from solid fuels and 0.5% from other fossil fuels. In comparison to 1990, total fuel consumption in 2014 including biomass increased by 50%. Natural gas is not available in Cyprus.

After robust growth rates in the 1980s (average annual growth was 6.1%), economic performance in the 1990s was mixed: real GDP growth was 9.7% in 1992, 1.7% in 1993, 6.0% in 1994, 6.0% in 1995, 1.9% in 1996 and 2.3% in 1997. This pattern underlined the economy's vulnerability to swings in tourist arrivals (i.e. to economic and political conditions in Cyprus, Western Europe, and the Middle East) and the need to diversify the economy. Declining competitiveness in tourism and especially in manufacturing are acting as a drag on growth until structural changes are in effect. This is greatly affecting the energy sector.

The emissions from the energy sector in Cyprus increased by 51% during the period 1990-2014. The greatest increase in emissions was between 1990 and 2008 (98%), the emissions reached their peak (7799 Gg CO2 eq.). All the emissions in 2014 are from fuel combustion. The contribution of the emissions from the energy sector to the total without LULUCF in 2014 was 71% compared to 64% in 1990.

Energy is mainly responsible for carbon dioxide emissions, while it contributes also to methane and nitrous oxide emissions. In 2014, 98.7% of the emissions from the energy sector were carbon dioxide, 0.3% methane and 1% nitrous oxide. Fugitive emissions from fuels have not been estimated since 2004 when the refining activities stopped in Cyprus. The contribution of each source to the total of the energy sector is presented in Figure E2.

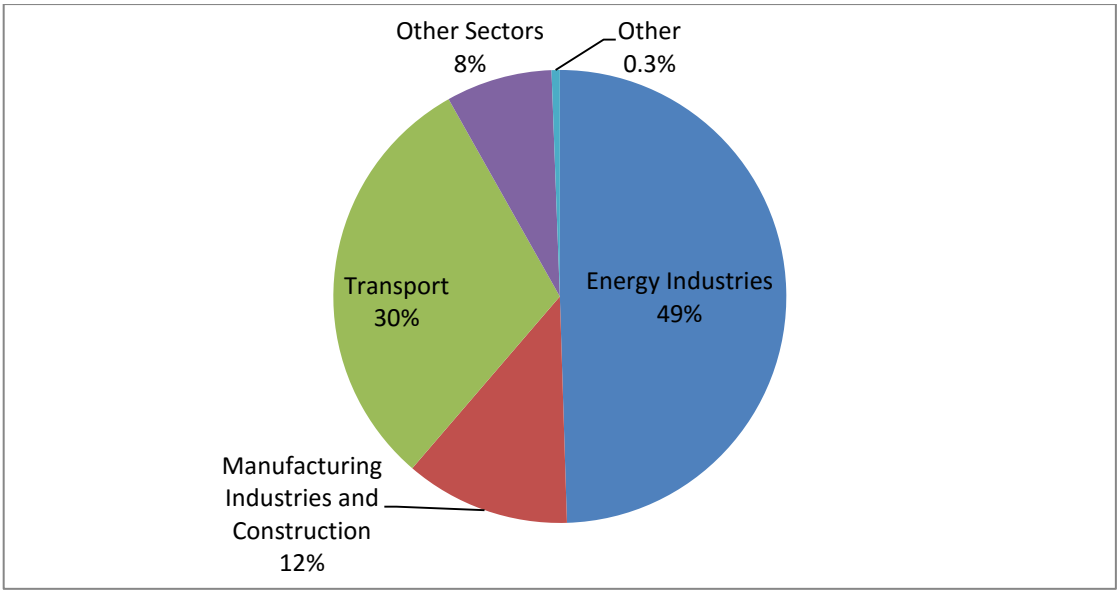

Figure E2. Contribution of the main energy sources of emissions to the total energy emissions in 2014

Industrial Processes

In 2014, GHG emissions from Industrial processes accounted for 16.3% of total emissions excluding LULUCF compared to 14% in 1990. The emissions have increased by 70% compared to 1990. 71.7% of the industrial processes emissions are from mineral production, 23.3% is from consumption of Halocarbons and SF6, 4.3% is from Other Product Manufacture and Use and the remaining 0.7% is from non-energy products from fuels and solvent use.

Agriculture

Emissions from Agriculture accounted for 7% of total emissions in 2014 (without LULUCF), compared to 9.5% in 1990. Emissions increased by 4.5% compared to 1990. The peak of Agriculture emissions was in 2002 (724 Gg CO2 eq.) when an increase of 35% compared to 1990 was observed. Since 2002 a reduction in emissions was observed, due to the reduction of N_2O emissions from agricultural soils, because of the reduction in the use of synthetic nitrogen fertilisers. The reduction of the use of fertilisers was caused by the drought that was taking place during the same period that had an extreme in 2008. Further reduction was caused by the recent changes in manure management. Agriculture is responsible for mainly methane and nitrous oxide emissions. In 2014 agriculture has contributed 42% to the total methane emissions and 58% to the total nitrous oxide emissions. The contribution of the main agricultural sources of emissions to the total agriculture emissions in 2014 is presented in Figure E3.

Land use, land use change and forestry

The emissions from LULUCF changed from about -613 Gg CO2 eq. in 1990 to -651 Gg CO2 in 2014. Overall the trend is one of increased removals from the LULUCF sector, with the exception of peaks in emissions in years with increased wildfires.

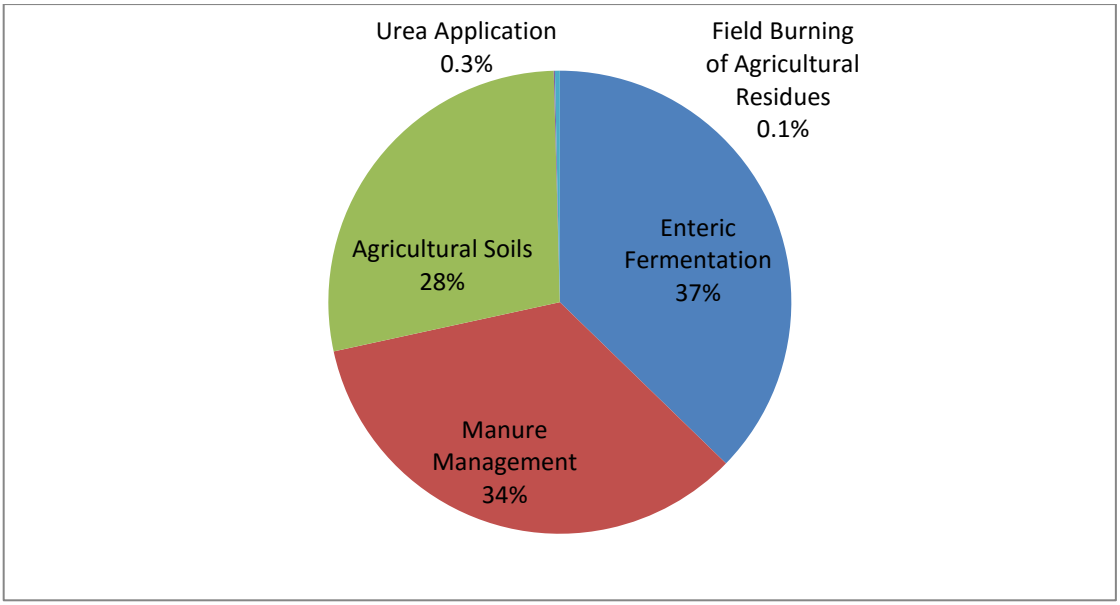

Figure E3. Contribution of the main agricultural sources of emissions to the total agriculture emissions in 2014

Waste

Emissions from the Waste Sector in 2014 contributed 6% of the total emissions without LULUCF. In 2014, 91% of the emissions is from solid waste disposal, 2% from biological treatment of solid waste and 7% from waste water treatment and discharge.55% of the total methane emissions and 6% of the nitrous oxide emissions of the country are from the sector of waste. The emissions from waste have changed considerably between 1990 and 2014 due to changes that are taking place in the waste and wastewater management practices of the country.

Chapter 1: Introduction

1.1. Background information on greenhouse gas inventories, climate change

Naturally occurring greenhouse gases (GHG) include water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3). In the last few years, a new category of greenhouse gases has emerged that includes hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6). These gases are man-made and are mainly used in a number of industrial activities in replacement of CFCs. Other naturally occurring gases, which do not contribute directly to the greenhouse effect are carbon monoxide (CO), oxides of nitrogen (NO_x), non-methane volatile organic compounds (NMVOC) and sulphur dioxide (SO_2).

1.1.1. Background information on climate change

International framework

United Nations Framework Convention on Climate Change[4]

In response to the emerging evidence that climate change could have a major global impact, the United Nations Framework Convention on Climate Change (henceforth the Convention) was adopted on 9 May 1992 and was opened for signature in Rio de Janeiro in June 1992.

The ultimate objective of the Convention is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Convention recognises that the developed countries should take the lead in combating climate change and calls these countries to:

- Adopt policies and measures to mitigate climate change.
- Return, individually or jointly, to 1990 levels of carbon dioxide and other greenhouse gas by the year 2000.
- Provide technology transfer and financial resources to help developing countries so as to confront climate change impacts and to develop, ensuring at the same time the environmental protection through the restraint of GHG emissions.

Kyoto Protocol[5]

Recognising early the need for an effective instrument to provide confidence in addressing the climate change challenge, the Parties at the third meeting of the Conference of the Parties (COP) to the Convention, held in Kyoto (1-11 December 1997), finalised negotiations related to the establishment of such a legal instrument, the Kyoto Protocol on Climate Change (KP). KP provides a foundation upon which future action can be intensified. It establishes, for the first time, legally binding targets for the reduction of greenhouse gas emissions and it also

[4] More information available at https://unfccc.int/essential_background/convention/items/6036.php
[5] More information available at https://unfccc.int/essential_background/kyoto_protocol/items/6034.php

confirms the capacity of the international community to cooperate in action to deal with a major global environmental problem.

KP calls for legally binding commitments of the developed countries to reduce, individually or jointly, emissions of 6 greenhouse gases (CO_2, CH_4, N_2O, HFC, PFC and SF_6) by more than 5% in the period 2008 to 2012, below their 1990 level. The EU and its Member States at the time agreed to an 8% reduction. For the achievement of these targets, the Protocol provides for the use of the following:

- Adoption of national policies and measures,
- Establishment of an emissions trading regime,
- Establishment of the joint implementation mechanism,
- Establishment of a clean development mechanism, and
- Protection and promotion of sinks to enhance CO_2 removals.

Detailed rules for the implementation of the Protocol were set out at the 7th Conference of the Parties (in Marrakesh) and are described in the Marrakesh Accords adopted in 2001. The Protocol entered into force on 16 February 2005, after its ratification from 141 Parties including developed countries with a contribution of more than 55% to global CO_2 emissions in1990.

The Doha Amendment[6]

At the eighth session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol held in Doha, Qatar, in December 2012, parties to the Kyoto Protocol adopted an amendment to the Kyoto Protocol by decision 1/CMP.8 in accordance with Articles 20 and 21 of the Kyoto Protocol.

Pursuant to Article 21, paragraph 7 and Article 20, paragraph 4, the amendment is subject to acceptance by Parties to the Kyoto Protocol. In accordance with Article 20, paragraph 4, the amendment will enter into force for those Parties having accepted it on the ninetieth day after the date of receipt by the Depositary of an instrument of acceptance by at least three fourths of the Parties to the Kyoto Protocol. A total of 144 instruments of acceptance are required for the entry into force of the amendment.

The Doha Amendment and the KP Decision set out the rules related to the second commitment period of the Kyoto Protocol (CP2). The key aspects of CP2 are as follows:

- CP2 will be eight years long, running from 1 January 2013 until 31 December 2020;
- Parties taking on commitments in CP2 (CP2 Parties) are required to reduce their aggregate emissions by 18% below 1990 levels in CP2. The commitments of individual Parties range from a 24% reduction (in the case of Ukraine) to a 0.5% reduction (in the case of Australia). The European Union, as a whole, is required to reduce its emissions by 20%;
- CP2 Parties are required to review their commitments by the end of 2014 with a view at increasing the level of their mitigation ambition;
- Notwithstanding the commitments set out in Annex B to the Kyoto Protocol (as amended), each CP2 Party's commitment in CP2 must be at least as ambitious as its actual annual average emissions between 2008 and 2010;

[6] More information available at https://unfccc.int/kyoto_protocol/doha_amendment/items/7362.php

- CP2 Parties may carry over surplus CP1 AAUs into CP2 without limit, but may only use or acquire such AAUs in limited circumstances;
- Access to all of the Kyoto Protocol's market mechanisms remains uninterrupted for CP2 Parties; and
- KP Parties agreed to the implementation of the Doha Amendment pending its formal entry into force, thus ensuring the Kyoto Protocol's operational continuity.

Climate change and Cyprus

The Republic of Cyprus ratified the UNFCCC in 1997 with Law No. 19(III) / 1997 as a non-Annex I party. The Kyoto Protocol was ratified by the Republic of Cyprus in 2003 with Law No. 29(III) / 2003. According to decision 10/CP.17 of COP17, as of 9 January 2013, the status of Cyprus changed from a non-Annex I to an Annex I party to the UNFCCC. As part of the EU, Cyprus has taken up commitments for the CP2 of the KP through the Doha amendment.

1.1.2. Background information on greenhouse gas inventories

International framework

Annual inventories of greenhouse and other gas emissions form an essential element of each national environmental policy-making process. They can be used to derive information on emissions trends with reference to a pre-selected base year, and can assist in monitoring the progress of existing abatement measures for the reduction of greenhouse gas emissions and the fulfilment of the KP target.

According to Article 4 of the Convention, Annex I Parties have the obligation to submit national inventories of GHG emissions and removals. At COP2, the annual submission of inventories was decided (Decision 9 / CP.2), while the use of the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"[7] (henceforth IPCC Guidelines) was adopted with Decision 2/CP.3. In order to enhance the transparency of the GHG inventories submitted and improve comparability across sectors and different countries, the use of Common Reporting Format (CRF) tables for the submission of the emissions / removals estimates per source/ sink category was adopted at COP5 (Decision 3/CP.5).

At the 12th session of the Subsidiary Body for Scientific and Technological Advice (SBSTA), the use of the IPCC "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories"[8] (henceforth IPCC Good Practice Guidance) for inventories due in 2003 and beyond was decided. The IPCC Good Practice Guidance is considered as an elaboration of the IPCC Guidelines.

New reporting guidelines, together with a structure of the National Inventory Report (NIR) were adopted at COP8 (Decision 18/CP.8) for use in reporting annual inventories due in 2004 and beyond. Overall annual national inventories submissions include the submission of both the Common Reporting Format tables and the National Inventory Report by the 15th of April.

[7] Available at http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html
[8] Available at http://www.ipcc-nggip.iges.or.jp/public/gp/english/index.html

At COP9 the use of the IPCC "Good Practice Guidance for Land Use, Land Use Change and Forestry" [9] (henceforth LULUCF Good Practice Guidance) for inventories due in 2005 and beyond was adopted (Decision 13/CP.9). Moreover, new Common Reporting Format tables for LULUCF, to be used for a trial period covering inventory submissions due in 2005, were adopted with the same decision.

The Conference of the Parties (COP), by its decision 14/CP.11, adopted the tables of the common reporting format and their notes for reporting on land use, land-use change and forestry (LULUCF) sector, to be used for the purpose of submission of the annual inventory due in and after 2007.

Cyprus

The first national inventory report for Cyprus was prepared in 2001 and covered the period 1990-1998. The inventory was prepared in the framework of the project “Strategic Plan for the Limitation of Greenhouse Gas Emissions in Cyprus”.

The first Inventory report submitted by Cyprus to the European Commission for the purposes of Decision no. 280/2004/EC, was in 2006 for the period 1990-2004. Cyprus at the time was a non-Annex I party and therefore had no obligation to submit annual inventories to the UNFCCC secretariat.

The first submission of a national inventory report to the UNFCCC secretariat, as an Annex I party was made in April 2013.

1.1.3. Background information on supplementary information required under article 7, paragraph 1, of the Kyoto protocol

Cyprus, as an Annex I Party that is also Party to the Kyoto Protocol is also required to report supplementary information required under Article 7, paragraph 1 of the Kyoto Protocol, with the inventory submission due under the Convention, in accordance with paragraph 3(a) of decision15/CMP.1. Part II of this report (Chapters 10-14) provides information on activities under Article3, paragraph 3 (Afforestation, Reforestation, Deforestation) and the elected activity under Article 3,paragraph 4 (Forest Management), on accounting of Kyoto units, on changes in the national system and the national registry and information on the minimization of adverse impacts of climate change in accordance with Articles 3.14.

1.2. Institutional arrangements

1.2.1. Institutional, legal and procedural 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 for estimating anthropogenic emissions by sources and removals by sinks of

[9] Available at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html

all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information.

The Ministry of Agriculture, Rural Development and Environment (MARDE) is the governmental body responsible for the co-ordination of all involved ministries, as well as any relevant public or private organisations, in relation to the implementation of the provisions of the national and European legislation associated with climate change. In this context, the MARDE has the responsibility for the planning, preparation, management, compilation of the national GHG inventory report[10]. The organisational structure of the National Inventory System is presented in Figure 1.1.

No legal framework is available that defines the roles, responsibilities and the co-operation between the MARDE and contact points of the involved Ministries and agencies.

There are no changes to the national system or registry, or their descriptions.

1.2.2. Overview of inventory planning, preparation and management

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 1.1).

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

[10]Contact person: Nicoletta Kythreotou, Address: Department of Environment, 1498 Nicosia, Cyprus, tel.: +357 22 408947, e-mail: nkythreotou@environment.moa.gov.cy

recommendations of the supervisor of the team. 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.

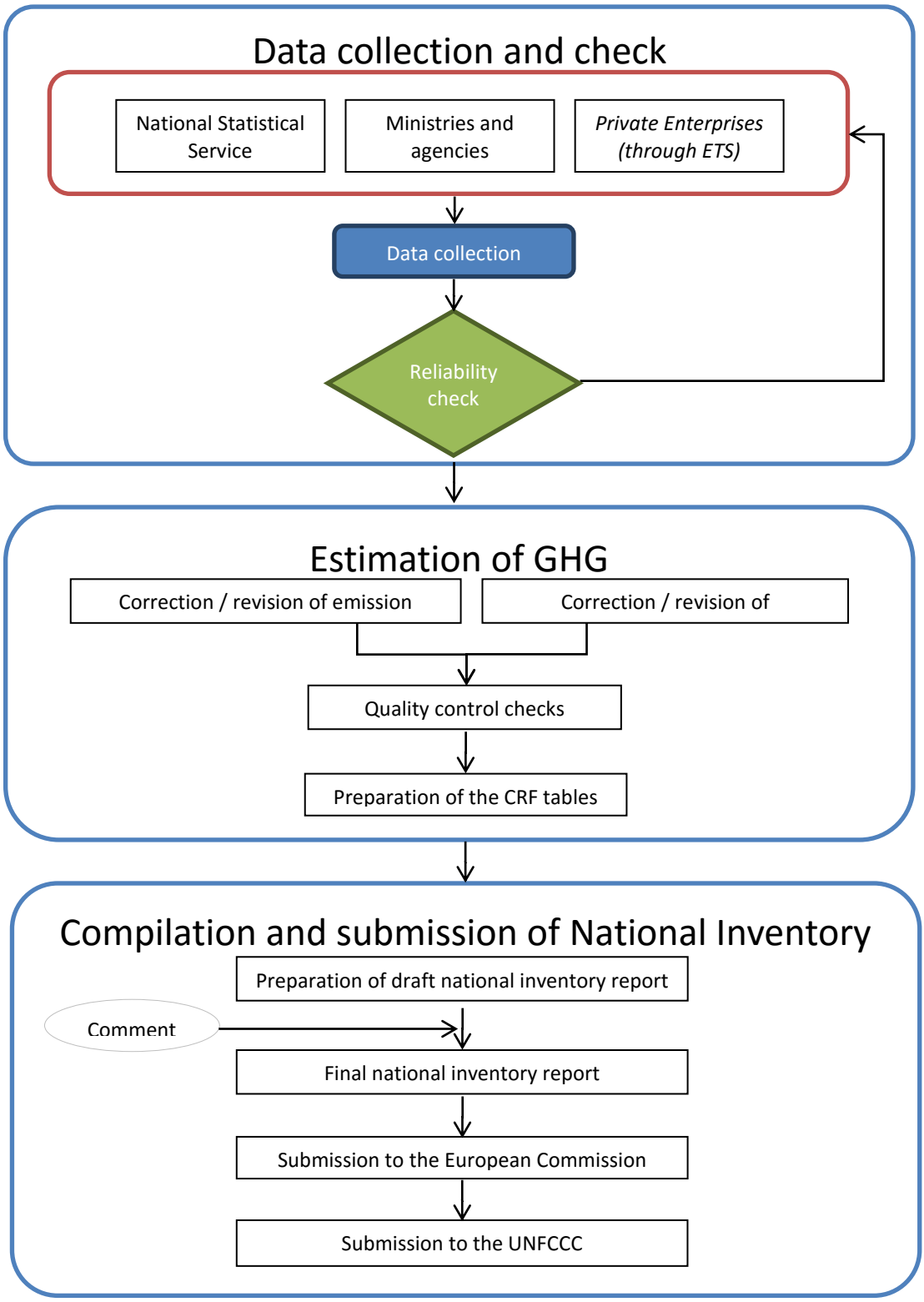

Figure 1.1. GHG emissions inventory preparation process in Cyprus

1.3. Inventory preparation

1.3.1. GHG inventory

The compilation of the inventory starts with the collection of the ETS data in June before the submission deadline (year X-1). When the first comments on the inventory are received by the European Commission and the UNFCCC for the submission of the previous year (approximately June), the necessary changes are made to the calculation sheets resulting to the CRFreporter data and notes are taken for the National Inventory Report, by the inventory compiler. Other data is made available from other governmental departments from November before the submission deadline (year X-1). In December the final National inventory report for the air pollutants under Directive 2001/81/EC prepared by the Department of Labour Inspection of the Ministry of Labour, Welfare and Social Insurance (DLI), is available and communicated to the inventory compiler.

Data reliability checks: data for some activities is available from several sources. In such cases, the data is compared between all sources. In cases where there are differences, these are discussed with the data sets compilers. In several cases the data providers agree that there is a mistake and they correct appropriately the data set.

Quality control/ quality assurance: when the calculations have been completed the excel files used for the data collection and the calculations are sent to Ms Niki Papaki (Environment Technician, tel. +357 22408946, email npapaki@environment.moa.gov.cy) and Mr Giorgos Ioannou (Statistics Officer, tel. +357 22602171, email geioannou@cystat.mof.gov.cy) to check the data collected and the calculations. In case any mistakes are identified, these are corrected accordingly by the inventory compiler.

Compilation of inventory report: the compilation of the report starts when the emissions are finalised and the CRF tables are available. Once the final draft is available, the report is sent to Ms Niki Papaki (Environment Technician, tel. +357 22408946, email npapaki@environment.moa.gov.cy), Mr Giorgos Ioannou (Statistics Officer, tel. +357 22602171, email geioannou@cystat.mof.gov.cy) and all the data providers for comments. The comments are taken into consideration for the finalisation of the report.

Approval and submission of report: when the report is finalised, it is send to Dr Theodoulos Mesimeris, Head of climate Action Unit and thereafter to the Director of the Department of Environment Mr Costas Hadjipanayiotou (chadjipanayiotou@environment.moa.gov.cy, tel. no.+357 22 408900) for the final approval. The inventory accompanied by the inventory report is submitted to the European Commission annually by 15 January.

The timetable for the completion of these stages in the annual inventory cycle is presented in Table 1.1.

Table 1.1. Timetable for the preparation and submission of GHG emissions/ removals inventory in Cyprus where x is the submission year

Task	Month
Corrections based on EC comments for previous submission	June year x-1
Collection of ETS data	June year x-1
Data collection from other ministries and agencies	November year x-1
Calculations, checks, CRF preparation	December year x-1
NIR preparation, revision, submission to the European Commission	January year x
CRF and NIR revision (if necessary) and final submission to the European Commission	March year x
CRF and NIR revision (if necessary) and submission UNFCCC secretariat	April year x

Inventory preparation team

The calculations, report preparation and overall management of the compilation of the inventory (inventory compiler) is the responsibility of Dr Nicoletta Kythreotou, Environment Officer at the Department of Environment since 2006. Dr Kythreotou holds a BSc in Environmental Science, an MSc in Environmental Engineering and a PhD in Mechanical Engineering.

The final assessment of the national inventory is performed by Dr Theodoulos Mesimeris, who is a Senior Environment Officer and the head of Climate Action Unit at the Department of Environment. Dr Mesimeris has been an officer at the Department of Environment since 2002 and has been dealing with climate change since then. The academic background of Dr Mesimeris is an MEng in Chemical Engineering, MSc in Environmental Management and PhD in Chemical Engineering.

Dr Mesimeris and Dr Kythreotou are the national contact points of the UNFCCC and the DG Climate Action of the European Commission.

Ms Melina Menelaou (BA Biological Science with emphasis on ecology) is responsible Land Use issues.

The contact details of the team are provided in Table 1.2.

Table 1.2. Contact details of the inventory compilation team

Person	Position	Telephone no.	Email
Dr Theodoulos Mesimeris	Senior Environment Officer	+357 22 408948	tmesimeris@environment.moa.gov.cy
Dr Nicoletta Kythreotou	Environment Officer	+357 22 408947	nkythreotou@environment.moa.gov.cy
Ms Niki Papaki	Environment Technician	+357 22 408946	npapaki@environment.moa.gov.cy
Ms Melina Menelaou	Environment Technician	+357 22 408959	mmenelaou@environment.moa.gov.cy

1.3.2. Data collection, processing and storage

Data from all the involved parties come in MS Excel spread-sheets. 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. Apart from the fuel consumption data is also obtained for CO_2 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 LoukiaMakri (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 22408925, 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).

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 GeorgiosPapaioannou, 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 Protection 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).

Lime, cement and ceramics (bricks and tiles) production data was obtained directly from the installations.

1.3.3. Quality assurance / quality control (QA / QC) procedures and extensive review of GHG inventory

See Section 1.6.

1.4. Brief general description of methodologies and data sources used

1.4.1. Emission factors

The estimation of GHG emissions / removals per source / sink category is predominately based on the methods described in the revised 2006 IPCC Guidelines. The emission factors used were derived from the 2006 IPCC Guidelines and special attention was paid in selecting the emission factors that are most representative of practices and conditions in Cyprus. Furthermore, emission factors were obtained from plant specific information contained in EU ETS reports. Due to data unavailability, for the estimation of the emissions of the sectors Refrigeration and Air Conditioning(2F1), Foam Blowing Agents (2F2), Fire Protection (2F3)and Metered Dose Inhalers (2F4a) the implied emission factors per capita from the average of Greece, Italy, Malta and Spain (NIR2015) have been used. For Use of Electrical Equipment (2G1) and N2O from Product Uses (2G3), the implied emission factor per capita from Greece was used. Details on the methods applied for the calculation of emissions / removals are given the chapters that follow.

The key categories analysis (see Section 1.6) constitutes the basic tool for methodological choice and for the prioritisation of the necessary improvements. In addition, the results of the various review processes (at national and EU level) represent key input information for the identification of possible improvements. It should be mentioned however, that data

availability as well as availability of resources (both human and financial) also have to be considered.

- Data availability could become a significant restrictive parameter when selecting an estimation methodology. The accuracy and the consistency of the emissions estimated depend on the availability of the data needed for the correct application of the selected methodology.
- Availability of resources needs also to be considered as the searching for and the collection of the necessary data in order to apply a detailed methodology for a source category should not affect the completeness and the on-time preparation of an inventory submission.

1.4.2. Activity data

Data collection, processing and check constitute the activity with the longest duration in the annual inventory cycle. The duration of this activity is related to the amount of the necessary data and the number of the entities involved. The on-time and successful completion of this activity has a major effect on the timeliness preparation and submission of the inventory as well as on its accuracy, completeness and consistency.

Table 1.3 gives an overview of the main data sets used for the estimation of GHG emissions /removals. Data from international organisations and databases are supplementary to the data collected from the above data providers. It should be noted that information and data collected (through questionnaires developed according to the guidelines described in the Commission Decision 2004/156/EC) in the framework of the formulation of the National Allocation Plan (NAP) for the period 2005-2007, according to the Directive 2003/87/EC (and its transposition to the national Law, 110(I)/2011) along with the data from the verified reports from installations under the EU ETS for years 2005-2014 constituted significant source of information and an additional quality control check.

Table 1.3. Data sources and data sets per IPCC sector, source category

Sector	Data	Sources
1A1 Electricity generation	Fuel consumption	ETS verified reports Statistical Service Energy Service DLI
1A2 Manufacturing industry and construction	Fuel consumption	ETS verified reports Statistical Service Energy Service DLI
1A3 Transport	Fuel consumption	Statistical Service Energy Service EUROCONTROL
1A4 Residential / Commercial / Agriculture	Fuel consumption	Statistical Service Energy Service DLI
1B Fugitive emissions from fuels	Fuel consumption	Statistical Service Energy Service DLI
2 Industrial processes	Industrial production NMVOCs emissions Population	ETS verified reports Statistical Service DLI
3 Agriculture	Cultivated areas	Statistical Service

Sector	Data	Sources
	Agricultural production Livestock population Fertilizer use	Department of Agriculture FAOSTAT
4LULUCF	Land cover data (which includes forest cover data) Forest Areas affected by wildfires	Department of Environment Department of Forestry
5 Waste	Quantities/composition of solid waste generated Recycling Population Industrial production	Department of Environment Statistical Service
6 KP-LULUCF	Land cover data (which includes forest cover data) Forest Areas affected by wildfires	Department of Environment Department of Forestry

1.4.3. Global Warming Potential

Emissions from anthropogenic activities affect the concentration and distribution of greenhouse gases in the atmosphere. These changes can potentially produce a radiative forcing of the Earth's surface and lower atmosphere, by changing either the reflection or absorption of solar radiation or the emissions and absorption of long-wave radiation.

A simple measure of the relative radiative effects of the emissions of various greenhouse gases is the Global Warming Potential (GWP) index. This index is defined as the cumulative radiative forcing between the present and some chosen time-horizon caused by a unit mass of gas emitted now, expressed relative to that for some reference gas. The values for GWP for the greenhouse gases that are used in this inventory are according to Decision 24/CP.19[11] (Annex II).

Corresponding values of GWP for other gases (NOx, CO, NMVOC) are not given by the IPCC (nor by other sources for this purpose), since at present it is impossible to calculate the indirect results of these gases, as the scientific knowledge on their chemical reactions taking place in the atmosphere is not sufficient.

Table 1.4. Direct Global Warming Potentials (mass basis) relative to carbon dioxide for the 100-year horizon

Gas	Chemical Compound	100-year Global Warming Potential
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous Oxide	N_2O	298
HFC-32	CH_2F_2	675
HFC-125	CHF_2CF_2	3500
HFC-134a	CH_2FCF_3	1430
HFC-143a	CF_3CH_3	4470
HFC-227ea	CF_3CHFCF_3	3220
HFC-245fa	$CH_2FCF_2CHF_2$	1030
HCF-365mfc	$CH_3CF_2CH_2CH_2CF_3$	794
Sulphur hexafluoride	SF_6	22800

[11] Decision 24/CP.19 Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention

Nitrogen trifluoride	NF_3	17200

1.5. Brief description of key categories

The IPCC Good Practice Guidance defines procedures (in the form of decision trees) for the choice of estimation methods within the context of the IPCC Guidelines. Decision trees formalise the choice of the estimation method most suited to national circumstances considering at the same time the need for accuracy and the available resources (both financial and human). Generally, inventory uncertainty is lower when emissions are estimated using the most rigorous methods, but due to finite resources, this may not be feasible for every source category. Therefore it is good practice to identify those source categories (key source categories) that have the greatest contribution to overall inventory uncertainty in order to make the most efficient use of available resources.

In that context, a key source category is one that is prioritised within the national inventory system because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions (level assessment) or/and to the trend of emissions (trend assessment). As far as possible, key source categories should receive special consideration in terms of two important inventory aspects:

1. The use of source category-specific good practice methods is preferable, unless resources are unavailable.
2. The key source categories should receive additional attention with respect to quality assurance (QA) and quality control (QC).

As a result of the adoption of the LULUCF Good Practice Guidance (Decision 13/CP.9) the concept of key sources has been expanded in order to cover LULUCF emissions by sources and removals by sinks. Therefore the term key category is used in order to include both sources and sinks.

The determination of the key categories for the Cyprus' inventory system is based on the application of the Tier 1 methodology (see Annex I for presentation of calculations) described in the IPCC Good Practice Guidance, adopting the categorization of sources that is presented in Table 7.1 of the IPCC Good Practice Guidance.

Tier 1 methodology for the identification of key categories assesses the impacts of various source categories on the level and the trend of the national emissions inventory. Key categories are those which, when summed together in descending order of magnitude, add up to over 95% of total emissions (level assessment) or the trend of the inventory in absolute terms.

In line with the specifications and options set out in the Kyoto Protocol and it´s follow up procedures, Cyprus identifies 1990 as its base year for carbon dioxide, methane and nitrous oxide and 1995 as its base year for hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride.

The summary of the key categories assessment for the Cyprus' inventory system for the years 1990 and 2014 with and without LULUCF are presented in the following Tables. The key categories analysis for all the years is available in the xml file submitted.

Table 1.5. Key categories for the Cyprus' inventory system without LULUCF (kt), 1990

Category	Classification	Gas	Target	Level
Agricultural Soils	Direct N2O Emissions From Managed Soils	N2O	no target	0.023
Agricultural Soils	Farming	N2O	Indirect N2O Emissions From Managed Soils	0.004
Cement Production	no classification	CO2	no target	0.124
Domestic Aviation	Fossil fuels	CO2	no target	0.002
Energy Industries	Liquid Fuels	CO2	no target	0.312
Energy Industries	Liquid Fuels	N2O	no target	0.001
Enteric Fermentation	Farming	CH4	no target	0.035
Lime Production	no classification	CO2	no target	0.001
Manufacturing Industries and Construction	Solid Fuels	CO2	no target	0.041
Manufacturing Industries and Construction	Liquid Fuels	CO2	no target	0.05
Manure Management	Farming	CH4	no target	0.02
Manure Management	Farming	N2O	no target	0.013
Non-energy Products from Fuels and Solvent Use	no classification	CO2	no target	0.001
Other Other Sectors	Liquid Fuels	CO2	no target	0.002
Other Process Uses of Carbonates	no classification	CO2	no target	0.01
Other Product Manufacture and Use	no classification	N2O	no target	0.007
Other Sectors	Liquid Fuels	CO2	no target	0.076
Road Transportation	Fuels	CH4	no target	0.001
Road Transportation	Fossil Fuels	CO2	no target	0.207
Road Transportation	Fuels	N2O	no target	0.005
Solid Waste Disposal	Waste	CH4	no target	0.045
Wastewater Treatment and Discharge	Wastewater	N2O	no target	0.002
Wastewater Treatment and Discharge	Wastewater	CH4	no target	0.016

Table 1.6. Key categories for the Cyprus' inventory system with LULUCF, 1990

Category	Classification	Gas	Target	Level
Agricultural Soils	Direct N2O Emissions From Managed Soils	N2O	no target	0.021
Agricultural Soils	Farming	N2O	Indirect N2O Emissions From Managed Soils	0.003
Cement Production	no classification	CO2	no target	0.111
Domestic Aviation	Fossil fuels	CO2	no target	0.002
Energy Industries	Liquid Fuels	CO2	no target	0.282
Energy Industries	Liquid Fuels	N2O	no target	0.001
Enteric Fermentation	Farming	CH4	no target	0.032
Forest Land	Carbon stock change	CO2	Forest Land	0.098
Lime Production	no classification	CO2	no target	0.001
Manufacturing Industries and Construction	Solid Fuels	CO2	no target	0.037
Manufacturing Industries and	Liquid Fuels	CO2	no target	0.045

Category	Classification	Gas	Target	Level
Construction				
Manure Management	Farming	CH4	no target	0.018
Manure Management	Farming	N2O	no target	0.012
Non-energy Products from Fuels and Solvent Use	no classification	CO2	no target	0.001
Other Other Sectors	Liquid Fuels	CO2	no target	0.002
Other Process Uses of Carbonates	no classification	CO2	no target	0.009
Other Product Manufacture and Use	no classification	N2O	no target	0.007
Other Sectors	Liquid Fuels	CO2	no target	0.069
Road Transportation	Fuels	CH4	no target	0.001
Road Transportation	Fossil fuels	CO2	no target	0.187
Road Transportation	Fuels	N2O	no target	0.004
Solid Waste Disposal	Waste	CH4	no target	0.04
Wastewater Treatment and Discharge	Wastewater	N2O	no target	0.002
Wastewater Treatment and Discharge	Wastewater	CH4	no target	0.015

Table 1.7. Key categories for the Cyprus' inventory system without LULUCF, 2014

Category	Classification	Gas	Unit	Target	Level	Trend
Agricultural Soils	Direct N2O Emissions From Managed Soils	N2O	kt	no target	0.013	0.015
Agricultural Soils	Farming	N2O	kt	Indirect N2O Emissions From Managed Soils	0.001	0.003
Biological Treatment of Solid Waste	Waste	CH4	kt	no target	0.001	0.001
Biological Treatment of Solid Waste	Waste	N2O	kt	no target	0.001	0.001
Cement Production	no classification	CO2	kt	no target	0.116	0.011
Domestic Aviation	Fossil fuels	CO2	kt	no target	0	0.003
Energy Industries	Liquid Fuels	CO2	kt	no target	0.35	0.056
Energy Industries	Liquid Fuels	N2O	kt	no target	0.001	0
Enteric Fermentation	Farming	CH4	kt	no target	0.028	0.011
Fire Protection	no classification	Aggregate F-gases	t CO2 equivalent	no target	0	0.001
Forest Land	Carbon stock change	CO2	kt	Forest Land	0	0
Lime Production	no classification	CO2	kt	no target	0	0.001
Manufacturing Industries and Construction	Solid Fuels	CO2	kt	no target	0.001	0.06
Manufacturing Industries and Construction	Other Fossil Fuels	CO2	kt	no target	0.007	0.01
Manufacturing Industries and Construction	Liquid Fuels	CO2	kt	no target	0.076	0.039
Manure Management	Farming	CH4	kt	no target	0.016	0.006
Manure Management	Farming	N2O	kt	no target	0.009	0.006
Non-energy Products from Fuels and Solvent Use	no classification	CO2	kt	no target	0.001	0
Other Other Sectors	Liquid Fuels	CO2	kt	no target	0.004	0.003
Other Process Uses of Carbonates	no classification	CO2	kt	no target	0.001	0.013
Other Product Manufacture and Use	no classification	N2O	kt	no target	0.007	0
Other Sectors	Liquid Fuels	CO2	kt	no target	0.053	0.034
Refrigeration and Air conditioning	no classification	Aggregate F-gases	t CO2 equivalent	no target	0.037	0.056
Road Transportation	Fuels	CH4	kt	no target	0.001	0
Road Transportation	Fossil fuels	CO2	kt	no target	0.21	0.004
Road Transportation	Fuels	N2O	kt	no target	0.006	0.001
Solid Waste Disposal	Waste	CH4	kt	no target	0.054	0.014
Wastewater Treatment and Discharge	Wastewater	N2O	kt	no target	0.002	0
Wastewater Treatment and Discharge	Wastewater	CH4	kt	no target	0.002	0.021

Table 1.8. Key categories for the Cyprus' inventory system with LULUCF, 2014

Category	Classification	Gas	Unit	Target	Level	Trend
Agricultural Soils	Direct N2O Emissions From Managed Soils	N2O	kt	no target	0.012	0.015
Agricultural Soils	Farming	N2O	kt	Indirect N2O Emissions From Managed Soils	0.001	0.003
Biological Treatment of Solid Waste	Waste	CH4	kt	no target	0.001	0.001
Biological Treatment of Solid Waste	Waste	N2O	kt	no target	0.001	0.001
Cement Production	no classification	CO2	kt	no target	0.108	0.016
Domestic Aviation	Fossil fuels	CO2	kt	no target	0	0.003
Energy Industries	Liquid Fuels	CO2	kt	no target	0.325	0.036
Energy Industries	Liquid Fuels	N2O	kt	no target	0.001	0
Enteric Fermentation	Farming	CH4	kt	no target	0.026	0.012
Fire Protection	no classification	Aggregate F-gases	t CO2 eq.	no target	0	0.001
Forest Land	Carbon stock change	CO2	kt	Forest Land	0.072	0.06
Lime Production	no classification	CO2	kt	no target	0	0.001
Manufacturing Industries and Construction	Solid Fuels	CO2	kt	no target	0.001	0.056
Manufacturing Industries and Construction	Other Fossil Fuels	CO2	kt	no target	0.006	0.009
Manufacturing Industries and Construction	Liquid Fuels	CO2	kt	no target	0.07	0.032
Manure Management	Farming	CH4	kt	no target	0.015	0.006
Manure Management	Farming	N2O	kt	no target	0.008	0.006
Non-energy Products from Fuels and Solvent Use	no classification	CO2	kt	no target	0.001	0
Other Other Sectors	Liquid Fuels	CO2	kt	no target	0.004	0.003
Other Process Uses of Carbonates	no classification	CO2	kt	no target	0.001	0.012
Other Product Manufacture and Use	no classification	N2O	kt	no target	0.007	0.001
Other Sectors	Liquid Fuels	CO2	kt	no target	0.049	0.035
Refrigeration and Air conditioning	no classification	Aggregate F-gases	t CO2 eq.	no target	0.035	0.05
Road Transportation	Fuels	CH4	kt	no target	0.001	0
Road Transportation	Fossil Fuels	CO2	kt	no target	0.194	0.006
Road Transportation	Fuels	N2O	kt	no target	0.005	0.001
Solid Waste Disposal	Waste	CH4	kt	no target	0.05	0.011
Wastewater Treatment and Discharge	Wastewater	N2O	kt	no target	0.002	0
Wastewater Treatment and Discharge	Wastewater	CH4	kt	no target	0.002	0.02

1.6. Information on the QA / QC plan including verification and treatment of confidentiality issues

1.6.1. QA / QC procedures

The development and the implementation of an inventory Quality Assurance / Quality Control (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.

With the Protocol's application, the pressure upon national GHG emissions inventories increases and therefore 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 adopted decisions.

In this framework, a QA/QC system is being implemented since the May 2007. The Ministry of Agriculture, Rural Development and Environment is responsible for the implementation of the QA/QC system. The system has the following objectives:

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

The accomplishment of the above-mentioned objectives can only be ensured by the implementation, from all the members of the Inventory Team (see Figure 1.2 for the flow chart of activities concerning emissions inventory), of the QA/QC procedures included in the plan for the following:

- Data collection and processing.

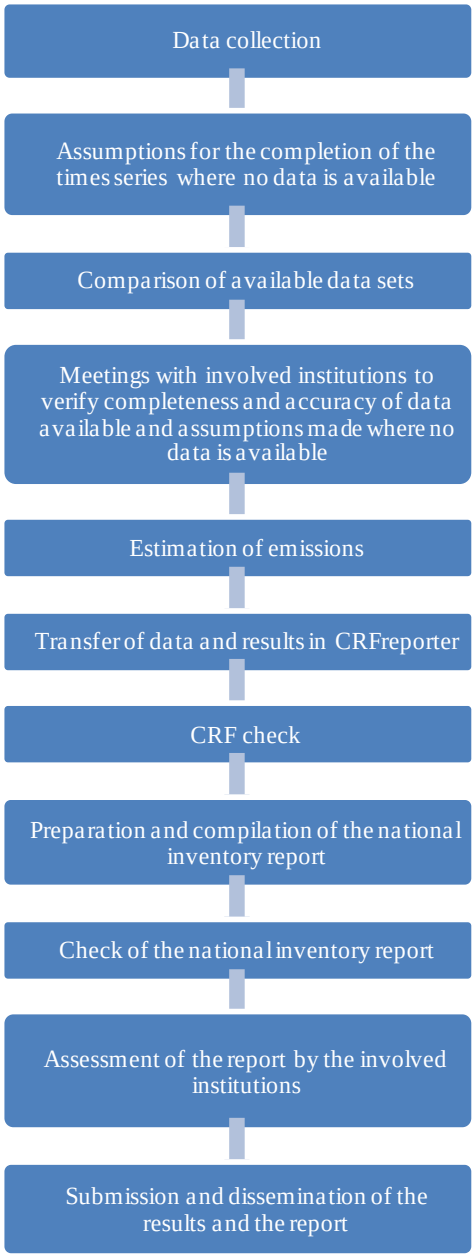

Figure 1.2. Flow chart activities concerning the GHG emissions inventory preparation.

- Applying methods consistent with IPCC Good Practice Guidance and LULUCF Good Practice Guidance for calculating / recalculating emissions or removals.
- Making quantitative estimates of inventory uncertainty.
- Archiving information and record keeping.
- Compiling national inventory reports.

The QA/QC system developed covers the following processes (see Table 1.9 and Fiugre 1.3 for the list of procedures within each process and for the relationship between the processes and the activities of the inventory team):

- QA/QC system management: comprises of all activities that are necessary for the management and control of the inventory agency in order to ensure the accomplishment of the abovementioned quality objectives.
- Quality control: 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 IPCC Good Practice Guidance, (c) quality control checks for data from secondary sources and (d) record keeping.
- Archiving inventory information: comprises of activities related to central archiving of inventory information and the compilation of the national inventory report.
- Quality assurance: comprises of 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: defines procedures for estimating and documenting uncertainty estimates per source / sink category and for the whole inventory.
- Inventory improvement: related to the preparation and the justification of any recalculations made.

Table 1.9. Quality assurance / quality control procedures for the Cyprus' GHG emissions inventory

Process	Procedure code	Procedure
Quality management	QM 01	System review
	QM 02	System improvement
	QM 03	Training
	QM 04	Record keeping
	QM 05	Internal reviews
	QM 06	Non-compliance – corrective and preventive actions
	QM 07	Supplies
	QM 08	Quality management system
	QM 09	Documents control
	QM 10	Internal communication
Quality control	QC 01	Data collection
	QC 02	Estimation of emissions / removals
	QC 03	Data quality control check
	QC 04	Input data record keeping
Archiving of inventory information	AI 01	Centralised archiving of inventory information
	AI 02	Compilation of reports
Quality assurance	QA 01	Expert review of input data and parameters
	QA 02	Expert review of GHG emissions / removals inventory
	QA 03	Review from public
Estimation of uncertainties	EU 01	Uncertainty analysis
Inventory improvement	II 01	Recalculations management

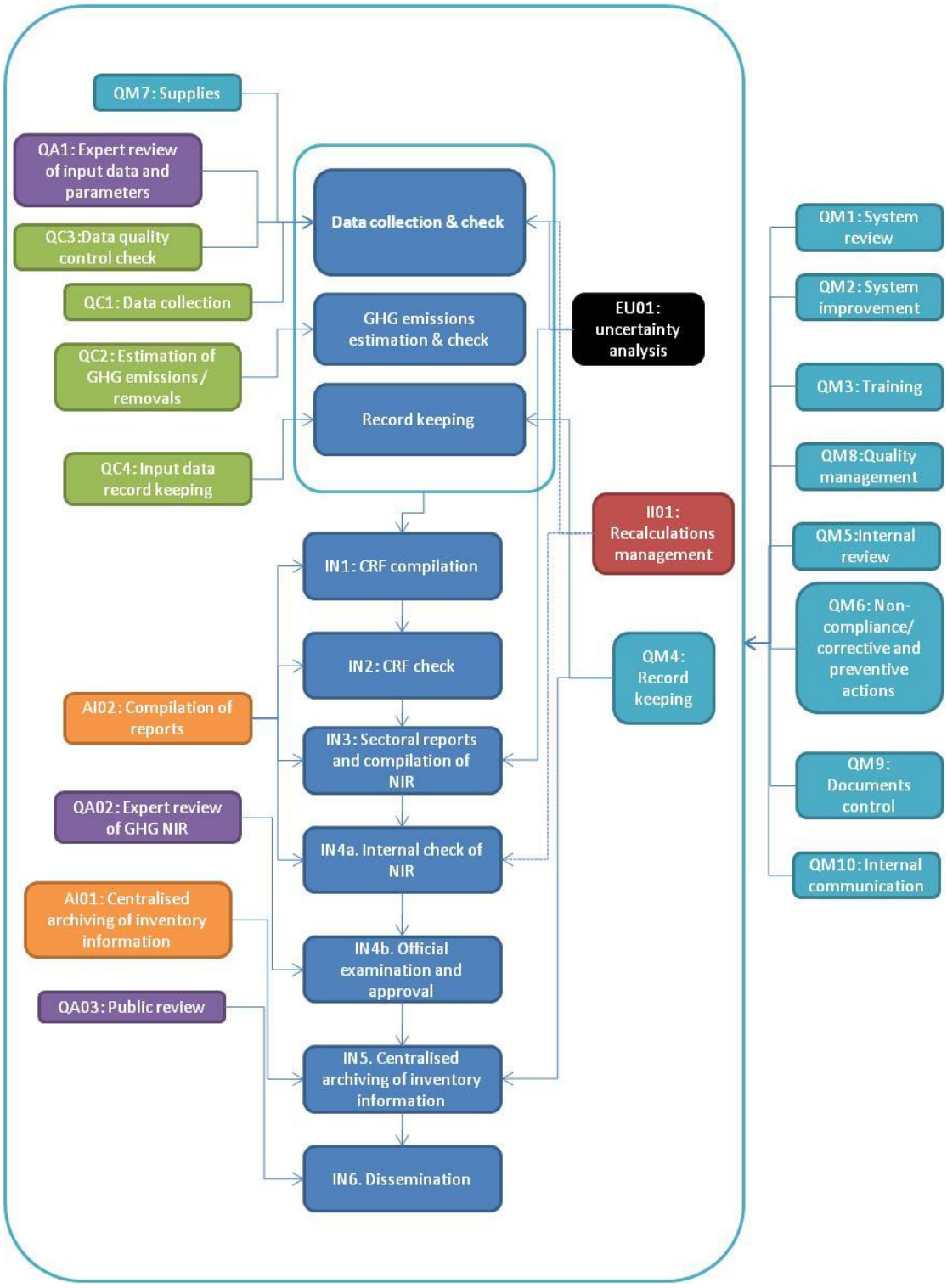

Figure 1.3. QA/QC processes and procedures and inventory related activities

1.6.2. Verification activities

Verification processes are intended to help establish an inventory's reliability. These processes provide alternative information on annual emissions and trends. The results of verification processes provide inputs to improve inventories, build confidence in emissions estimates and trends, and enhance cooperation in improving inventory estimates.

The verification techniques applied include internal quality checks, inventory inter-comparison and comparison of indicators. In all cases, comparisons of the systems for which data are available and the processes of data acquisition are considered along with the results of the studies.

Comparisons with other, independently compiled, national or regional emissions estimates are a quick option to verify completeness, approximate emission levels, or allocations to source categories or sub-source categories. The availability of such independently compiled inventories varies.

Comparison of national greenhouse gas inventories with international data sets is an independent means to verify inventory estimates. Comparisons with inventories from other countries enable cross-checking of assumptions regarding the use of emission factors, completeness of source categories and overall approaches. In addition to comparisons with single country emissions inventories, it is possible to make more systematic comparisons for larger groups of countries.

For a given source category, different types of bottom-up comparisons are performed in parallel. These comparisons examine activity data and emission factors. These include:
- Comparisons with other datasets, in order to check for completeness, magnitude, and source allocation;
- Inter-country comparisons in which input data are compared for different countries for the same year.

The verification activities implemented are presented in Table 1.10. The verification activities carried out in comparison to the activities listed in Box 2.1 in Annex 2 of the GPG (page A2.10) are presented in Table 1.11.

Table 1.10. Verification activities implemented

Type	Activity
Top-down Vs. bottom-up	Carbon dioxide from fossil fuel combustion: a reference calculation based on apparent fuel consumption per fuel type is mandatory according to the Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines).
	This type of top-down completeness and order-of-magnitude check is also applied in the estimation of emissions from the consumption of halocarbons and SF6: the bulk imports of the gases are considered the top-down estimates and the actual emissions estimates are the bottom-up.
Comparison of activity data	Fuel consumption is compared where available with the fuel consumption collected/ estimated by the Statistical Service, Energy Service and the Department of Labour Inspection. Fuel consumption for electricity, cement and ceramics production, is also compared with the data collected annually from the installations through the implementation of the ETS law No. 110(I)/2011.

Type	Activity
	Industrial production is possible to be collected directly from the installations due to their small number. The data collected is compared with data collected by the Department of Labour Inspection, the Statistical Service and the data collected annually from the installations through the implementation of the ETS law No. 110(I)/2011.
	Animal population is compared between the data available from the Department of Labour Inspection, the Statistical Service, the Department of Agriculture and FAOSTAT (where data is available).
Comparison of emission factors	Emission factors for fuel consumption for electricity, cement and ceramics production are available from the annual reports submitted by the installations for the implementation of the ETS law No. 110(I)/2011.
Comparison of emissions between countries	Comparison of emissions and resulting implied emission factors is performed by the European Environment Agency and the EU experts review team through the QA/QC processes of the European Union.
Comparisons of emission intensity indicators between countries	Comparison of emissions between countries and the resulting emissions per capita has been performed for the estimation of emissions from solvents and other product use (sector 3) and actual emissions from the consumption of halocarbons and SF6 (source 2F).

Table 1.11. Verification activities included in Box 2.1 in Annex 2 of the GPG

Category	Activity	Performed
A. Checks	Check for discontinuities in emission trends from base year (usually 1990) to end year.	✓
B. Comparisons of emissions and other such features	Compare the Reference Approach for CO2 emissions from fuel combustion with other approaches.	✓
	Compare inventory emissions estimates by source category and gas against independently compiled national estimates from international databases.	x
	Compare activity data against independently compiled estimates and perhaps activity data from countries with similar source categories and sectors.	✓
	Compare (implied) emission factors for source categories and gases with independent estimates and estimates from countries with similar source categories and sectors.	✓
	Compare sector intensity estimates of selected source categories with estimates from other countries with similar source categories and sectors. If necessary, calculate emission intensity estimates based on international statistical compendia.	✓
C. Comparisons of uncertainties	Compare uncertainty estimates with those from reports of other countries and the IPCC default values.	x
D. On-site measurements	Perform direct source testing on key source categories, if possible.	x

1.6.3. Treatment of confidentiality issues

No data is reported as confidential in the national inventory with the exception of the fuel consumption for military purposes. The fuel consumption for military purposes is included in the total of the country, but emissions are not estimated separately.

1.7. General uncertainty evaluation

In order to evaluate the accuracy of an emissions inventory, an uncertainty analysis has to be carried out for both annual estimates of emissions and emissions trends over time.

Detailed explanation regarding the choice of the uncertainty values on the activity data and emission factors estimations is presented in Annex I. The uncertainty analysis for the Cyprus' GHG inventory is based on Tier 1 methodology described in the IPCC Good Practice Guidance and the LULUCF Good Practice Guidance, with 1990 as base year for CO_2, CH_4, and N_2O.

For the estimation of uncertainties per gas, a combination of the information provided by the IPCC and critical evaluation of information from indigenous sources was applied.

The uncertainty analysis was carried out without the LULUCF sector.[12]

Figure 1.4 presents the change in uncertainty estimates through during the period 1990-2014. The detailed results of the uncertainty analysis are presented in Annex I. The total uncertainty in 2014 inventory is 6.1% and the trend uncertainty 9.3%.

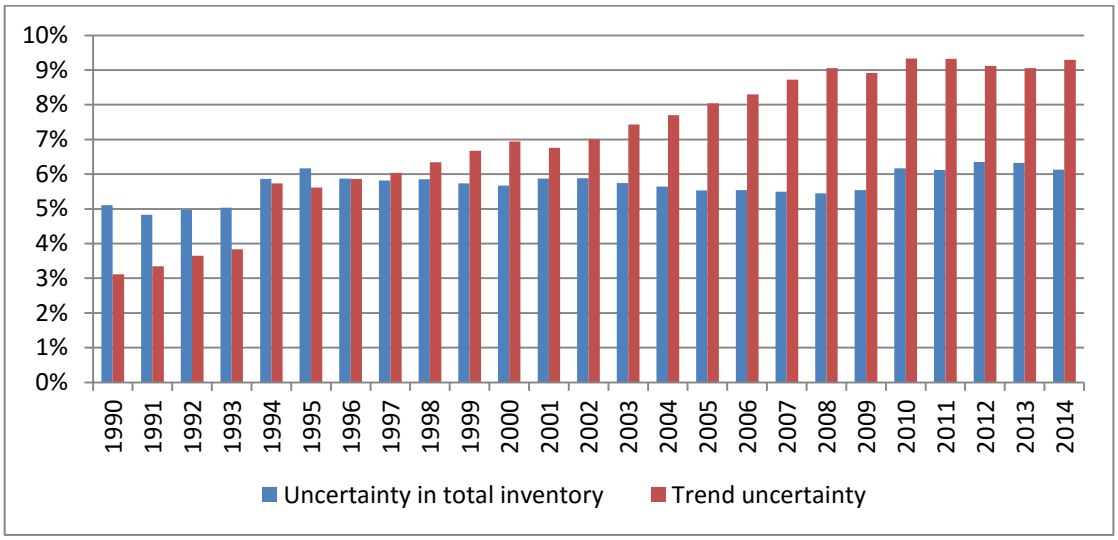

Figure 1.4. Uncertainty without LULUCF through during the period 1990-2014

1.8. General assessment of the completeness

In the present inventory report, estimates of GHG emissions in Cyprus for the years 1990-2014 are presented. Emissions estimates included in the CRF tables submitted and discussed in the present report, cover the areas of the Republic of Cyprus under the effective control of the Government of the Republic of Cyprus. All major sources are reported including emissions estimates for indirect greenhouse gases and SO_2.Completeness in the present inventory submission will be further discussed in the relevant chapters. Nevertheless, the main deficiencies are the following:

LULUCF: most important deficiency. Emissions for the LULUCF sector have never been fully reported. Available data has been collected for land uses and land use changes in Cyprus by utilizing the CORINE Land Cover data of 2000, 2006 and 2012 and the CORINE Land change data of 2006-2000 and 2012-2006, thus establishing the time series. Further work is however necessary to setup the complete methodologies to estimate the GHG emissions.

[12] As recommended by the UNFCCC review team in the "Provisional findings and recommendations" document for the National Inventory Report of 2013

Extensive work is going to take place during 2016, with support from the JRC. The goal is by the 2017 submission to have a full LULUCF and KP LULUCF GHG inventory in line with the 2006 IPCC guidelines, the IPCC "Good Practice Guidance for Land Use, Land Use Change and Forestry" and the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol.

Transport of oil (1.B.2.a.3), Distribution of oil products (1.B.2.a.5) and venting of oil (1.B.2.c.1.i): no data/method is available to estimate the emissions.

Use of notation keys: there are still some empty cells in the xml. Work is in progress to fill all the cells and use the correct notation keys.

Further details on deficiencies are provided in the appropriate chapter. A national inventory improvement plan is available and implemented.

1.9. Information on national registry

No issue, acquisition, holding, transfer, cancellation, retirement and carry-over of AAUs, RMUs, ERUs, CERs, tCERs and lCERs has been performed for the year X-1.

1.10. Use of Kyoto Protocol Mechanisms

Joint implementation, CDM and international emissions trading have not been used for the year X-2.

1.11. Additional information

The following elements are submitted as electronic attachments to the current report:

- xml file and crf tables generated by the CRFreporter,
- Reporting on uncertainty and completeness xlsx

Chapter 2: Trends in greenhouse gas emissions

2.1. Description and interpretation of emission trends for aggregated greenhouse gas emissions

The GHG emissions in 2014 were 7743 Gg CO2 eq. including LULUCF and 8394 Gg CO2 eq. excluding LULUCF. Between 1990 and 2014, the total national emissions excluding LULUCF increased by 49%.

Carbon dioxide emissions accounted for 82% of total GHG emissions in 2014 without LULUCF and increased by 47% from 1990. Methane emissions accounted for 10.3% of total GHG emissions in 2014 without LULUCF and increased by 30% since 1990, while nitrous oxide emissions accounted for 3.9% of the total GHG emissions in 2014 without LULUCF and increased by 6.7% since 1990. Finally, F-gases and SF6 emissions accounted for 3.8% of total GHG emissions in 2014.

The emissions by gas and sector are presented in Table 2.1. The GHG emissions in 2014 were 7743 Gg CO2 eq. including LULUCF and 8394 Gg CO2 eq. excluding LULUCF. Between 1990 and 2014, the total national emissions excluding LULUCF increased by 48.9%.

The emissions by gas and sector are presented in Table 2.1. The summary tables for each year of the inventory by gas and source as these were generated by CRF reporter v5.14.2 are presented in Annex II. Total emissions by sector are also presented in Figure 2.1.

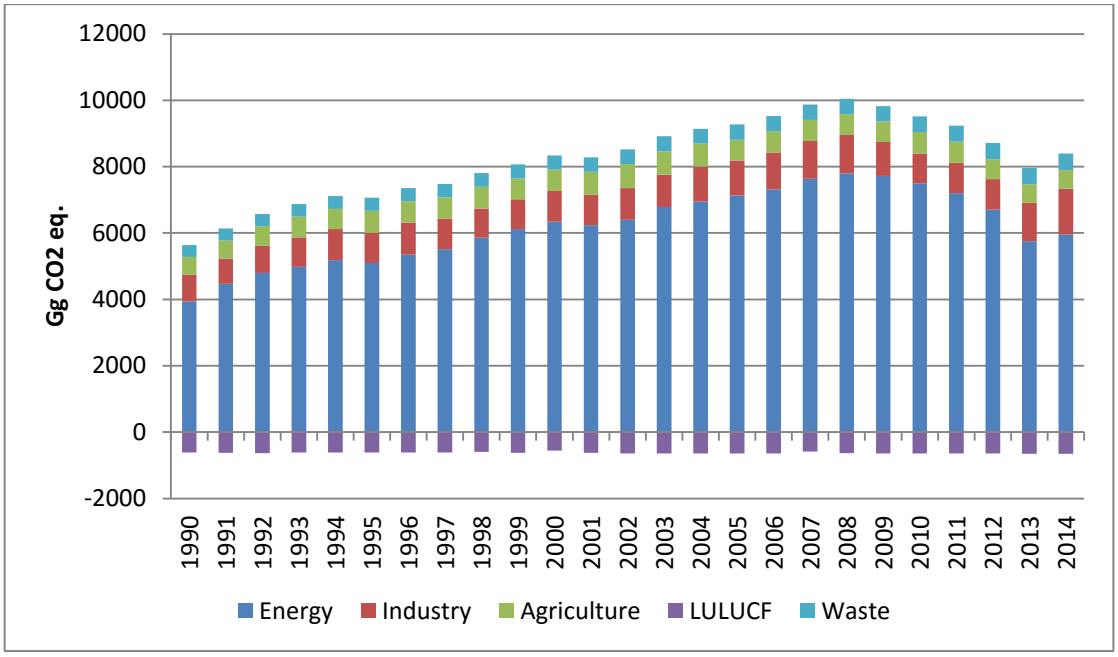

Figure E1. Total GHG emissions in Cyprus for the period 1990-2014, Gg CO2 eq.

Table 2.1. Total GHG emissions in Cyprus with and without LULUCF for the period 1990-2014, Gg CO2 eq.

Gg CO2 eq.	1990	1995	2000	2005	2010	2013	2014
CO2 emissions w/o net CO2 from LULUCF	4662.89	5892.12	7139.53	7961.70	8004.59	6449.42	6878.33
CO2 emissions w/ net CO2 from LULUCF	4049.35	5275.09	6571.05	7314.02	7363.28	5796.98	6226.45
CH4 emissions w/o CH4 from LULUCF	664.24	765.01	814.69	859.73	892.54	860.40	864.44
CH4 emissions w/ CH4 from LULUCF	664.28	765.34	820.39	859.89	893.28	860.63	864.69
N2O emissions w/o N2O from LULUCF	310.71	399.52	363.99	360.09	377.94	328.75	331.57
N2O emissions w/ N2O from LULUCF	310.74	399.74	367.75	360.19	378.43	328.90	331.73
HFCs	0.15	8.95	20.50	90.93	245.43	323.98	319.83
PFCs							
SF6	0.03	0.06	0.08	0.12	0.15	0.15	0.15
NF3							
Total (w/o LULUCF)	5638.01	7065.67	8338.78	9272.57	9520.65	7962.71	8394.32
Total (w/ LULUCF)	5024.54	6449.18	7779.77	8625.14	8880.58	7310.64	7742.85

1. Energy	3940.66	5093.38	6344.87	7128.69	7494.56	5750.89	5959.29
2. Industrial Processes	808.14	907.85	927.75	1057.77	908.75	1159.76	1375.2
3. Agriculture	564.31	707.13	657.5	652.02	661.97	576.81	578.77
4. LULUCF	-613.47	-616.49	-559.01	-647.43	-640.07	-652.07	-651.47
5. Waste	377.11	417.69	452.94	479.84	487.89	502.68	505.2
6. Other	NO	NO	NO	NO	NO	NO	NO
Total (w/o LULUCF)	5690.22	7126.06	8383.07	9318.32	9553.17	7990.14	8418.46
Total (w/ LULUCF)	5076.75	6509.56	7824.06	8670.89	8913.1	7338.07	7766.98

2.2. Description and interpretation of emission trends by category

GHG emissions trends by sector for the period 1990 - 2014 are presented in Table 2.2.

Table 2.2. Total national GHG emissions by sector 1990-2014

	Energy	Industry	Agriculture	LULUCF	Waste	Total (w/o LULUCF)	Total (w/ LULUCF)
1990	3941	807	536	-613	355	5638	5025
1991	4471	764	538	-620	361	6135	5516
1992	4798	817	588	-630	370	6574	5943
1993	4978	895	626	-617	378	6876	6259
1994	5187	933	612	-613	386	7118	6505
1995	5093	907	672	-616	393	7066	6449

	Energy	Industry	Agriculture	LULUCF	Waste	Total (w/o LULUCF)	Total (w/ LULUCF)
1996	5346	962	651	-614	398	7357	6743
1997	5512	930	637	-615	405	7484	6870
1998	5855	884	657	-591	413	7809	7218
1999	6118	896	635	-627	421	8070	7443
2000	6345	927	638	-559	428	8339	7780
2001	6237	912	697	-619	435	8281	7662
2002	6395	956	724	-648	442	8518	7870
2003	6786	973	709	-647	445	8913	8266
2004	6950	1055	688	-643	450	9143	8500
2005	7129	1055	630	-647	458	9273	8625
2006	7312	1119	645	-644	454	9529	8885
2007	7633	1135	646	-588	457	9871	9284
2008	7800	1161	623	-637	463	10046	9410
2009	7725	1018	618	-646	464	9825	9178
2010	7495	907	644	-640	476	9521	8881
2011	7202	919	633	-643	486	9240	8596
2012	6706	915	600	-644	492	8713	8069
2013	5751	1159	556	-652	496	7963	7311
2014	5959	1375	560	-651	500	8394	7743
Change 1990-2014	***51.2%***	***70.3%***	***4.5%***	***6.2%***	***41.1%***	***48.9%***	***54.1%***

2.2.1. Energy

The energy sector in Cyprus relies on fossil fuel combustion for meeting the bulk of energy requirements. Final consumption in 2014 amounted to approximately 78 PJ compared to 77 PJ in 2013 (1.5% increase). 97% of the consumption in 2014 was from liquid fuels, 0.1% from solid fuels and 0.5% from other fossil fuels. In comparison to 1990, total fuel consumption in 2014 including biomass increased by 50%. Natural gas is not available in Cyprus.

After robust growth rates in the 1980s (average annual growth was 6.1%), economic performance in the 1990s was mixed: real GDP growth was 9.7% in 1992, 1.7% in 1993, 6.0% in 1994, 6.0% in 1995, 1.9% in 1996 and 2.3% in 1997. This pattern underlined the economy's vulnerability to swings in tourist arrivals (i.e. to economic and political conditions in Cyprus, Western Europe, and the Middle East) and the need to diversify the economy. Declining competitiveness in tourism and especially in manufacturing are acting as a drag on growth until structural changes are in effect. This is greatly affecting the energy sector.

The emissions from the energy sector in Cyprus increased by 51% during the period 1990-2014. The greatest increase in emissions was between 1990 and 2008 (98%), the emissions reached their peak (7799 Gg CO2 eq.). All the emissions in 2014 are from fuel combustion. The contribution of the emissions from the energy sector to the total without LULUCF in 2014 was 71% compared to 64% in 1990.

Energy is mainly responsible for carbon dioxide emissions, while it contributes also to methane and nitrous oxide emissions. In 2014, 98.7% of the emissions from the energy sector were carbon dioxide, 0.3% methane and 1% nitrous oxide. Fugitive emissions from fuels have

not been estimated since 2004 when the refining activities stopped in Cyprus. The contribution of each source to the total of the energy sector is presented in Figure 2.2.

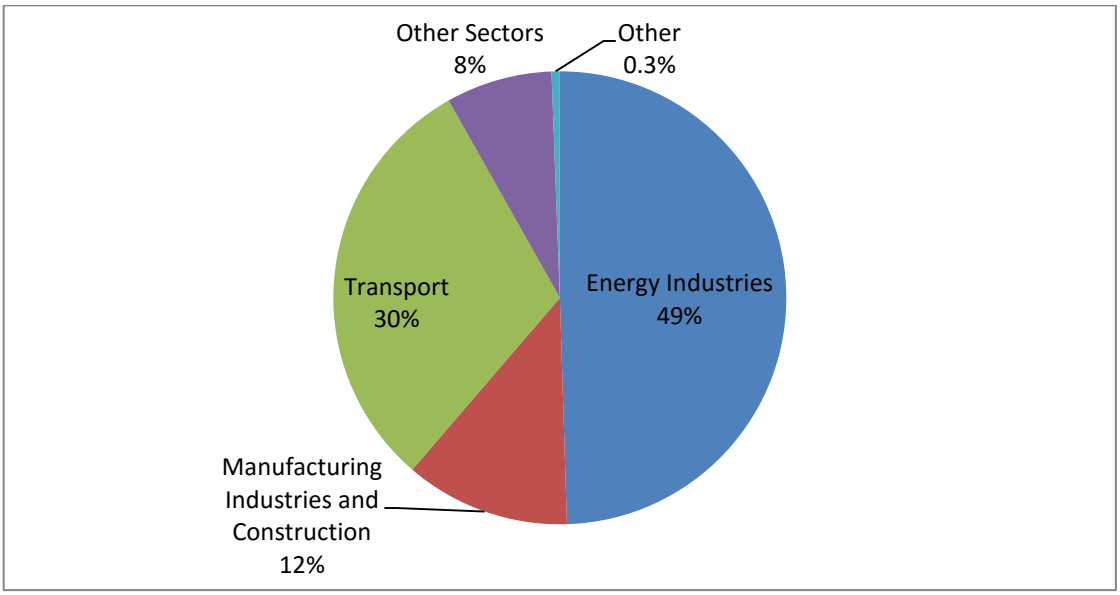

Figure 2.2. Contribution of the main energy sources of emissions to the total energy emissions in 2014

2.2.2. Industrial processes

In 2014, GHG emissions from Industrial processes accounted for 16.3% of total emissions excluding LULUCF compared to 14% in 1990. The emissions have increased by 70% compared to 1990. 71.7% of the industrial processes emissions are from mineral production, 23.3% is from consumption of Halocarbons and SF6, 4.3% is from Other Product Manufacture and Use and the remaining 0.7% is from non-energy products from fuels and solvent use.

2.2.3. Agriculture

Emissions from Agriculture accounted for 7% of total emissions in 2014 (without LULUCF), compared to 9.5% in 1990. Emissions increased by 4.5% compared to 1990. The peak of Agriculture emissions was in 2002 (724 Gg CO2 eq.) when an increase of 35% compared to 1990 was observed. Since 2002 a reduction in emissions was observed, due to the reduction of N_2O emissions from agricultural soils, because of the reduction in the use of synthetic nitrogen fertilisers. The reduction of the use of fertilisers was caused by the drought that was taking place during the same period that had an extreme in 2008. Further reduction was caused by the recent changes in manure management. Agriculture is responsible for mainly methane and nitrous oxide emissions. In 2014 agriculture has contributed 42% to the total methane emissions and 58% to the total nitrous oxide emissions. The contribution of the main agricultural sources of emissions to the total agriculture emissions in 2014 is presented in Figure 2.3.

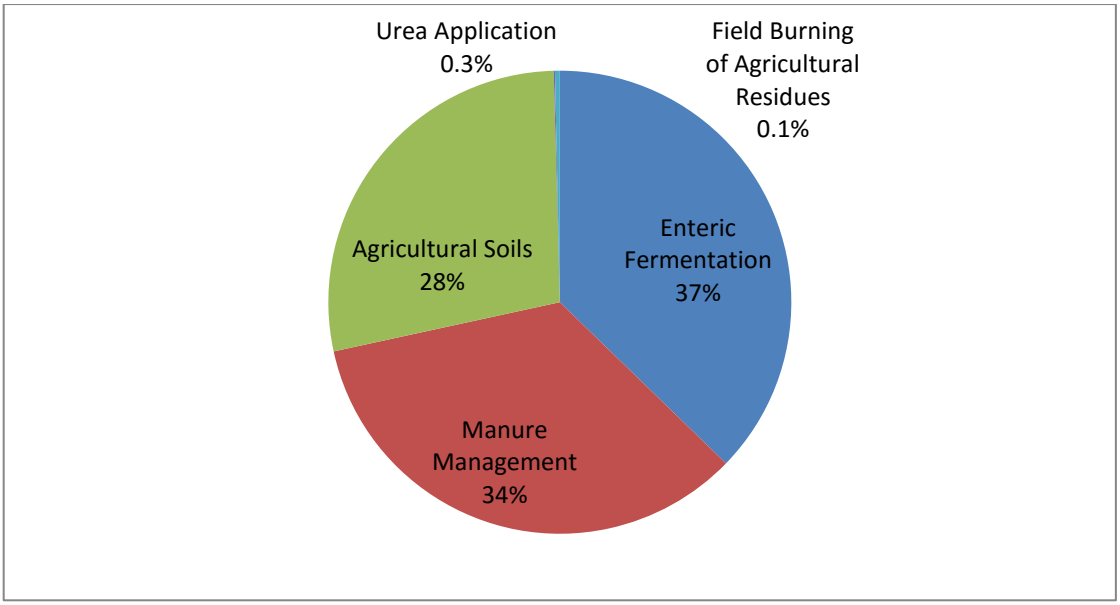

Figure 2.3. Contribution of the main agricultural sources of emissions to the total agriculture emissions in 2014

2.2.4. Land use, land use change and forestry

The emissions from LULUCF changed from about -613 Gg CO2 eq. in 1990 to -651 Gg CO2 in 2014. Overall the trend is one of increased removals from the LULUCF sector, with the exception of peaks in emissions in years with increased wildfires.

2.2.5. Waste

Emissions from the Waste Sector in 2014 contributed 6% of the total emissions without LULUCF. In 2014, 91% of the emissions is from solid waste disposal, 2% from biological treatment of solid waste and 7% from waste water treatment and discharge.55% of the total methane emissions and 6% of the nitrous oxide emissions of the country are from the sector of waste. The emissions from waste have changed considerably between 1990 and 2014 due to changes that are taking place in the waste and wastewater management practices of the country.

2.3. Description and interpretation of emission trends by gas

GHG emissions trends by gas for the period 1990 - 2014 are presented in Figure 2.4 and Table 2.3.

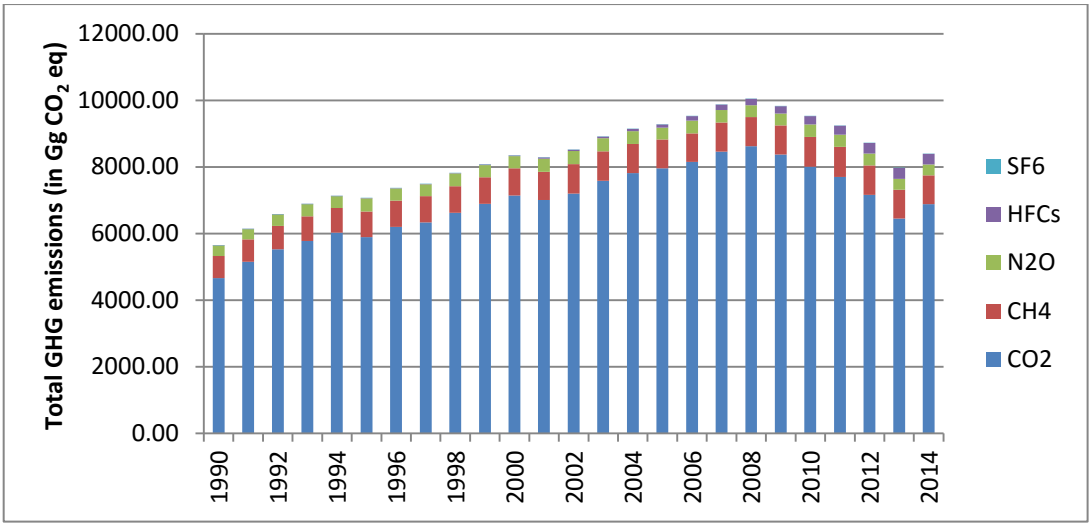

Figure 2.4. Total national GHG emissions by gas 1990-2014 (excluding LULUCF)

Table 2.3. Total national GHG emissions by gas 1990-2014

Gg CO2 eq.	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
CO2 w/o LULUCF	4663	5147	5524	5779	6022	5892	6202
CO2 w/ LULUCF	4049	4527	4893	5161	5408	5275	5587
CH4 w/o LULUCF	664	677	706	733	742	765	786
CH4 w LULUCF	664	678	706	733	743	765	786
N2O w/o LULUCF	311	311	343	364	353	400	366
N2O w LULUCF	311	311	344	364	353	400	366
HFCs	0.15	0.16	0.16	0.22	0.70	8.95	3.61
PFCs							
SF6	0.03	0.03	0.03	0.04	0.05	0.06	0.07
NF3							
Total (w/o LULUCF)	5638	6135	6574	6876	7118	7066	7357
Total (w/ LULUCF)	5025	5516	5943	6259	6505	6449	6743

Gg CO2 eq.	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
CO2 w/o LULUCF	6331	6621	6889	7140	7002	7193	7583
CO2 w/ LULUCF	5715	6026	6262	6571	6379	6545	6936
CH4 w/o LULUCF	793	798	800	815	853	886	882
CH4 w LULUCF	794	801	800	820	855	886	882
N2O w/o LULUCF	354	381	367	364	396	397	395
N2O w LULUCF	355	382	367	368	397	397	395
HFCs	6.09	9.38	14.2	20.5	31.0	41.3	52.8
PFCs							
SF6	0.07	0.07	0.07	0.08	0.08	0.08	0.09
NF3							
Total (w/o LULUCF)	7484	7809	8070	8339	8281	8518	8913
Total (w/ LULUCF)	6870	7218	7443	7780	7662	7870	8266

Gg CO2 eq.	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
CO2 w/o LULUCF	7811	7962	8152	8458	8620	8372	8005
CO2 w/ LULUCF	7167	7314	7507	7865	7983	7725	7363
CH4 w/o LULUCF	879	860	856	875	874	874	893
CH4 w LULUCF	880	860	857	878	874	874	893
N2O w/o LULUCF	386	360	377	370	359	358	378
N2O w LULUCF	387	360	378	372	359	358	378

HFCs	65.9	90.9	143	168	193	221	245
PFCs							
SF6	0.10	0.12	0.12	0.14	0.15	0.16	0.15
NF3							
Total (w/o LULUCF)	9143	9273	9529	9871	10046	9825	9521
Total (w/ LULUCF)	8500	8625	8885	9284	9410	9178	8881

Gg CO2 eq.	**2011**	**2012**	**2013**	**2014**			
CO2 w/o LULUCF	7696	7161	6449	6878			
CO2 w/ LULUCF	7052	6516	5797	6226			
CH4 w/o LULUCF	906	881	860	864			
CH4 w LULUCF	907	882	861	865			
N2O w/o LULUCF	363	356	329	332			
N2O w LULUCF	364	357	329	332			
HFCs	274	314	324	320			
PFCs							
SF6	0.15	0.16	0.15	0.15			
NF3							
Total (w/o LULUCF)	9240	8713	7963	8394			
Total (w/ LULUCF)	8596	8069	7311	7743			

2.3.1. Carbon dioxide

Carbon dioxide emissions from 1990 to 2014 by source category are presented in Table 2.5. Total CO2 emissions without LULUCF increased from 4,663 Gg in 1990 to 6,878 Gg in 2014. The increase of 47% from 1990 to 2014 is mainly attributed to the increased electricity production as well as to the increased energy consumption in the residential and transport sectors. The decrease of 20% from 2008 to 2014 is mainly attributed to economic crisis and the increasing share of renewable energy technologies.

CO2 emissions from Energy increase from 3,896 Gg in 1990 to 5,883 Gg in 2014, presenting a total increase of 51% from 1990 to 2014. Carbon dioxide emissions from Industrial processes in 2014 increased by 30% compared to 1990 (from 765 to 995 Gg CO2).

2.3.2. Methane

The methane emissions from 1990 to 2014 by source category are presented in Table 2.6. Total methane emissions without LULUCF in 2014 increased by 30% from 1990. Methane emissions from Agriculture in 2014 accounted for 42% of total methane emissions (without LULUCF). Methane emissions from Waste sector in 2014 account for 55% of the total CH4 emissions (excl. LULUCF). The energy sector accounts for the remaining 3% of the total methane emissions (without LULUCF).

2.3.3. Nitrous Oxide

Nitrous oxide emissions from 1990 to 2014 by source category are presented in Table 2.7. Total nitrous oxide emissions without LULUCF in 2014 increased by 30% from 1990. Agriculture represents the largest anthropogenic source of nitrous oxide emissions in Cyprus with 58% of the total nitrous oxide emissions in 2014, without LULUCF. N2O emissions from industrial processes account for 18% of the national total N2O without LULUCF. N2O emissions from Waste in 2014 (6.3% of total emissions without LULUCF) increased by 67% compared to 1990 levels. N2O emissions from Energy in 2014 account for 17.5%.

2.3.4. Halocarbons and sulphur hexafluoride

HFC and PFC are chemical substances, the production of which aims mainly to the substitution of ozone depleting substances (see Montreal Protocol – 1987). HFC and PFC are not harmful to the stratospheric ozone layer and thus their emissions are not controlled by the above-mentioned Protocol. However, many of these substances, as well as SF6, are powerful greenhouse gases. Apart from being characterized by a high Global Warming Potential (GWP), these gases have extremely long atmospheric lifetimes, resulting in their essentially irreversible accumulation in the atmosphere. Especially sulphur hexafluoride is the most potent greenhouse gas according to the IPCC evaluation.

HFC emissions increased significantly since 1990, mainly due to the increase of air conditioning equipment in the residential sector, the increasing trend of emissions from the commercial refrigeration and the introduction of new passenger cars with air-conditioning systems, but also due to the implementation of the Montreal Protocol, leading to an increase in the number of equipment operating with f-gases.

Table 2.4. Halocarbons and sulphur hexafluoride emissions for the period 1990-2014 in Gg CO2 eq.

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
HFC-134a (t)		0.003	0.05	1.08	1.99	2.35	2.32
HFC-227ea (t)		0.002	0.09	0.38	0.84	1.04	1.02
Unspecified mix of HFCs (t CO2 eq.)	145.6	8926	19637	88156	239897	317282	313214
Total (Gg CO2 eq.)	0.15	8.94	20.00	90.93	245.4	324.0	319.8
SF6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SF6 -(kt CO2 equivalent)	0.03	0.06	0.08	0.12	0.15	0.15	0.00

Table 2.5. CO2 emissions 1990-2014, Gg

	1990	1995	2000	2005	2010	2013	2014	% change 1990-2014
1. Energy	**3895.60**	**5038.75**	**6280.25**	**7048.90**	**7402.01**	**5674.01**	**5882.96**	**51.02**
A. Fuel combustion (sectoral approach)	3895.60	5038.75	6280.25	7048.90	7402.01	5674.01	5882.96	51.02
1. Energy industries	1761.49	2166.14	2954.60	3471.84	3868.00	2829.73	2940.32	66.92
2. Manufacturing industries and construction	512.20	770.90	818.73	908.28	697.26	509.32	699.67	36.60
3. Transport	1180.52	1482.01	1760.10	2045.15	2253.25	1808.42	1761.20	49.19
4. Other sectors	430.40	602.54	725.39	604.60	563.22	503.10	446.78	3.81
5. Other	11.00	17.17	21.43	19.03	20.29	23.44	34.98	218.17
2. Industrial processes	**765.48**	**851.83**	**857.60**	**911.84**	**601.84**	**774.62**	**994.97**	**29.98**
A. Mineral industry	759.18	838.76	846.54	894.20	584.65	765.12	985.70	29.84
D. Non-energy products from fuels and solvent use	6.24	13.06	10.90	17.59	17.16	9.47	9.26	48.41
G. Other product manufacture and use	0.06	0.02	0.16	0.04	0.03	0.02	0.01	-84.40
3. Agriculture	**1.82**	**1.54**	**1.67**	**0.97**	**0.74**	**0.79**	**0.41**	**-77.58**
H. Urea application	1.82	1.54	1.67	0.97	0.74	0.79	0.41	-77.58
4. Land use, land-use change and forestry [(2)]	**-613.54**	**-617.03**	**-568.48**	**-647.69**	**-641.30**	**-652.44**	**-651.88**	**6.25**
A. Forest land	-613.54	-617.03	-568.48	-647.69	-641.30	-652.44	-651.88	6.25
Memo items:								
International bunkers	**915.95**	**1024.37**	**1439.04**	**1762.63**	**1423.68**	**1531.23**	**1509.74**	**64.83**
Aviation	733.16	807.72	832.57	845.58	835.79	775.83	776.41	5.90
Navigation	182.79	216.65	606.47	917.05	587.89	755.40	733.33	301.19
CO_2 emissions from biomass	**17.95**	**33.26**	**29.16**	**44.12**	**142.57**	**142.60**	**144.83**	**706.80**
Total CO_2 w/o LULUCF	**4662.89**	**5892.12**	**7139.53**	**7961.70**	**8004.59**	**6449.42**	**6878.33**	**47.51**
Total CO_2 w/ LULUCF	**4049.35**	**5275.09**	**6571.05**	**7314.02**	**7363.28**	**5796.98**	**6226.45**	**53.76**

Table 2.6. CH4 emissions 1990-2014, Gg

	1990	1995	2000	2005	2010	2013	2014	% change 1990-2014
1. Energy	**0.42**	**0.51**	**0.59**	**0.74**	**0.86**	**0.74**	**0.74**	**74.83**
A. Fuel combustion (sectoral approach)	0.42	0.51	0.59	0.74	0.86	0.74	0.74	74.84
1.Energy industries	0.07	0.08	0.11	0.14	0.15	0.11	0.11	65.64
2.Manufacturing industries and construction	0.04	0.03	0.04	0.05	0.05	0.02	0.04	25.98
3.Transport	0.22	0.25	0.29	0.39	0.49	0.43	0.42	93.12
4.Other sectors	0.10	0.14	0.14	0.15	0.17	0.17	0.16	56.95
5.Other	0.001	0.002	0.003	0.01	0.01	0.01	0.005	220.95
B. Fugitive emissions from fuels	0.0000025	0.0000032	0.0000046	NO,NE	NO,NE	NO,NE	NE,NO	
2.Oil and natural gas and other emissions from energy production	0.0000025	0.0000032	0.0000046	NO,NE	NO,NE	NO,NE	NE,NO	
3. Agriculture	**12.46**	**14.94**	**15.44**	**15.89**	**16.55**	**14.64**	**14.66**	**17.71**
A.Enteric fermentation	7.99	9.01	9.10	9.27	9.55	9.11	9.32	16.74
B.Manure management	4.46	5.92	6.33	6.61	6.99	5.52	5.33	19.67
F.Field burning of agricultural residues	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-52.17
4. Land use, land-use change and forestry	**0.002**	**0.01**	**0.23**	**0.01**	**0.03**	**0.01**	**0.01**	**482.14**
A.Forest land	0.002	0.01	0.23	0.01	0.03	0.01	0.01	482.14
5. Waste	**13.69**	**15.15**	**16.56**	**17.76**	**18.29**	**19.04**	**19.18**	**40.07**
A.Solid waste disposal	10.05	11.15	12.59	14.25	16.18	17.80	18.22	81.39
B. Biological treatment of solid waste	NO	NO	NO	NO	0.11	0.20	0.26	
D.Waste water treatment and discharge	3.64	4.00	3.96	3.52	2.00	1.04	0.69	-80.96
Total CH_4 w/o LULUCF	**26.57**	**30.60**	**32.59**	**34.39**	**35.70**	**34.42**	**34.58**	**30.14**
Total CH_4 w/ LULUCF	**26.57**	**30.61**	**32.82**	**34.40**	**35.73**	**34.43**	**34.59**	**30.17**
Memo items:								
International bunkers	**0.019**	**0.023**	**0.055**	**0.081**	**0.053**	**0.064**	**0.062**	**230.95**
Aviation	0.005	0.006	0.006	0.006	0.006	0.005	0.005	5.85
Navigation	0.014	0.018	0.049	0.075	0.047	0.058	0.057	315.62

Table 2.7. N2O emissions 1990-2014, Gg

	1990	1995	2000	2005	2010	2013	2014	% change 1990-2014
1. Energy	**0.12**	**0.14**	**0.17**	**0.21**	**0.24**	**0.20**	**0.19**	**68.31**
A. Fuel combustion (sectoral approach)	0.12	0.14	0.17	0.21	0.24	0.20	0.19	68.31
1.Energy industries	0.013	0.016	0.022	0.027	0.030	0.022	0.023	72.16
2.Manufacturing industries and construction	0.006	0.006	0.007	0.009	0.008	0.004	0.007	26.50
3.Transport	0.09	0.11	0.13	0.17	0.20	0.17	0.16	72.30
4.Other sectors	0.003	0.005	0.006	0.005	0.004	0.004	0.004	8.81
5.Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	225.84
2. Industrial processes	**0.14**	**0.16**	**0.16**	**0.18**	**0.20**	**0.20**	**0.20**	**44.37**
G.Other product manufacture and use	0.14	0.16	0.16	0.18	0.20	0.20	0.20	44.37
3. Agriculture	**0.75**	**1.00**	**0.84**	**0.78**	**0.77**	**0.64**	**0.65**	**-13.34**
B.Manure management	0.24	0.29	0.32	0.30	0.27	0.23	0.24	0.33
D.Agricultural soils	0.50	0.71	0.52	0.48	0.49	0.41	0.40	-19.92
F.Field burning of agricultural residues	0.0004	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002	-52.78
4. Land use, land-use change and forestry	**0.0001**	**0.0007**	**0.0126**	**0.0003**	**0.0016**	**0.0005**	**0.0005**	**482.14**
A.Forest land	0.0001	0.0007	0.0126	0.0003	0.0016	0.0005	0.0005	482.14
5. Waste	**0.04**	**0.05**	**0.05**	**0.05**	**0.06**	**0.07**	**0.07**	**70.51**
B. Biological treatment of solid waste	NO	NO	NO	NO	0.01	0.01	0.02	
D. Waste water treatment and discharge	0.04	0.05	0.05	0.05	0.06	0.06	0.05	32.72
Total direct N_2O emissions w/o LULUCF	**1.04**	**1.34**	**1.22**	**1.21**	**1.27**	**1.10**	**1.11**	**6.72**
Total direct N_2O emissions w/ LULUCF	**1.04**	**1.34**	**1.23**	**1.21**	**1.27**	**1.10**	**1.11**	**6.76**
Memo items:								
International bunkers	**0.028**	**0.029**	**0.043**	**0.053**	**0.046**	**0.048**	**0.034**	**21.2**
Aviation	0.021	0.023	0.023	0.024	0.023	0.022	0.022	5.9
Navigation	0.008	0.007	0.020	0.029	0.023	0.027	0.012	62.6

2.4. Description and interpretation of emission trends for indirect greenhouse gases and SO2

The role of carbon monoxide (CO), nitrogen oxides (NOx) and non-methane organic volatile compounds (NMVOC) is important for climate change as these gases act as precursors of tropospheric ozone. In this way, they contribute to ozone formation and alter the atmospheric lifetimes of other greenhouse gases. For example, CO interacts with the hydroxyl radical (OH), the major atmospheric sink for methane, to form carbon dioxide. Therefore, increased atmospheric concentration of CO limits the number of OH compounds available to destroy methane, thus increasing the atmospheric lifetime of methane.

These gases are generated through a variety of anthropogenic activities. Emissions for indirect greenhouse gases and SO2 are presented in Table 2.8. The emissions (except LULUCF) have been estimated by the Department of Labour Inspection that is the competent authority for the preparation of air pollutants inventories under Directive 2001/81/EC.

2.5. Description and interpretation of emission trends for KP-LULUCF inventory in aggregate and by activity, and by gas

Please refer to Chapter 9.

Table 2.8. Indirect greenhouse gases and SO2 emissions for the period 1990-2014 in Gg

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**						
Energy														
NOx	15.97	16.11	17.95	18.34	19.48	19.48	18.77	19.05	19.47	21.57	22.86	20.30	20.45	20.80
CO	NE,NO,IE	NE,NO,IE	NE,NO,IE	NE,NO,IE	NE,NO,IE	NE,NO,IE	NE,NO,IE	NE,NO,IE	NE,NO,IE	0.05	0.05	0.05	NE,NO,IE	NE,NO,IE
NMVOC	11.48	10.95	11.14	10.96	10.98	10.98	10.28	10.07	9.47	8.99	8.43	8.06	7.48	7.37
SO2	31.30	32.58	37.42	39.59	42.11	42.11	41.17	43.30	46.59	50.67	47.95	44.99	45.29	46.77
Industrial processes														
NOx	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	0.07	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO
CO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO
NMVOC	2.36	2.05	2.14	2.15	2.35	2.35	2.06	2.21	2.10	2.11	2.30	2.20	2.94	3.51
SO2	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO	NE,NA,NO
Agriculture														
NOx	0.65	0.65	0.80	0.68	0.66	0.66	0.64	0.52	0.45	0.47	0.46	0.50	0.41	0.33
CO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
NMVOC	1.54	1.52	1.58	1.75	1.77	1.77	1.90	1.85	1.80	1.77	1.77	1.82	1.92	1.93
SO2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
LULUCF														
NOx	NO	NO	NO	NO	NO	NO	NO	NO	0.45	0.47	0.46	0.50	0.41	0.33
CO	NO	NO	NO	NO	NO	NO	NO	NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
NMVOC	NO	NO	NO	NO	NO	NO	NO	NO	1.80	1.77	1.77	1.82	1.92	1.93
SO2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Waste														
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
CO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NE,NO,IE	1.80	1.77	1.77	1.82	1.92	1.93
NMVOC	0.54	0.56	0.57	0.59	0.61	0.61	0.62	0.63	NO	NO	NO	NO	NO	NO
SO2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.45	0.47	0.46	0.50	0.41	0.33
Total including LULUCF														
NOx	**16.62**	**16.76**	**18.75**	**19.03**	**20.14**	**20.14**	**19.42**	**19.58**	**19.92**	**22.12**	**23.33**	**20.81**	**20.86**	**21.14**
CO	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**NA,NO,IE**	**0.00**	**0.05**	**0.05**	**0.05**	**0.00**	**0.00**
NMVOC	**15.91**	**15.07**	**15.43**	**15.45**	**15.71**	**15.71**	**14.86**	**14.86**	**14.02**	**13.53**	**13.17**	**12.78**	**13.05**	**13.54**
SO2	**31.31**	**32.59**	**37.43**	**39.60**	**42.12**	**42.12**	**41.18**	**43.31**	**46.59**	**50.68**	**47.97**	**45.00**	**45.30**	**46.78**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014			
Energy														
NOx	20.28	20.18	20.09	20.58	19.26	18.92	17.41	20.34	20.36	15.25	16.33			
CO	NE,NO,IE	NE,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE			
NMVOC	6.13	5.47	4.46	4.67	4.45	4.01	3.77	3.55	3.38	2.84	2.62			
SO2	40.06	37.81	31.41	29.37	22.37	17.69	21.86	20.86	16.17	13.70	16.74			
Industrial processes														
NOx	20.28	20.18	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE			
CO	NE,NO,IE	NE,NO,IE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE			
NMVOC	6.13	5.47	5.27	4.92	3.98	3.70	4.10	2.25	2.22	1.90	1.83			
SO2	40.06	37.81	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE	NO,NA,NE			
Agriculture														
NOx	NE,NO,IE	NE,NO,IE	0.34	0.31	0.24	0.20	0.25	0.18	0.20	0.19	0.16			
CO	6.13	5.47	NE.NO	NE.NO	NE.NO	NE.NO	NE.NO	NE.NO	NE.NO	NE.NO	NE.NO			
NMVOC	40.06	37.81	1.68	1.66	1.65	1.59	1.60	1.60	1.56	1.49	1.56			
SO2	20.28	20.18	NO	NO	NO	NO	NO	NO	NO	NO	NO			
LULUCF				LULUCF										
NOx	20.28	20.18	NO	NO	NO	NO	NO	NO	NO	NO	NO			
CO	NE,NO,IE	NE,NO,IE	NO	NO	NO	NO	NO	NO	NO	NO	NO			
NMVOC	6.13	5.47	NO	NO	NO	NO	NO	NO	NO	NO	NO			
SO2	40.06	37.81	NO	NO	NO	NO	NO	NO	NO	NO	NO			
Waste														
NOx	NE,NO,IE	NE,NO,IE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
CO	6.13	5.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NE.IE			
NMVOC	40.06	37.81	0.79	0.81	0.84	0.85	0.77	0.73	0.71	0.67	0.62			
SO2	20.28	20.18	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00			
Total including LULUCF														
NOx	6.13	5.47	**20.44**	**20.90**	**19.51**	**19.12**	**17.67**	**20.53**	**20.56**	**15.44**	**16.49**			
CO	40.06	37.81	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**NA.NO,IE**			
NMVOC	20.28	20.18	**12.20**	**12.06**	**10.93**	**10.15**	10.24	**8.13**	**7.87**	**6.89**	**6.63**			
SO2	NE,NO,IE	NE,NO,IE	**31.42**	**29.37**	**22.38**	**17.69**	**21.87**	**20.87**	**16.17**	**13.71**	**16.74**			

Chapter 3: Energy (CRF source category sector 1)

3.1. Overview of sector

Carbon dioxide (CO_2) emissions from stationary combustion result from the release of the carbon in fuel during combustion. CO_2 emissions depend on the carbon content of the fuel. During the combustion process, most carbon is emitted as CO_2 immediately. However, some carbon is released as carbon monoxide (CO), methane (CH_4) or non-methane volatile organic compounds (NMVOCs), all of which oxidise to CO_2 in the atmosphere within a period of a few days to about 12 years. The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines) account for all the released carbon as CO_2 emissions. Unoxidised carbon, in the form of particulate matter, soot or ash, is excluded from greenhouse gas emissions totals.

3.1.1. Emissions trends

The energy sector in Cyprus relies on fossil fuel combustion for meeting the bulk of energy requirements. Final consumption in 2014 amounted to approximately 78 PJ compared to 77 PJ in 2013 (1.5% increase). 97% of the consumption in 2014 was from liquid fuels, 0.1% from solid fuels and 0.5% from other fossil fuels. In comparison to 1990, total fuel consumption in 2014 including biomass increased by 50%. Natural gas is not available in Cyprus.

After robust growth rates in the 1980s (average annual growth was 6.1%), economic performance in the 1990s was mixed: real GDP growth was 9.7% in 1992, 1.7% in 1993, 6.0% in 1994, 6.0% in 1995, 1.9% in 1996 and 2.3% in 1997. This pattern underlined the economy's vulnerability to swings in tourist arrivals (i.e. to economic and political conditions in Cyprus, Western Europe, and the Middle East) and the need to diversify the economy. Declining competitiveness in tourism and especially in manufacturing are acting as a drag on growth until structural changes are in effect. This is greatly affecting the energy sector.

The emissions from the energy sector in Cyprus increased by 51% during the period 1990-2014. The greatest increase in emissions was between 1990 and 2008 (98%), the emissions reached their peak (7800Gg CO2 eq.). All the emissions in 2014 are from fuel combustion. The contribution of the emissions from the energy sector to the total without LULUCF in 2014 was 71% compared to 64% in 1990.

Energy is mainly responsible for carbon dioxide emissions, while it contributes also to methane and nitrous oxide emissions. In 2014, 98.7% of the emissions from the energy sector were carbon dioxide, 0.3% methane and 1% nitrous oxide (Table 3.1). Fugitive emissions from fuels have not been estimated since 2004 when the refining activities stopped in Cyprus. The contribution of each source to the total of the energy sector is presented in Table 3.1.

Table 3.1. Emissions from the energy sector 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 (Gg)	3,896	5,039	6,280	7,049	7,402	5,674	5,883
CH4 (Gg)	0.42	0.51	0.59	0.74	0.86	0.74	0.74
N2O (Gg)	0.12	0.14	0.17	0.21	0.24	0.20	0.19
Total (Gg CO2 eq.)	3,941	5,093	6,345	7,129	7,495	5,751	5,959

3.1.2. Methodology

There are three methods provided in the IPCC Guidelines: two Tier 1 approaches (the 'Reference Approach' and the 'Sectoral Approach') and the Tier 2/Tier 3 approach (a detailed technology-based method, also called 'bottom-up' approach). For the Tier 1 Sectoral Approach, total CO_2 is summed across all fuels (excluding biomass) and all sectors. For Tiers 2 and 3, the Detailed Technology-Based Approach, total CO_2 is summed across all fuels and sectors, plus combustion technologies (e.g. stationary and mobile sources). Both approaches provide more disaggregated emission estimates, but also require more data. For the estimation of emissions for Cyprus, the two Tier 1 approaches i.e. the 'Reference Approach' and the 'Sectoral Approach'. The sectoral approach is presented in this chapter. The reference approach is presented in details in Section 3.2.8. A comparison of the results of the two approaches is presented in Section 3.2.9.

The calculation of GHG emissions from energy is based on the IPCC 2006 Guidelines. Where data is available for installations included in the Emissions Trading System of the EU, emission factors have been reported as country or plant specific. The methodologies applied for the calculation of emissions by source category is presented in Table 3.2.

Table 3.2. Methodology for the estimation of emissions from energy

	CO_2		CH_4		N_2O	
	Method	**EF**	**Method**	**EF**	**Method**	**EF**
1AA FUEL COMBUSTION						
1A1Energy industries						
1A1a Public electricity	CS	CS	T1	D	T1	D
1A1b Petroleum refining	T1	D	T1	D	T1	D
1A2 Manufacturing Industries and Construction						
1A2b Non - ferrous metals	T1	D	T1	D	T1	D
1A2c Chemicals	T1	D	T1	D	T1	D
1A2d Pulp, Paper and Print	T1	D	T1	D	T1	D
1A2e Food processing, beverages and tobacco	T1	D	T1	D	T1	D
1A2f Non-metallic Minerals – Liquid fuels	CS	CS	T1	D	T1	D
1A2f Non-metallic Minerals – Solid fuels	CS	CS	T1	D	T1	D
1A2f Non-metallic Minerals – Other fossil fuels	T1	D	T1	D	T1	D
1A2f Non-metallic Minerals – Biomass	T1	D	T1	D	T1	D
1A2i Mining (excluding fuels) and Quarrying	T1	D	T1	D	T1	D
1A2k Construction	T1	D	T1	D	T1	D
1A2m Non-specified Industry	T1	D	T1	D	T1	D
1A3 Transport						

	CO_2		CH_4		N_2O	
	Method	**EF**	**Method**	**EF**	**Method**	**EF**
1A3aiiDomestic aviation	T1	D	T1	D	T1	D
1A3b Road Transportation	T1	D	T1	D	T1	D
1A3d ii Domestic water-borne navigation	T1	D	T1	D	T1	D
1A4 Other Sectors						
1A4a Commercial/ Institutional – stationary combustion	T1	D	T1	D	T1	D
1A4b Residential	T1	D	T1	D	T1	D
1A4ci Agriculture/ Forestry/ Fisheries - stationary	T1	D	T1	D	T1	D
1A4ciii Agriculture/ Forestry/ Fisheries - Fishing (mobile combustion)	T1	D	T1	D	T1	D
1A5 Other						
1A5a Stationary - Other	T1	D	T1	D	T1	D
1B FUGITIVE EMISSIONS FROM FUELS						
1B2 Oil and Natural Gas and Other Emissions from Energy Production	NA	NA	T1	D	NA	NA

T1: IPCC methodology Tier 1; D: IPCC default methodology and emission factor; CS: Country specific emission factor; PS: Plant specific emission factor; OTH: Other; NA: not available

Key categories

The results of the key categories assessment are presented in Section 1.5.

Uncertainty

The uncertainty analysis is presented in Section 1.7.

3.1.3. Completeness

The emissions from energy are complete.

3.2. Fuel combustion (CRF source category 1A)

3.2.1. Source category description

The emissions from the fuel combustion in Cyprus increased by 51.2% during the period 1990-2014. The greatest increase in emissions was between 1990 and 2008 (98%), the emissions reached their peak (7799 Gg CO2 eq.). The majority of energy related GHG emissions (49.5%) in 2014 was derived from energy industries, while transport contributed 30.5%, manufacturing industries and construction 11.8%, other sectors 7.6% and other 0.6% respectively.

The substantial increase of GHG emissions from road transport (51% between 1990 and 2014) is directly linked to the increase of vehicles fleet but also to the increase of transportation activity. The renewal of the passenger car fleet and the implied improvement of energy efficiency, limit the increase of GHG emissions. The implemented, adopted and

planned measures for the improvement of public transport are expected to moderate the high use of passenger cars.

Energy is mainly responsible for carbon dioxide emissions, while it contributes also to methane and nitrous oxide emissions. In 2014, 98.72% of the emissions from the energy sector were carbon dioxide, 0.31% methane and 0.97% nitrous oxide (Table 3.3). The contribution of each source to the total of the sector is presented in Table 3.3. The trend of the emissions from fuel consumption (1A) is presented in Figure 3.1.

Table 3.3. Emissions from the energy sector 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 (Gg)	3,896	5,039	6,280	7,049	7,402	5,674	5,883
CH4 (Gg)	0.42	0.51	0.59	0.74	0.86	0.74	0.74
N2O (Gg)	0.12	0.14	0.17	0.21	0.24	0.20	0.19
Total (Gg CO2 eq.)	3,941	5,093	6,345	7,129	7,495	5,751	5,959
Gg CO2 eq.							
1A1. Energy industries	1767	2173	2964	3483	3881	2839	2950
1A2. Manufacturing and construction	515	774	822	912	701	511	702
1A3. Transport	1214	1522	1807	2104	2324	1869	1820
1A4. Other sectors	434	608	731	610	569	509	451
1A5. Other (not elsewhere specified)	11.06	17.27	21.55	19.23	20.49	23.66	35.19

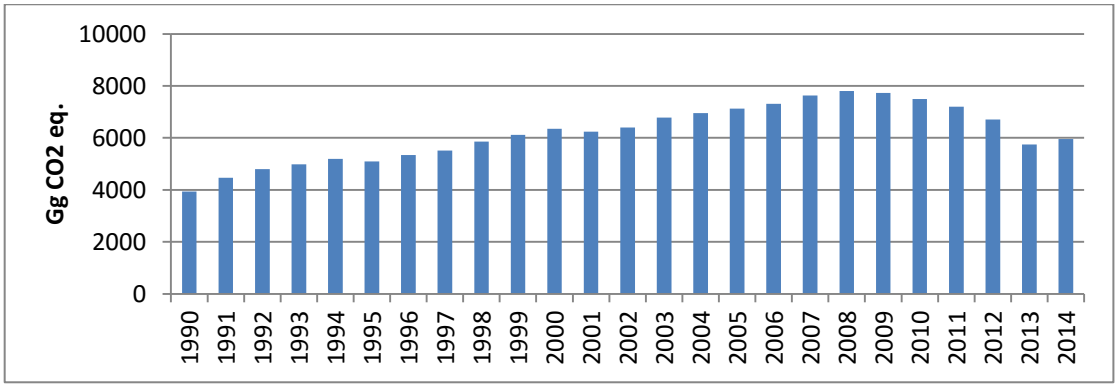

Figure 3.1. Fuel combustion (1A) emissions 1990-2014

3.2.2. Methodological issues

Emission factors

The emission factors used are predominately the defaults proposed by the IPCC guidelines. Further details on the emission factor are provided in the methodological issues Section of each source.

Activity data

The fuel consumption data published by the National Statistical Service in 2015 for the period 1990-2014are presented in Table 3.4. In green are sectors/consumers that have been added for the first time in 2014 and in red are the revisions.

Table 3.4. Fuel consumption according to the National Energy balance 2014in kt (1990-2014)

(a) 1990-1996

CYSTAT: ENERGY BALANCE 2014	1990	1991	1992	1993	1994	1995	1996
Refinery gas							
Refinery fuel	18	17	17	13	24	13	12
LPG							
Non-ferrous metals							
Non-metallic minerals							
Food, beverages and tobacco							
Not elsewhere specified (Industry)							
Commercial and public services							
Residential	49	49	55	51	50	51	51
Agriculture/forestry							
Non-biogasoline = GASOLINE							
Road	163	170	172	169	180	183	186
Non-bio jet kerosene = JET-KEROSENE							
International aviation	236	280	272	231	237	260	249
Not elsewhere specified (Other)							
Other kerosene							
Residential	12	12	17	16	17	17	18
Oil and gas extraction							
Not elsewhere specified (Industry)							
Biodiesels							
Road							
Non-bio gas/diesel oil = DIESEL							
International marine bunkers	24	20	21	14	12	15	25
Main activity producer electricity plants			11	3	2	8	6
Autoproducer electricity plants							
Road	210	202	246	255	261	285	298
Chemical and petrochemical							
Non-ferrous metals							
Non-metallic minerals							
Mining and Quarrying							
Food, beverages and tobacco							
Construction							
Not elsewhere specified (Industry)	98	109	132	137	141	153	161
Commercial and public services							
Residential							
Agriculture/forestry							
Fishing							
Not elsewhere specified (Other)							
Total fuel oil							
International marine bunkers	34	36	38	36	50	54	65
Refinery fuel	11	12	13	13	14	17	16
Main activity producer electricity plants	540	561	645	697	727	662	703
Autoproducer electricity plants							
Autoproducer CHP Plants							
Non-metallic minerals	37	124	118	100	110	97	111
Food, beverages and tobacco							
Paper, pulp and printing							
Not elsewhere specified (Industry)							
Commercial and public services							
White spirit and SPB							
Not elsewhere specified (Industry)				1		1	1
Lubricants							
International marine bunkers							1
Non-energy use: Road				6	8	8	9

CYSTAT: ENERGY BALANCE 2014	1990	1991	1992	1993	1994	1995	1996
Refinery gas							
Refinery fuel	18	17	17	13	24	13	12
LPG							
Non-ferrous metals							
Non-metallic minerals							
Food, beverages and tobacco							
Not elsewhere specified (Industry)							
Commercial and public services							
Residential	49	49	55	51	50	51	51
Agriculture/forestry							
Non-biogasoline = GASOLINE							
Road	163	170	172	169	180	183	186
Non-bio jet kerosene = JET-KEROSENE							
International aviation	236	280	272	231	237	260	249
Not elsewhere specified (Other)							
Other kerosene							
Non-energy use: Not elsewhere specified (Industry)				2	3	3	3
Bitumen							
Construction							
Non-energy use: Not elsewhere specified (Industry)	33	23	50	59	57	54	57
Pet-coke							
Non-metallic minerals		93	85	114	112	125	147
Other products (liquid)							
Refinery fuel							
Not elsewhere specified (Industry)	40	5					
Bituminous Coal							
Non-metallic minerals	97	97	26	31	27	20	18
Lignite							
Not elsewhere specified (Other)	0	0	0	0	0	0	0
Industrial waste (non-renewable) (TJ)							
Non-metallic minerals	0	0	0	0	0	0	0
RENEWABLES							
Solid biomass							
Charcoal production plants (Transformation)	112	112	112	112	405	388	328
Chemical and petrochemical							
Non-metallic minerals							
Food, beverages and tobacco							
Commercial and public services							
Residential							
Agriculture/Forestry							
Not elsewhere specified (Other)	145	120	118	117	85	91	136
Charcoal (kt)							
Commercial and public services							
Residential							
Not elsewhere specified (Other)	1	1	1	1	2	7	7
Biogases (TJ)							
Main activity producer CHP plants							
Autoproducer CHP plants							
Commercial and public services							
Agriculture/Forestry							

(b) 1997-2003

CYSTAT: ENERGY BALANCE 2014	1997	1998	1999	2000	2001	2002	2003
Refinery gas							
Refinery fuel	16	16	20	19	19	21	21
LPG							
Non-ferrous metals							
Non-metallic minerals							
Food, beverages and tobacco							
Not elsewhere specified (Industry)							
Commercial and public services							
Residential	52	50	49	53	53	54	58
Agriculture/forestry							
Non-biogasoline = GASOLINE							
Road	191	195	203	206	219	228	252
Non-bio jet kerosene = JET-KEROSENE							
International aviation	245	258	264	268	314	302	323
Not elsewhere specified (Other)							
Other kerosene							
Residential	20	21	20	24	24	31	31
Oil and gas extraction							
Not elsewhere specified (Industry)							
Biodiesels							
Road							
Non-bio gas/diesel oil = DIESEL							
International marine bunkers	27	35	46	50	47	33	36
Main activity producer electricity plants	6	12	21	19	4	2	5
Autoproducer electricity plants							
Road	314	334	340	350	355	341	351
Chemical and petrochemical							
Non-ferrous metals							
Non-metallic minerals							
Mining and Quarrying							
Food, beverages and tobacco							
Construction							
Not elsewhere specified (Industry)	169	180	185	191	193	185	190
Commercial and public services							
Residential							
Agriculture/forestry							
Fishing							
Not elsewhere specified (Other)							
Total fuel oil							
International marine bunkers	71	63	108	143	145	105	88
Refinery fuel	14	15	16	16			
Main activity producer electricity plants	743	811	856	902	897	932	1095
Autoproducer electricity plants							
Autoproducer CHP Plants							2
Non-metallic minerals	70	68	68	70	54	55	62
Food, beverages and tobacco							
Paper, pulp and printing							
Not elsewhere specified (Industry)							
Commercial and public services							
White spirit and SPB							
Not elsewhere specified (Industry)	1		1		1		
Lubricants							
International marine bunkers	1	1	1	1	1	1	1
Non-energy use: Road	8	5	5	5	5	6	6
Non-energy use: Not elsewhere specified (Industry)	3	2	2	2	2	2	2

CYSTAT: ENERGY BALANCE 2014	1997	1998	1999	2000	2001	2002	2003
Bitumen							
Construction							
Non-energy use: Not elsewhere specified (Industry)	62	75	86	83	81	84	70
Pet-coke							
Non-metallic minerals	152	150	154	141	133	139	137
Other products (liquid)							
Refinery fuel						16	16
Not elsewhere specified (Industry)	1						
Bituminous Coal							
Non-metallic minerals	19	26	30	49	53	53	53
Lignite							
Not elsewhere specified (Other)	0	0	0	0	0	0	0
Industrial waste (non-renewable) (TJ)							
Non-metallic minerals	0	0	0	0	18	0	15
RENEWABLES							
Solid biomass							
Charcoal production plants (Transformation)	288	314	281	248	253	235	209
Chemical and petrochemical							
Non-metallic minerals				41	70	90	211
Food, beverages and tobacco							
Commercial and public services							
Residential							
Agriculture/Forestry							
Not elsewhere specified (Other)	70	64	88	78	80	74	67
Charcoal (kt)							
Commercial and public services							
Residential							
Not elsewhere specified (Other)	7	8	7	5	5	7	7
Biogases (TJ)							
Main activity producer CHP plants							
Autoproducer CHP plants							
Commercial and public services							
Agriculture/Forestry							

(c) 2004-2010

CYSTAT: ENERGY BALANCE 2014	2004	2005	2006	2007	2008	2009	2010
Refinery gas							
Refinery fuel	9						
LPG							
Non-ferrous metals			1	1		1	1
Non-metallic minerals							1
Food, beverages and tobacco			3	3	3	3	3
Not elsewhere specified (Industry)			1	1	1	1	
Commercial and public services			13	13	14	13	13
Residential	56	53	35	36	34	36	34
Agriculture/forestry			1	1	1	1	1
Non-biogasoline = GASOLINE							
Road	282	303	323	352	373	383	390
Non-bio jet kerosene = JET-KEROSENE							
International aviation	295	291	300	287	286	265	270
Not elsewhere specified (Other)						1	1
Other kerosene							
Residential	24	13	16	16	14	19	14
Oil and gas extraction							
Not elsewhere specified (Industry)		3					

CYSTAT: ENERGY BALANCE 2014	2004	2005	2006	2007	2008	2009	2010
Biodiesels							
Road				1	16	17	17
Non-bio gas/diesel oil = DIESEL							
International marine bunkers	27	67	106	104	88	73	53
Main activity producer electricity plants	8	16	7	16	23	92	158
Autoproducer electricity plants				1			
Road	354	346	323	337	330	321	329
Chemical and petrochemical							
Non-ferrous metals							
Non-metallic minerals							
Mining and Quarrying							
Food, beverages and tobacco							
Construction							
Not elsewhere specified (Industry)	171	47	24	20	18	18	14
Commercial and public services			19	18	20	19	23
Residential		83	98	89	78	83	70
Agriculture/forestry		27	28	28	23	20	19
Fishing					3	4	4
Not elsewhere specified (Other)			4	6	13	5	5
Total fuel oil							
International marine bunkers	27	225	190	171	165	146	134
Refinery fuel							
Main activity producer electricity plants	1046	1104	1137	1174	1219	1163	1053
Autoproducer electricity plants				4	3	2	2
Autoproducer CHP Plants	5	6	7	14	12	11	8
Non-metallic minerals	68	37	35	38	38	30	25
Food, beverages and tobacco							
Paper, pulp and printing							
Not elsewhere specified (Industry)		28	19	27	25	17	20
Commercial and public services		1	2	2	2	2	2
White spirit and SPB							
Not elsewhere specified (Industry)		1	1	1			
Lubricants							
International marine bunkers	1	1	1	1	1		
Non-energy use: Road	7	2	2	2	2	2	2
Non-energy use: Not elsewhere specified (Industry)	3	4	4	4	4	4	4
Bitumen							
Construction		69	69	57	66	74	83
Non-energy use: Not elsewhere specified (Industry)	65						
Pet-coke							
Non-metallic minerals	146	154	146	143	152	144	116
Other products (liquid)							
Refinery fuel							
Not elsewhere specified (Industry)	6						
Bituminous Coal							
Non-metallic minerals	57	52	54	49	40	21	26
Lignite							
Not elsewhere specified (Other)	1	1	1	1	1	1	1
Industrial waste (non-renewable) (TJ)							
Non-metallic minerals	71	138	73	288	239	276	299
RENEWABLES							
Solid biomass							
Charcoal production plants (Transformation)	184	174	135	274	211	47	48
Chemical and petrochemical							
Non-metallic minerals	127	38	61	133	281	304	347
Food, beverages and tobacco							
Commercial and public services				14	15	15	15

CYSTAT: ENERGY BALANCE 2014	2004	2005	2006	2007	2008	2009	2010
Residential			74	95	123	222	84
Agriculture/Forestry			5				
Not elsewhere specified (Other)	61	58					
Charcoal (kt)							
Commercial and public services			5	7	7	6	6
Residential			5	6	6	5	5
Not elsewhere specified (Other)	8	10					
Biogases (TJ)							
Main activity producer CHP plants						13	21
Autoproducer CHP plants				9	78	131	148
Commercial and public services						11	12
Agriculture/Forestry				6		54	93

(d) 2011-2014

CYSTAT: ENERGY BALANCE 2014	2011	2012	2013	2014		
Refinery gas						
Refinery fuel						
LPG						
Non-ferrous metals	1	1		1		
Non-metallic minerals	1	1	1	1		
Food, beverages and tobacco	4	5	4	4		
Not elsewhere specified (Industry)			1			
Commercial and public services	14	14	12	11		
Residential	38	37	33	31		
Agriculture/forestry	1	1	1			
Non-biogasoline = GASOLINE						
Road	385	372	349	341		
Non-bio jet kerosene = JET-KEROSENE						
International aviation	294	264	235	231		
Not elsewhere specified (Other)	2	1	2	2		
Other kerosene						
Residential	16	17	12	9		
Oil and gas extraction				2		
Not elsewhere specified (Industry)						
Biodiesels						
Road	18	18	17	11		
Non-bio gas/diesel oil = DIESEL						
International marine bunkers	58	69	83	80		
Main activity producer electricity plants	112	214	236	124		
Autoproducer electricity plants	2	2	2	1		
Road	313	272	231	224		
Chemical and petrochemical		1	1	2		
Non-ferrous metals		1				
Non-metallic minerals		3	3	1		
Mining and Quarrying		5	4	3		
Food, beverages and tobacco		3	2	3		
Construction		5	3	3		
Not elsewhere specified (Industry)	16	3	1	1		
Commercial and public services	20	16	14	13		
Residential	80	76	63	57		
Agriculture/forestry	22	21	21	19		
Fishing	3	3	2	2		
Not elsewhere specified (Other)	6	5	5	9		
Total fuel oil						
International marine bunkers	141	128	157	153		
Refinery fuel						

CYSTAT: ENERGY BALANCE 2014	2011	2012	2013	2014		
Main activity producer electricity plants	1058	896	649	793		
Autoproducer electricity plants	2		2	4		
Autoproducer CHP Plants	2	2	2	0		
Non-metallic minerals	15	13	8	6		
Food, beverages and tobacco		9	7	12		
Paper, pulp and printing				1		
Not elsewhere specified (Industry)	34	2	2	0		
Commercial and public services	2	3	3	1		
White spirit and SPB						
Not elsewhere specified (Industry)						
Lubricants						
International marine bunkers						
Non-energy use: Road	2	1	1	1		
Non-energy use: Not elsewhere specified (Industry)	4	4	3	3		
Bitumen						
Construction	64	36	24	21		
Non-energy use: Not elsewhere specified (Industry)						
Pet-coke						
Non-metallic minerals	100	94	135	162		
Other products (liquid)						
Refinery fuel						
Not elsewhere specified (Industry)						
Bituminous Coal						
Non-metallic minerals	12	20	20	4.152		
Lignite						
Not elsewhere specified (Other)	1	1	1	0		
Industrial waste (non-renewable) (TJ)						
Non-metallic minerals	4	0	0	279		
RENEWABLES						
Solid biomass						
Charcoal production plants (Transformation)	45	82	71	58		
Chemical and petrochemical				42		
Non-metallic minerals	306	117	178	277		
Food, beverages and tobacco				44		
Commercial and public services	13	16	16	16		
Residential	123	143	112	71		
Agriculture/Forestry						
Not elsewhere specified (Other)						
Charcoal (kt)						
Commercial and public services	6	6	6	6		
Residential	6	6	6	6		
Not elsewhere specified (Other)						
Biogases (TJ)						
Main activity producer CHP plants	92	91	118	116		
Autoproducer CHP plants	180	192	171	176		
Commercial and public services	11	11	11	12		
Agriculture/Forestry	165	182	166	172		

Due to the unavailability of consumption data for several years, using the data as is would create issues of inconsistence and incomparability. Therefore it was decided to complete the period using the following assumptions. The resulting data used for the estimation of the emissions will be presented at the methodological issues Section of the appropriate sector. The following pages present the assumptions made to allocate consumption to activities where data was not available.

LPG

(a) 2006-2006 consumption from Not elsewhere specified (Industry) has been moved to Non-metallic minerals.

(b) There is available data for all the consumers of LPG during the period 2006-2013. Since there is no particular trend during this period, it was decided to use the same ratio as 2006 to distribute the consumption that was allocated to residential to all sectors for the period 1990-2005 (Table 3.5).

Table 3.5. Contribution of different activities to LPG consumption (2006) used to allocate consumption to different sectors for 1990-2005

Activity	Consumption
Non-ferrous metals	1.9%
Non-metallic minerals	1.9%
Food, beverages and tobacco	5.6%
Commercial and public services	24.1%
Residential	64.8%
Agriculture/forestry	1.9%

Jet kerosene

Information on fuel consumption for domestic flights is not available from national statistics. To estimate the emissions from aviation, the available information on fuel consumption from EUROCONTROL was used (3.19. Fuel consumption for domestic and in) for 2005-2014. To complete the time series back to 1990, it was assumed that domestic flights during the period 1990-2004 had the same contribution to the total consumption as 2005 (1.48%).

Other kerosene

(a) Other kerosene consumption was recorded for non-elsewhere specified (industry) only for 2005. For the same year the consumption of residential sector was much lower than other years. The consumption from non-elsewhere specified (industry) of 2005 was moved to residential.

(b) Oil and gas extraction consumption (NEW CONSUMER) was moved to Not elsewhere specified (Industry).

Diesel

According to the energy balance of 2014, the consumers of gas-diesel oil are Main activity producer electricity plants, Road, Chemical and petrochemical, Non-ferrous metals, Non-metallic minerals, Mining and Quarrying, Food, beverages and tobacco, Construction, Not elsewhere specified (Industry), Commercial and public services, Residential, Agriculture/ Forestry and Not elsewhere specified (Other). Consumption data for Chemical and petrochemical, Non-ferrous metals, Non-metallic minerals, Mining and Quarrying, Food, beverages and tobacco, Construction is only available for 2012to 2014. The consumption of fishing has been added in 2014 for the period 2008-2014.

(a) Consumption by Autoproducer electricity plants that is reported for some years is transferred to Not elsewhere specified (Industry).

(b) For the years 2006-2011 all consumption from industrial activities (incl. autoproducers) was included in Not elsewhere specified (Industry). The consumption was allocated to the industrial sectors according to the ratio of 2012 (Table 3.6).

Table 3.6. Contribution of different activities to gas-diesel oil consumption (2012) used to allocate consumption to Chemical and petrochemical, Non-ferrous metals, Non-metallic minerals, Mining and Quarrying, Food, beverages and tobacco, Construction, Not elsewhere specified (Industry) for 2006-2011

Activity	Consumption
Chemical and petrochemical	5%
Non-ferrous metals	5%
Non-metallic minerals	14%
Mining and Quarrying	24%
Food, beverages and tobacco	14%
Construction	24%
Not elsewhere specified (Industry)	14%

(c) The contribution of fishing consumption to the total for the years 2005-2007 is assumed the same as 2008.

(d) For 2005, consumption is available for Main activity producer electricity plants, road, Residential and Agriculture/forestry. Due to the large increase of the Not elsewhere specified (Industry) compare to 2006-2011, it is assumed that consumption by Commercial and public services, and Not elsewhere specified (Other) is included in the Not elsewhere specified (Industry). The assumed contribution of each sector to the consumption allocated to Not elsewhere specified (Industry) is based on the 2012 consumption ratio for these sectors (Table 3.7).

Table 3.7. Contribution of different activities to gas-diesel oil consumption (2012) used to allocate consumption to Chemical and petrochemical, Non-ferrous metals, Non-metallic minerals, Mining and Quarrying, Food, beverages and tobacco, Construction, Not elsewhere specified (Industry), Commercial and public services, Not elsewhere specified (Other) from Not elsewhere specified (Industry) for 2005

Activity	Consumption
Chemical and petrochemical	2%
Non-ferrous metals	2%
Non-metallic minerals	7%
Mining and Quarrying	12%
Food, beverages and tobacco	7%
Construction	12%
Not elsewhere specified (Industry)	7%
Commercial and public services	38%
Not elsewhere specified (Other)	12%

(e) To estimate the consumption for the years 1990-2004, the consumption ratio compared to Not elsewhere specified (Industry) is assumed to be the same as 2012 (Table 3.8).

Table 3.8. Contribution of different activities to gas-diesel oil consumption (2012) used to allocate consumption to from Not elsewhere specified (Industry) for 1990-2004

Activity	Consumption
Chemical and petrochemical	0.7%

Non-ferrous metals	0.7%
Non-metallic minerals	2.11%
Mining and Quarrying	3.52%
Food, beverages and tobacco	2.11%
Construction	3.52%
Not elsewhere specified (Industry)	2.11%
Commercial and public services	11.27%
Residential	53.52%
Agriculture/ forestry	14.79%
Fishing	2.11%
Not elsewhere specified (Other)	3.52%

(f) Consumption for Water-borne navigation activities is available for the years 1998-2013[13] (Table 3.9). The consumption for the period 1990-1997 was estimated assuming that the contribution of the activity to road transport consumption is the same as 1998; the consumption for 2014 was estimated assuming that the contribution of the activity to road transport consumption is the same as 2013.

Table 3.9. Consumption diesel for Water-borne navigation activities

Year	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
t	1097.05	1236.84	531.915	430.208	561.862	430.478	596.723	730.847
kt	1.10	1.24	0.53	0.43	0.56	0.43	0.60	0.73
% of road	0.33%	0.36%	0.15%	0.12%	0.16%	0.12%	0.17%	0.21%

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
t	558.887	626.709	757.997	1491.21	946.597	886.776	625.631	472.399
kt	0.56	0.63	0.76	1.49	0.95	0.89	0.63	0.47
% of road	0.17%	0.19%	0.23%	0.46%	0.29%	0.28%	0.23%	0.20%

(g) The consumption for Water-borne navigation activities was subtracted from Road transport. Therefore road transport consumption was revised for the whole reporting period.

RFO

(a) All consumption allocated to Autoproducer electricity, Food, beverages and tobacco plants and Autoproducer CHP Plants was moved to Not elsewhere specified (Industry).

(b) The consumption food, beverages and tobacco, is only available for 2012-2014. For 2005-2012 consumption is also reported for non – metallic minerals and commercial and public services.

(c) All consumption during 1990-2004 except Refinery fuel and Main activity producer electricity plants was allocated to non-metallic minerals, food, beverages and tobacco, not elsewhere specified (industry) and commercial and public services.

(d) Consumption for Paper, pulp and printing is only available for 2014. It is known however that activities in the particular sector did take place in previous years.

Bitumen

[13] Mr. George Ioannou, Statistical Service, Estimation based on fuel expenses assuming that all fuel is road diesel

All bitumen consumption allocated to Non-energy use: Not elsewhere specified (Industry) during 1990-2004 has been moved to construction.

Pet-coke

Pet-coke in Cyprus is consumed only for cement production. According to the information received from the cement installations, pet-coke was consumed in 1990. The energy balance shows that pet-coke was not imported in 1990. To reduce the inconsistency and the impact on the times series, it was decided to move the "other liquid fuels" consumption of 1990 to cement as pet-coke.

Solid biofuels

(a) All consumption of solid biofuels for the period 1990-1999 is reported as non-elsewhere specified (other).

(b) For 2001-2005 consumption is reported as non-elsewhere specified (other) and non-metallic minerals.

(c) Consumption in agriculture is reported only for 2006.

The consumption of agriculture of 2006 was moved to commercial and public services for which consumption is reported for 2007-2013. All the consumption reported as non-elsewhere specified (other) for 1990-2005 was distributed to commercial and public services, and residential sector according to the consumption ratio the two sectors had in 2007 (Table 3.10).

Table 3.10. Contribution of different activities to solid biofuels consumption (2007) used to allocate consumption to commercial and public services, and residential for 1990-2005

Activity	Consumption
Commercial and public services	12.8%
Residential	87.2%

Charcoal

All charcoal consumption for the period 1990-2005 was reported as non-elsewhere specified (other). For the period 2006-2014, the charcoal consumption is allocated to commercial and public services, and residential sectors using the ratio of 50:50. This ratio was used to allocate charcoal consumption to the two sectors for the period 1990-2005.

Biogases

Biogas consumption is available in Cyprus after 2006, when the first anaerobic digester of the country started it operation. The biogas in Cyprus is consumed onsite to produce electricity and heat through a combined heat power (CHP) generator. Therefore, the biogas consumed by "Main activity producer CHP plants" (2009-2012) and "Autoproducer CHP plants" (2007-2014) was moved to agriculture.

3.2.3. Energy industries (CRF 1A1)

3.2.3.1. Source category description

Prior to the introduction of electricity production from renewable energy sources, the Electricity Authority of Cyprus (EAC) was the solely provider of electrical energy in Cyprus. EAC remains the single electricity producer for the public. Heat production (included in 1A1a) and manufacture of solid fuels and other energy industries (1A1c) do not occur in Cyprus. Refining activities in the country stopped in 2004 following a government decision not to upgrade it to EU standards, instead turning it into a fuel import and storage terminal. Consequently emissions from petroleum refinery (1A1b) are reported for the years 1990-2004 only.

The consumption of fossil fuels by energy industries in 2014 (37.5 PJ) increased by 61.6% compared to 1990 (23.2 PJ). Since 2005, when the refinery stopped its operations, the emissions from energy industries are entirely caused by the production of electricity (1A1a). Emissions from energy industries account for 35.2% of total national emissions without LULUCF for 2014, while in 1990 the contribution was 31.1%. The total GHG emissions from energy industries in 2014 (2.9 Tg CO2 eq.) increased by 61.1% compared to 1990 (1.8 Tg CO2 eq). The emissions from energy industries are presented in Table Table 3.11. Since 2009, a decreasing trend of emissions has been observed. This decreasing trend is attributed to the penetration of renewable energy technologies to the energy mix, and to the economic recession that the country is facing since 2010. The emissions from energy industries (1A1) for the period 1990-2014 are presented in Figure 3.2.

Table 3.11. Emissions from energy industries 1990-2014

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO2 (Gg)	1761	2166	2955	3472	3868	2830	2940
CH4 (Gg)	0.07	0.08	0.11	0.14	0.15	0.11	0.11
N2O (Gg)	0.01	0.02	0.02	0.03	0.03	0.02	0.02
Total (Gg CO2 eq.)	1767	2173	2964	3483	3868	2839	2940
Gg CO2 eq.							
1A1ai Electricity generation	1680.5	2083.9	2859.1	3483	3868	2839	2940
1A1b Petroleum Refining	85.9	90.43	104.4	NO	NO	NO	NO

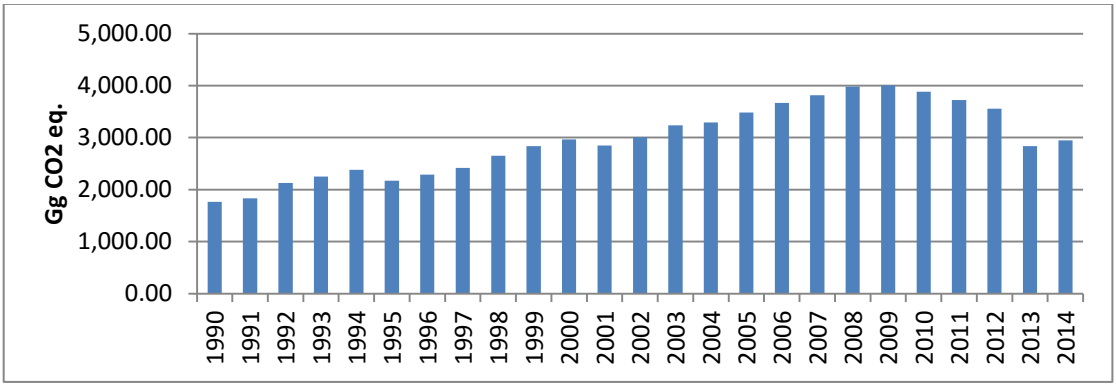

Figure 3.2. Energy industries emissions (1A1) 1990-2014

3.2.3.2. Methodological issues

Carbon dioxide emissions

Public electricity and heat production

The IPCC approach to the calculation of emission inventories encourages the use of fuel statistics collected by an officially recognised national body, as this is usually the most appropriate and accessible activity data. As already mentioned, there is only one electricity producing company in Cyprus (EAC), therefore the fuel consumption for public electricity and heat production was obtained from this one company. The fuel consumption data for all the years was obtained in kt. The fuel consumption data used for the years 1990-2004 is presented in Table 3.12.

Table 3.12. Fuel consumption data obtained from the electricity production company in Cyprus (1990-2004)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Fuel consumption (kt)								
HFO	540.4	560.5	644.6	694.8	726.4	661.2	702.5	742.9
Diesel	0.0	0.0	10.5	3.5	2.0	8.2	5.9	5.8
Net calorific value (TJ/kt)*								
HFO	40.446	40.446	40.446	40.446	40.446	40.446	40.446	40.446
Diesel	42.815	42.815	42.815	42.815	42.815	42.815	42.815	42.815
CO2 emissions (Gg)								
HFO	1675.8	1738.0	1999.0	2154.5	2252.6	2050.5	2178.5	2303.7
Diesel	0.0	0.0	32.62	10.79	6.09	25.45	18.39	17.83

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Fuel consumption (kt)							
HFO	810.9	856.1	900.5	893.8	930.8	1000.3	1042.1
Diesel	11.6	21.0	18.7	3.7	1.6	5.1	8.4
Net calorific value (TJ/kt)*							
HFO	40.446	40.446	40.446	40.446	40.446	40.446	40.446
Diesel	42.815	42.815	42.815	42.815	42.815	42.815	42.815
CO2 emissions (Gg)							
HFO	2514.8	2654.9	2792.5	2771.6	2886.5	3102.2	3231.6
Diesel	35.91	64.97	57.89	11.48	4.91	15.73	26.14

Detailed data on fuel consumption and other parameters are submitted annually by the installation since 2005 in compliance to the Emissions Trading System law (110(I)/2011). The data collected through the ETS for the period 2005-2014 and used for the estimation of the emissions is presented in Table 3.13.

Table 3.13. Data collected through the ETS for electricity production in Cyprus (2005-2014)

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Fuel consumption (kt)										
HFO	1103.2	1137.3	1174.7	1218.5	1163.1	1053.0	1057.8	895.5	649.3	793.3
Diesel	16.3	6.9	16.0	22.9	91.9	157.5	111.7	213.9	237.5	123.6
Net calorific value (TJ/kt)*										
HFO	40.446	40.460	40.463	40.690	40.795	40.641	40.741	40.791	40.613	40.691
Diesel	42.815	42.821	42.806	42.598	42.660	42.938	42.714	42.715	42.580	42.354
CO2 emissions (Gg)										
HFO	3421.2	3632.1	3751.9	3896.3	3707.6	3377.5	3373.4	2869.8	2085.9	2553.1
Diesel	50.60	21.28	49.72	70.98	284.84	490.53	336.65	676.13	743.85	387.23

* weighted average based on consumption

The emissions for 1990-2004 were estimated using the implied emission factors derived from the annual report of the company for 2005 in compliance with the ETS law which are 76.67 t CO2/TJ HFO and 72.43 t CO2/TJ diesel. For the years 2005-2014, the CO2 emissions as reported by the company in compliance with the ETS law have been used (Table 3.13).

The emission factor was multiplied with the fuel consumption of the respective fuel. This method has been considered as a country specific method, since it does not follow the methodologies proposed by the IPCC guidelines.

Petroleum refining

Data for the consumption of fuel for petroleum refining was obtained from the National Statistical Service in kt (Table 3.14). No information is available on the characteristics of the consumption reported as other oil products. The fuel consumption was converted to TJ using the default NCVs of 40.4 TJ/kt RFO, 40.2 TJ/kt other oil product and 49.5 TJ/kt refinery gas. CO2 emission factors are also the defaults proposed by the revised IPCC 2006 guidelines (volume 2, pg. 2.16); i.e. 77.4 t CO2/TJ RFO, 73.3 t CO2/TJ other oil product and 57.6 t CO2/TJ refinery gas.

Table 3.14. Fuel consumed for petroleum refining in Cyprus (1990-2004)

Fuel consumption (kt)	1990	1991	1992	1993	1994	1995	1996	1997
RFO	11	12	13	13	14	17	16	14
Other products	0	0	0	0	0	0	0	0
Refinery gas	18	17	17	13	24	13	12	16

	1998	1999	2000	2001	2002	2003	2004
RFO	15	16	16	0	0	0	0
Other products	0	0	0	0	16	16	0
Refinery gas	16	20	19	19	21	21	9

Non-Carbon dioxide emissions

Non-CO2 emissions were estimated using the default emission factors proposed by the IPCC2006 methodology for energy industries (volume 2, pg. 2.16); i.e. 3 kg CH4/TJ and 0.6 kg N2O/TJ for RFO and other oil products and 1 kg CH4/TJ and 0.1 kg N2O/TJ for Refinery gas.

3.2.3.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

3.2.3.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

3.2.3.5. Source-specific recalculations

No recalculations have been performed.

3.2.3.6. Source-specific planned improvements

There are no planned improvements for Public electricity and Heat production.

3.2.4. Manufacturing industries and construction (CRF 1A2)

3.2.4.1. Source category description

Emissions from energy consumption for the production of steam and process heat are mainly reported under Manufacturing industry and construction.

Even though the shock inflicted on the manufacturing sector by the Turkish invasion of 1974 was severe, recovery during the period 1975-1983 was remarkable. By 2002 the sector accounted for about 10% of GDP and 12% of employment. However, during the past decade, the manufacturing industry of Cyprus has been going through difficult times, experiencing a fall in the growth of production, exports and employment. This development has been the result of erosion in competitiveness, both abroad and in the local market, at a time of increasingly intensified, international competition. At the root of these problems lie the structural weaknesses of the sector, the drastic reduction of tariff protection due to the participation of Cyprus in the World Trade Organization, the rising labour costs and low productivity. As a result the share of the manufacturing sector in the Gross Domestic Product and in employment remained stagnant. International competition is increasingly intensified mainly from two directions: on the one hand, the high-wage producers, who have combined design, quality and new forms of flexible production to cut working and capital costs and improve response times and on the other, the low-wage mass producers of South-East Asia.

The main industrial activities that take place in Cyprus are food and beverage processing, cement and gypsum production, light chemicals (predominately pharmaceuticals), metal and wood products. The industrial sector in 2012 registered a negative growth rate in real terms for a second year in a row.

The GHG emissions caused by energy consumption in manufacturing industries and construction in 2014 were 703 Gg CO2 eq. The total GHG emissions from manufacturing industries and construction in 2014 increased by 36.5% compared to 1990, while the corresponding increase in fuel consumption was 32%. There is no available information to explain the large change in emissions between 1990 and 1991. The emissions from manufacturing industries and construction 1990-2014 are presented in Figure 3.3.

Table 3.15. Emissions from manufacturing industries and construction 1990-2014

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO2 (Gg	512.2	770.9	818.7	908.3	697.3	509.3	699.7
CH4 (Gg)	0.04	0.03	0.04	0.05	0.05	0.02	0.04
N2O (Gg)	0.006	0.006	0.007	0.009	0.008	0.004	0.007
Total (Gg CO2 eq.)	514.8	773.5	821.9	912	700.7	511.3	703.0
Gg CO2 eq.							
1A2b. Non-ferrous metals	4.9	6.3	7.2	6.5	5.8	0.0	3.1
1A2c. Chemicals	2.3	3.4	4.3	3.6	2.1	0.0	6.5
1A2d. Pulp, paper and print	4.3	12.7	9.2	5.2	3.7	3.2	3.1
1A2e. Food Processing etc.	72.8	170.9	131.5	81.5	59.6	40.3	59.3
1A2f. Non-metallic minerals	382	481.7	577.2	726.2	555.6	417.1	586.6
1A2giii. Mining	11	17.2	21.5	17.9	10.7	12.8	9.6
1A2gv. Construction	11	17.2	21.5	17.9	10.7	12.8	9.6
1A2gviii. Other non-specified industry	26	63.9	49.5	53.2	52.5	25.3	25.3

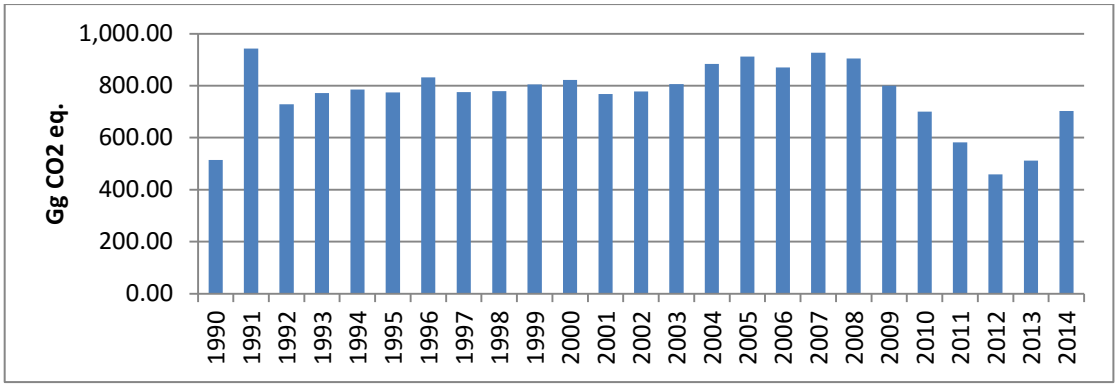

Figure 3.3. Emissions from energy use in manufacturing industries and construction (1A2) 1990-2014

3.2.4.2. Methodological issues

Data

The data used to estimate the emissions for the industrial activities from energy consumption in manufacturing industries and construction 1990-2014 is presented in Table 3.16. Consumption for Iron and steel (1A2a) is included in Non-ferrous metals (1A2b). Consumption for Transport equipment (1A2g), Machinery (1A2h) and Autoproducer electricity plants is included in Non-specified Industry (1A2m).Paper, pulp and printing (1A2d), Solid biofuels in Chemical and petrochemical (1A2c) and other kerosene in Non-specified Industry (1A2m) are introduced for the first time (in green colour). Additionally, the consumption of RFO is revised for all industrial sectors where it is consumed (with red colour).

Table 3.16. Fuel consumption in manufacturing industries and construction 1990-2014

	1990	1991	1992	1993	1994	1995	1996
1A2b Non-ferrous metals							
LPG (kt)	0.91	0.91	1.02	0.94	0.93	0.94	0.94
Diesel/gasoil (kt)	0.69	0.77	0.93	0.96	0.99	1.08	1.13
1A2c Chemical and petrochemical							
Diesel/gasoil (kt)	0.69	0.77	0.93	0.96	0.99	1.08	1.13
Solid biofuels (TJ)							
1A2d Paper, pulp and printing							
RFO (kt)	1.54	5.17	4.92	4.17	4.58	4.04	4.63
1A2e Food, beverages and tobacco							
Diesel/gasoil (kt)	2.07	2.30	2.79	2.89	2.98	3.23	3.40
RFO (kt)	18.50	62.00	59.00	50.00	55.00	48.50	55.50
LPG (kt)	2.72	2.72	3.06	2.83	2.78	2.83	2.83
Solid biofuels (TJ)							
1A2f Non-Metallic Minerals							
Pet-coke (kt)	40.00	93.00	85.00	114.00	112.00	125.00	147.00
RFO (kt)	9.25	31.00	29.50	25.00	27.50	24.25	27.75
diesel (kt)	2.07	2.30	2.79	2.89	2.98	3.23	3.40
LPG (kt)	0.91	0.91	1.02	0.94	0.93	0.94	0.94
Other bituminous coal (kt)	97.00	97.00	26.00	31.00	27.00	20.00	18.00
Solid biomass (TJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial waste* (TJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1A2i Mining							
Diesel (kt)	3.45	3.84	4.65	4.82	4.96	5.39	5.67
1A2k Construction							

	1990	1991	1992	1993	1994	1995	1996
Diesel (kt)	3.45	3.84	4.65	4.82	4.96	5.39	5.67
1A2m Non-specified Industry							
Diesel (kt)	2.07	2.30	2.79	2.89	2.98	3.23	3.40
RFO (kt)	6.17	20.67	19.67	16.67	18.33	16.17	18.50
Other oil products (kt)	0.00	5.00	0.00	0.00	0.00	0.00	0.00
White spirit (kt)	0.00	0.00	0.00	1.00	0.00	1.00	1.00
Other kerosene (kt)							

	1997	1998	1999	2000	2001	2002	2003
1A2b Non-ferrous metals							
LPG (kt)	0.96	0.93	0.91	0.98	0.98	1.00	1.07
Diesel/gasoil (kt)	1.19	1.27	1.30	1.35	1.36	1.30	1.34
1A2c Chemical and petrochemical							
Diesel/gasoil (kt)	1.19	1.27	1.30	1.35	1.36	1.30	1.34
Solid biofuels (TJ)							
1A2d Paper, pulp and printing							
RFO (kt)	2.92	2.83	2.83	2.92	2.25	2.29	2.58
1A2e Food, beverages and tobacco							
Diesel/gasoil (kt)	3.57	3.80	3.91	4.04	4.08	3.91	4.01
RFO (kt)	35.00	34.00	34.00	35.00	27.00	27.50	31.00
LPG (kt)	2.89	2.78	2.72	2.94	2.94	3.00	3.22
Solid biofuels (TJ)							
1A2f Non-Metallic Minerals							
Pet-coke (kt)	152.00	150.00	154.00	141.00	133.00	139.00	137.00
RFO (kt)	17.50	17.00	17.00	17.50	13.50	13.75	15.50
diesel (kt)	3.57	3.80	3.91	4.04	4.08	3.91	4.01
LPG (kt)	0.96	0.93	0.91	0.98	0.98	1.00	1.07
Other bituminous coal (kt)	19.00	26.00	30.00	49.00	53.00	53.00	53.00
Solid biomass (TJ)	0.00	0.00	0.00	41.00	70.00	90.00	211.00
Industrial waste* (TJ)	0.00	0.00	0.00	0.00	18.00	0.00	15.00
1A2i Mining							
Diesel (kt)	5.95	6.34	6.51	6.73	6.80	6.51	6.69
1A2k Construction							
Diesel (kt)	5.95	6.34	6.51	6.73	6.80	6.51	6.69
1A2m Non-specified Industry							
Diesel (kt)	3.57	3.80	3.91	4.04	4.08	3.91	4.01
RFO (kt)	11.67	11.33	11.33	11.67	9.00	9.17	12.33
Other oil products (kt)	1.00	0.00	0.00	0.00	0.00	0.00	0.00
White spirit (kt)	1.00	0.00	1.00	0.00	1.00	0.00	0.00
Other kerosene (kt)							

	2004	2005	2006	2007	2008	2009	2010
1A2b Non-ferrous metals							
LPG (kt)	1.04	0.98	1.00	1.00	0.00	1.00	1.00
Diesel/gasoil (kt)	1.20	1.12	1.14	0.95	0.86	0.86	0.67
1A2c Chemical and petrochemical							
Diesel/gasoil (kt)	1.20	1.12	1.14	0.95	0.86	0.86	0.67
Solid biofuels (TJ)							
1A2d Paper, pulp and printing							
RFO (kt)	2.83	1.65	1.12	1.59	1.47	1.00	1.18
1A2e Food, beverages and tobacco							
Diesel/gasoil (kt)	3.61	3.36	3.43	2.86	2.57	2.57	2.00
RFO (kt)	34.00	19.76	13.41	19.06	17.65	12.00	14.12
LPG (kt)	3.11	2.94	3.00	3.00	3.00	3.00	3.00
Solid biofuels (TJ)							
1A2f Non-Metallic Minerals							

	2004	2005	2006	2007	2008	2009	2010
Pet-coke (kt)	146.00	154.00	146.00	143.00	152.00	144.00	116.00
RFO (kt)	17.00	37.00	35.00	38.00	38.00	30.00	25.00
diesel (kt)	3.61	3.36	3.43	2.86	2.57	2.57	2.00
LPG (kt)	1.04	0.98	1.00	1.00	1.00	1.00	1.00
Other bituminous coal (kt)	57.00	54.72	54.33	49.46	44.60	23.49	27.44
Solid biomass (TJ)	127.00	38.00	61.00	133.00	281.00	304.00	347.00
Industrial waste* (TJ)	71.00	138.00	73.00	288.00	239.00	276.00	299.00
1A2i Mining							
Diesel (kt)	6.02	5.60	5.71	4.76	4.29	4.29	3.33
1A2k Construction							
Diesel (kt)	6.02	5.60	5.71	4.76	4.29	4.29	3.33
1A2m Non-specified Industry							
Diesel (kt)	3.61	3.36	3.43	3.86	2.57	2.57	2.00
RFO (kt)	16.33	12.59	11.47	24.35	20.88	17.00	14.71
Other oil products (kt)	6.00	0.00	0.00	0.00	0.00	0.00	0.00
White spirit (kt)	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Other kerosene (kt)	1.04	0.98	1.00	1.00	0.00	1.00	1.00

	2011	2012	2013	2014
1A2b Non-ferrous metals	1.00	1.00	0.00	1.00
LPG (kt)	0.76	1.00	0.00	0.00
Diesel/gasoil (kt)				
1A2c Chemical and petrochemical	0.76	1.00	1.00	2.00
Diesel/gasoil (kt)				42.00
Solid biofuels (TJ)				
1A2d Paper, pulp and printing	2.00	1.12	0.96	1.00
RFO (kt)				
1A2e Food, beverages and tobacco	2.29	3.00	2.00	3.00
Diesel/gasoil (kt)	24.00	9.00	7.00	12.00
RFO (kt)	4.00	5.00	4.00	4.00
LPG (kt)				44.00
Solid biofuels (TJ)				
1A2f Non-Metallic Minerals	100.00	94.00	135.00	162.00
Pet-coke (kt)	15.00	13.00	8.00	6.00
RFO (kt)	2.29	3.00	3.00	1.00
diesel (kt)	1.00	1.00	1.00	1.00
LPG (kt)	12.25	0.00	0.00	4.15
Other bituminous coal (kt)	306.00	117.00	178.00	277.00
Solid biomass (TJ)	56.23	23.06	45.08	390.53
Industrial waste* (TJ)				
1A2i Mining	3.81	5.00	4.00	3.00
Diesel (kt)				
1A2k Construction	3.81	5.00	3.00	3.00
Diesel (kt)				
1A2m Non-specified Industry	4.29	5.00	3.00	2.00
Diesel (kt)	12.00	3.00	5.00	4.00
RFO (kt)	0.00	0.00	0.00	0.00
Other oil products (kt)	0.00	0.00	0.00	0.00
White spirit (kt)				2.00
Other kerosene (kt)	1.00	1.00	0.00	1.00

* non-renewable

Methodology

The emissions from energy use in manufacturing industries and construction were estimated using predominately the IPCC 2006 guidelines. Details for each industrial activity are presented below.

Non-ferrous metals

The liquid fuels are consumed by non-ferrous metals, namely LPG and Gas-Diesel oil (Table 3.16). Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17). The CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC 2006 guidelines (volume 2, pg. 2.18); i.e. 63100 kg CO2/TJ, 1 kg CH4/TJ and 0.1 kg N2O/TJ for LPG and 74100 kg CO2/TJ, 3 kg CH4/TJ and 0.6 kg N2O/TJ for Gas-Diesel oil.

Chemicals

According the energy balance gas-diesel oil and solid biomass are consumed by chemical industries (Table 3.16). Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17). The CO2, CH4 and N2O emissions from gas-diesel oil were estimated using the default emission factors proposed by the IPCC 2006 guidelines (volume 2, pg. 2.18); i.e. 74100 kg CO2/TJ, 3 kg CH4/TJ and 0.6 kg N2O/TJ. Consumption of solid biomass is reported for the first time in 2014.The CO2, CH4 and N2O emissions from solid biomass were estimated using the default emission factors proposed by the IPCC 2006 guidelines (volume 2, pg. 2.19); i.e. 100000 kg CO2/TJ, 30 kg CH4/TJ and 4 kg N2O/TJ.

Pulp, Paper and Print

Fuel consumption for this category has been reported for the first time in the 2014 energy balance. However, the activity did take place in previous years. Therefore assumptions have been made to estimate the fuel consumption of the category (see previous Section) of the complete period. Consumption of RFO was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17).The CO2, CH4 and N2O emissions from RFO were estimated using the default emission factors proposed by the IPCC 2006 guidelines (volume 2, pg. 2.18); i.e. 77400 kg CO2/TJ, 3 kg CH4/TJ and 0.6 kg N2O/TJ.

Food processing, beverages and tobacco

According the energy balance the fuels consumed by food processing, beverages and tobacco industries are LPG, gas-diesel oil and RFO (Table 3.16). Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17). The CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.18); i.e. 63100 kg CO2/TJ, 1 kg CH4/TJ and 0.1 kg N2O/TJ for LPG, 74100 kg CO2/TJ, 3 kg CH4/TJ, 0.6 kg N2O/TJ for Gas-Diesel oil and 77400 kg CO2/TJ, 3 kg CH4/TJ, 0.6 kg N2O/TJ for RFO. Consumption of solid biomass is reported for the first time in 2014.The CO2, CH4 and N2O emissions from solid biomass were estimated using the default emission factors proposed by the IPCC 2006 guidelines (volume 2, pg. 2.19); i.e. 100000 kg CO2/TJ, 30 kg CH4/TJ and 4 kg N2O/TJ.

Non-metallic minerals

According the energy balance the non-metallic minerals industries consume LPG, gas-diesel oil, RFO, pet-coke, other bituminous coal, solid biomass and industrial waste non-renewable (Table 3.16). RFO consumption for 1990-2004 has been revised due to the addition of Pulp, Paper and Print industries.

All liquid fuel consumption (LPG, gas-diesel oil, RFO and pet-coke) was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17). Pet-coke is consumed only by two cement producing installations during 1990-2011, which merged into one in 2011. These installations have been submitting annual emissions' report according to the requirements of the ETS law 110(I)/2011, since 2005. The CO2 emissions from pet-coke for the period 2005-2013 were used as reported for the ETS. CO2 emissions for the period 1990-2004 were estimated using the IEF of 2005, resulting from the division of CO2 emissions by the TJ fuel consumed (84.51 t CO2/TJ). CH4 and N2O emissions for fuels were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.18); i.e. 3 kg CH4/TJ and 0.6 kg N2O/TJ for gas-diesel oil, RFO and pet-coke and 1 kg CH4/TJ and 0.1 kg N2O/TJ for LPG.

Other bituminous coal was consumed during the period 1990-2011 by only one cement-producing installation, which has been submitting annual emissions' report according to the requirements of the ETS law 110(I)/2011, since 2005. The new installation (after 2011) consumed other bituminous coal in 2014 only. Fuel consumption for the period 2005-2014 was obtained in TJ from the annual ETS reports. Fuel consumption for the period 1990-2004 was converted to TJ with the NCV of the first ETS report submitted (i.e. 2005), which was 29.824 TJ/kt. The CO2 emissions from other bituminous coal for the period 2005-2013 were used as reported for the ETS. CO2 emissions for the period 1990-2004 were estimated using the IEF of 2005, resulting from the division of CO2 emissions by the TJ fuel consumed (92.60 t CO2/TJ). CH4 and N2O emissions for other bituminous coal were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.18); i.e. 10 kg CH4/TJ and 1.5 kg N2O/TJ.

Solid biomass data was available in TJ. Solid biomass is consumed by only one cement-producing installation, which has been submitting annual emissions' report according to the requirements of the ETS law 110(I)/2011, since 2005. The CO2 emissions from solid biomass for the period 2005-2014 were used as reported for the ETS. CO2, CH4 and N2O emissions for solid biomass were estimated using the default emission factors proposed by the IPCC 2006 guidelines for "other primary solid biomass" (volume 2, pg. 2.19); i.e. 100000 kg CO2/TJ, 30 kg CH4/TJ and 4 kg N2O/TJ.

Non-renewable waste data was available in TJ. Non-renewable waste is consumed by only one cement-producing installation, which has been submitting annual emissions' report according to the requirements of the ETS law 110(I)/2011, since 2005. The CO2, CH4 and N2O emissions for non-renewable industrial waste were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.19); i.e. 143000 kg CO2/TJ, 30 kg CH4/TJ and 4 kg N2O/TJ.

1A2i Mining (excluding fuels) and Quarrying

According the energy balance mining and quarrying industries consume only diesel (Table 3.16). Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17.). CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.18); i.e. 74100kg CO2/TJ, 3 kg CH4/TJ and 0.6 kg N2O/TJ for gas – diesel oil.

1A2k Construction

According the energy balance construction industries consume only diesel (Table 3.16). Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17). CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.18); i.e. 74100kg CO2/TJ, 3 kg CH4/TJ and 0.6 kg N2O/TJ for gas – diesel oil.

1A2m Non-specified Industry

According the energy balance the fuels consumed by Non-specified industries are gas-diesel oil, RFO, other oil products and white spirit (Table 3.16). Other kerosene has been consumed in 2014 by the gas exploration platforms. RFO consumption for 1990-2014 has been revised due to the addition of Pulp, Paper and Print industries. Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 3.17). The CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.18); i.e. 74100 kg CO2/TJ for Gas-Diesel oil, 77400 kg CO2/TJ for RFO, 71900 kg CO2/TJ for other kerosene, 73300 kg CO2/TJ for white spirit and other oil products. The emission factors for CH4 and N2O are 3 kg CH4/TJ, 0.6 kg N2O/TJ for all fuels.

Table 3.17. Parameters used for the estimation of emissions

	NCV (TJ/kt)	IEF (tCO2/TJ)*
Gas-diesel oil	43.0	
RFO	40.4	
Other oil products	40.2	
White spirit	40.2	
Pet-coke	32.5	84.505
LPG	47.3	
Other kerosene	43.8	
Other bituminous coal	25.8	92.600

* based on the ETS 2005 report; used for the years 1990-2004

3.2.4.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

3.2.4.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

3.2.4.5. Source-specific recalculations

Non-ferrous metals: a mistake has been identified in the emission factors used for LPG. The emissions' estimates for the complete period have been affected.

Pulp, Paper and Print: fuel consumption for this category has been reported for the first time in the 2014 energy balance. However, the activity did take place in previous years. Therefore assumptions have been made to estimate the fuel consumption of the category (see previous Section) of the complete period.

Food processing, beverages and tobacco: RFO consumption has been revised due to the addition of Pulp, Paper and Print industries. The emissions' estimates for the complete period have been affected.

Non-metallic minerals: RFO consumption for the period 1990-2004 has been revised due to the addition of Pulp, Paper and Print industries. The emissions' estimates for the complete period have been affected.

1A2m Non-specified Industry: RFO consumption has been revised due to the addition of Pulp, Paper and Print industries. The emissions' estimates for the complete period have been affected. Source 1A2m includes consumption from Autoproducer electricity plants and Autoproducer CHP plants.

3.2.4.6. Source-specific planned improvements

Efforts are made in collaboration with the Statistical Service to further improve data on fuel consumption per industrial activity.

3.2.5. Transport (CRF 1A3)

3.2.5.1. Source category description

Internal aviation, road transportation, railways and internal navigation should be included in the transport sector (1A3). Emissions from international marine and aviation bunkers are not included in national totals, but are calculated and reported separately as Memo items (CRF 1D) (see Section 3.5). In Cyprus, the sources of emissions reported in Transport are domestic aviation (1A3a), road transport (1A3b) and Domestic water-borne navigation (1A3d(ii) - NEW). No other transport mean is used in Cyprus; i.e. there is no railway activity in Cyprus.

All fuel consumption and respective emissions for road transport are reported under 1A3b(i) Cars. The reason for this is the unavailability of fuel consumption breakdown to different means of road transport.

Between 1990 and 2014 the emissions from transport have increased by 50% (Table 3.18). During the same period the emissions from domestic aviation decreased by 94.5%, while emissions from road transport increased by 50%. The emissions for the period are presented in Table 3.18. Transport contributes 22% to the total emissions of the country in 2014 without LULUCF and 30.5% to the emissions from the energy sector. Transport (1A3) emissions are also presented in Figure 3.4.

Table 3.18. Transport emissions 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 (Gg)	1181	1482	1760	2045	2253	1808	1761
CH4 (Gg)	0.22	0.25	0.29	0.39	0.49	0.43	0.42
N2O (Gg)	0.09	0.11	0.13	0.17	0.20	0.17	0.16
Total (Gg CO2 eq.)	1214	1522	1807	2104	2324	1869	1820
Gg CO2 eq.							
1A3a. Domestic aviation	11.08	12.20	12.58	12.59	7.72	0.97	0.61
1A3b. Road transport	1200	1506	1792	2089	2313	1866	1817
1A3d. Domestic Navigation	2.24	3.03	1.72	2.37	3.07	1.53	1.49

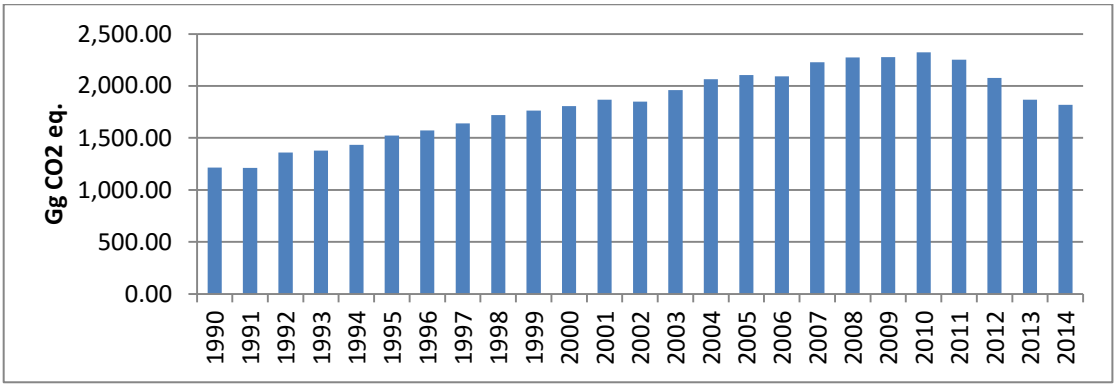

Figure 3.4. Transport (1A3) emissions 1990-2014

3.2.5.2. Methodological issues

Domestic aviation

The emissions from domestic aviation were estimated using the Tier 1 method proposed by 2006 IPCC guidelines. Information on fuel consumption for domestic flights is not available from national statistics. To estimate the emissions from aviation, the available information on fuel consumption from EUROCONTROL was used (Table 3.19) for 2005-2014. To complete the time series back to 1990, it was assumed that domestic flights during the period 1990-2004 had the same contribution to the total consumption as 2005 (1.48%). Total consumption for 1990-2004 was obtained from the National Statistics.

NCV and emission factors are the defaults proposed by the IPCC 2006 guidelines; i.e. 44.1 TJ/kt, 71.5 t CO2/TJ, 0.5 kg CH4/TJ and 2 kg N2O/TJ.

This is the first time this method is used. In previous submissions emissions were estimated using LTOs.

Table 3.19. Fuel consumption for domestic and international flights 1990-2014 (kt)

kt	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Domestic	3.5	4.1	4.0	3.4	3.5	3.8	3.7	3.6	3.8	3.9
International	232.5	275.9	268.0	227.6	233.5	256.2	245.3	241.4	254.2	260.1
TOTAL	236	280	272	231	237	260	249	245	258	264

kt	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Domestic	4.0	4.6	4.5	4.8	4.4	4.0	3.3	3.0	2.8	2.3
International	264.0	309.4	297.5	318.2	290.6	264.2	266.4	262.4	272.3	257.4
TOTAL	268	314	302	323	295	268.2	269.7	265.3	275.1	259.7

kt	2010	2011	2012	2013	2014					
Domestic	2.4	0.7	0.5	0.3	0.2					
International	262.6	272.5	263.4	245.7	246.0					
TOTAL	265.1	273.2	263.9	246.1	246.2					

Road transport

GHG emissions from road transport were estimated according to the IPCC2006 guidelines. Fuel consumption data was obtained from the energy balance prepared by the statistical service and is presented in Table 3.20.Consumption of diesel for the whole reporting period has been revised to exclude consumption for water-borne navigation. Consumption of biofuel for 2013 has been revised due to revision of the energy balance for biofuels. Carbon dioxide emission factors are according to the IPCC 2006 guidelines (volume 2, pg. 3.16, table 3.2.1 and pg. 1.23, table 1.4). Methane and nitrous oxide emission factor are according to the IPCC 2006 guidelines (volume 2, pg. 3.21, table 3.2.2).

All fuel consumption and respective emissions for road transport are reported under 1A3b(i) Cars. The reason for this is the unavailability of fuel consumption breakdown to different means of road transport.

Table 3.20. Fuel consumed by road transport (kt) during 1990-2014

kt	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gasoline	163	170	172	169	180	183	186	191	195	203
Diesel	209	201	245	254	260	284	297	313	333	339
Biodiesel	0	0	0	0	0	0	0	0	0	0

kt	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Gasoline	206	219	228	252	282	303	323	352	373	383
Diesel	349	355	340	351	353	345	322	336	329	320
Biodiesel	0	0	0	0	0	0	0	1	16	17

kt	2010	2011	2012	2013	2014
Gasoline	390	385	372	349	341
Diesel	328	312	271	231	224
Biodiesel	17	18	18	17	11

Calorific values and emission factors for the estimation of emissions from road transport are presented in Table 3.21.The CH4 emission factor for gasoline has been revised compared to 2015 submission due to the recommendation by the TERT to use the factors for “motor gasoline - oxidation catalyst” instead of “low mileage light duty vehicle vintage 1995 or later” that was used in NIR2015. NCV and CO2 emission factor for biodiesel has been obtained from table 1.4 (volume 2, pg. 1.23). CH4 and N2O emission factors for biodiesel have been assumed to be the same as diesel (IPCC2006 default, volume 2, pg. 3.21).

Table 3.21. Parameters used for the estimation of emissions from road transport (IPCC 2006 guidelines)

Fuel	NCV (TJ/kt)	CO2 (kg/TJ)	CH_4 EF (kg/TJ)	N_2O EF (kg/TJ)
Diesel	43.0	74100	3.9	3.9
Gasoline	44.3	69300	25	8
Biodiesel	37.0*	70800	3.8	5.7

* NCV based on the energy balance prepared by the National Statistical Service and not the IPCC guidelines

Emissions for CO2, CH4 and N2O have also been estimated using COBERT for the years 2013 and 2014. A comparison of the results of the calculations above (IPCC2006 guidelines) and COBERT results is presented in Table 3.22.

Table 3.22. Comparison of emissions estimates using IPCC2006 guidelines and COBERT results

	CO2		CH4		N2O	
	2013	2014	2013	2014	2013	2014
COBERT (kt)	1850.49	1840.52	0.160	0.156	0.0372	0.0366
NIR2016 (kt)	1835.79	1790.17	0.425	0.415	0.163	0.159

Domestic water-borne navigation

Estimation of emission from domestic water-borne navigation activities has been made possible due to data obtained from the Statistical Service on fuel consumption for the years 1998-2013 (Table 3.23). The consumption for remaining years has been estimated assuming the following: (a) for the years 1990-1997 the contribution of domestic water-borne navigation activities to road transport was assumed the same as 1998 (0.33%), (b) for 2014 the contribution of domestic water-borne navigation activities to road transport was assumed the same as 2013 (0.20%).

Table 3.23. Diesel consumption by domestic water-borne navigation activities

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Activity (kt)	0.69	0.66	0.81	0.84	0.86	0.94	0.98	1.03	1.10	1.24

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Activity (kt)	0.53	0.43	0.56	0.43	0.60	0.73	0.56	0.63	0.76	1.49

	2010	2011	2012	2013	2014
Activity (kt)	0.89	0.63	0.47	0.46	0.89

Calorific values and emission factors of road diesel for the estimation of emissions from domestic water-borne navigation are according to IPCC2006: NCV 43 TJ/kt (volume 2, pg. 1.18), 74100 kg CO2/TJ (volume 2, pg. 3.50), 3.9 kg CH4/TJ and 3.9 kg N2O/TJ (assumed same as road - default, volume 2, pg. 3.21).

3.2.5.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

3.2.5.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

3.2.5.5. Source-specific recalculations

The CH4 emission factor for gasoline has been revised compared to 2015 submission due to the recommendation by the TERT to use the factors for "motor gasoline - oxidation catalyst" instead of "low mileage light duty vehicle vintage 1995 or later" that was used in NIR2015.

Consumption of diesel for the whole reporting period has been revised to exclude consumption for domestic water-borne navigation.

3.2.5.6. Source-specific planned improvements

Obtain COBERT estimates for emissions from road transport for the whole reporting period by NIR2017 submission.

The improvement of the estimation of emissions from domestic aviation is planned. However, because it is not considered a priority or urgent to complete it, due to the very small contribution to the total emissions, it is not foreseen to be completed for the next submission.

3.2.6. Other sectors (CRF 1A4)

3.2.6.1. Source category description

Emissions from other sectors (1A4) include the emissions caused by the sectors commercial/ institutional (1A4A), residential (1A4B) and agriculture/ forestry/ fishery (1A4C). The source of emissions is the energy consumption for heat in order to cover the needs for the space heating, water heating etc. Thermal needs in these sectors are covered mainly by liquid fossil fuels, while the contribution of biomass (fuel wood), especially in the residential sector, is also significant (mainly in mountainous areas).

Due to the unavailability of consumption data for several years and sectors, using the fuel consumption data as published by the Statistical Service, would create issues of consistence and comparability. Therefore it was decided to complete the period using assumptions.

GHG emissions from other sectors in 2014 increased by 3.9% compared to 1990 emissions (from 434 Gg CO_2 eq in 1990 to 451 Gg CO_2 eq in 2014). Table 3.24 presents the trend between 1990 and 2014. Other sectors contribute 5.8% to the total emissions of the country in 2014 without LULUCF and 7.6% to the emissions from the energy sector. The emissions from Other sources (1A4) are presented in Figure 3.5.

Table 3.24. GHG emissions from Other sectors 1990-2014

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO2 (Gg)	430.4	602.5	725.4	604.6	563.2	503.1	446.8
CH4 (Gg)	0.10	0.14	0.14	0.15	0.17	0.17	0.15
N2O (Gg)	0.003	0.005	0.005	0.005	0.004	0.004	0.003
Total (Gg CO2 eq.)	434	608	730	610	569	509	451
Gg CO2 eq.							
1A4a. Commercial / Institutional	75.8	105.3	116.8	99.5	120.0	91.3	78.8
1A4b. Residential	302	416.4	507.4	420.7	371.9	340.6	305.6
1A4ci. Agriculture/Forestry/Fisheries-stationary	49.2	75.4	93.5	79.7	64.0	70.4	60.9
1A4ciii. Agriculture/Forestry/Fisheries-Fishing	6.6	10.4	12.9	9.8	12.8	6.4	6.4

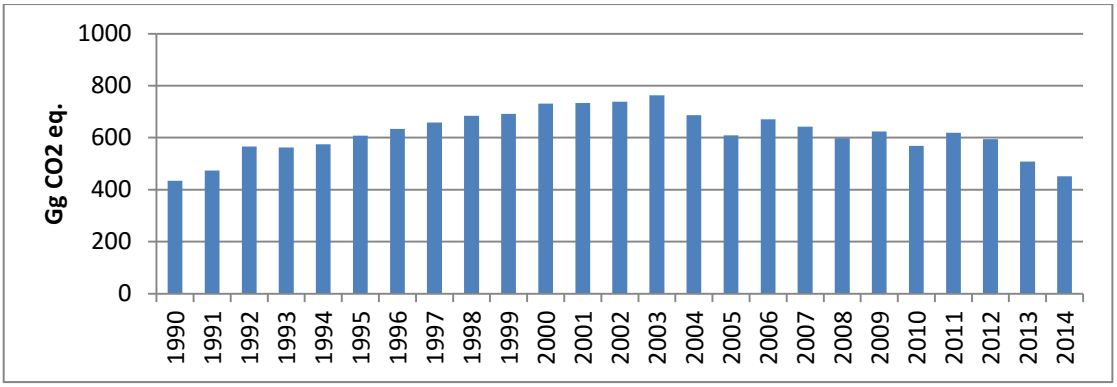

Figure 3.5. Other sectors (1A4) emissions 1990-2014

3.2.6.2. Methodological issues

Due to the unavailability of consumption data for several years and sectors, using the fuel consumption data as published by the Statistical Service, would create issues of consistence and comparability. Therefore it was decided to complete the period using assumptions. The activity data used for the estimation of GHG emissions of other sectors is presented in Table 3.25.

Gas biomass consumed by agriculture includes all biogas consumption. Diesel consumption by agriculture was revised to exclude diesel consumed for fishing (in red). Fuel consumption for fishing is added for the first time. Moreover RFO consumption by the commercial sector has been revised and Off-road Vehicles and Other Machinery (1A4c ii) consumption is included in road transport (1A3b).

Table 3.25. Fuel consumption for other sectors 1990-2014

	1990	1991	1992	1993	1994	1995	1996	1997	1998
1A4a Commercial / Institutional									
Gas-diesel oil (kt)	11	12	15	15	16	17	18	19	20
RFO (kt)	2	5	5	4	5	4	5	3	3
LPG (kt)	12	12	13	12	12	12	12	13	12
Solid biofuels (TJ)	19	15	15	15	11	12	17	9	8
Biogas (TJ)									
Charcoal (kt)	1	1	1	1	1	4	4	4	4
1A4b Residential									
Other kerosene (kt)	12	12	17	16	17	17	18	20	21
Gas-diesel oil (kt)	52	58	71	73	75	82	86	90	96
LPG (kt)	32	32	36	33	32	33	33	34	32
Solid biofuels (TJ)	126	105	103	102	74	79	119	61	56
Charcoal (kt)	1	1	1	1	1	4	4	4	4
1A4c Agriculture / Forestry / Fishing / Fish farms									
1A4c i Stationary									
Gas-diesel oil (kt)	14	16	20	20	21	23	24	25	27
LPG (kt)	0.9	0.9	1.0	0.9	0.9	0.9	0.9	1.0	0.9
Biogas (TJ)									
Solid Biomass (TJ)									
1A4c iii Fishing									
Gas-diesel oil (kt)	2	2	3	3	3	3	3	4	4

	1999	2000	2001	2002	2003	2004	2005	2006	2007
1A4a Commercial / Institutional									

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Gas-diesel oil (kt)	21	22	22	21	21	19	18	19	18
RFO (kt)	3	3	2	2	3	3	1	2	2
LPG (kt)	12	13	13	13	14	13	13	13	13
Solid biofuels (TJ)	11	10	10	10	9	8	7	5	14
Biogas (TJ)									
Charcoal (kt)	4	3	3	4	4	4	5	5	7
1A4b Residential									
Other kerosene (kt)	20	24	24	31	31	24	16	16	16
Gas-diesel oil (kt)	99	102	103	99	102	92	83	98	89
LPG (kt)	32	34	34	35	38	36	34	35	36
Solid biofuels (TJ)	77	68	70	64	58	53	51	74	95
Charcoal (kt)	4	3	3	4	4	4	5	5	6
1A4c Agriculture / Forestry / Fishing / Fish farms									
1A4c i Stationary									
Gas-diesel oil (kt)	27	28	29	27	28	25	24	25	25
LPG (kt)	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0
Biogas (TJ)								0	15
Solid Biomass (TJ)								5	
1A4c iii Fishing									
Gas-diesel oil (kt)	4	4	4	4	4	4	3	3	3

	2008	2009	2010	2011	2012	2013	2014
1A4a Commercial / Institutional							
Gas-diesel oil (kt)	20	19	23	20	16	14	13
RFO (kt)	2	2	2	2	3	3	1
LPG (kt)	14	13	13	14	14	12	11
Solid biofuels (TJ)	15	15	15	13	16	16	16
Biogas (TJ)		11	12	11	11	11	11
Charcoal (kt)	7	6	6	6	6	6	6
1A4b Residential							
Other kerosene (kt)	14	19	14	16	17	12	9
Gas-diesel oil (kt)	78	83	70	80	76	63	57
LPG (kt)	34	36	34	38	37	33	31
Solid biofuels (TJ)	123	222	84	123	143	112	71
Charcoal (kt)	6	5	5	6	6	6	7
1A4c Agriculture / Forestry / Fishing / Fish farms							
1A4c i Stationary							
Gas-diesel oil (kt)	23	20	19	22	21	21	19
LPG (kt)	1.0	1.0	1.0	1.0	1.0	1	0.0
Biogas (TJ)	78	209	274	448	476	466	464
Solid Biomass (TJ)							
1A4c iii Fishing							
Gas-diesel oil (kt)	3	4	4	3	3	2	2

The GHG emissions from other sectors were estimated according to the IPCC2006 guidelines. Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006

guidelines (Table 3.26). The oxidation factor used is 1, as proposed by the IPCC 2006 guidelines (pg. 1.20).The CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC2006 guidelines (IPCC2006, pg. 2.20-2.22, oil) as presented in Table 3.26.

Table 3.26. Parameters used for the estimation of emissions from other sectors

Fuel	NCV (TJ/kt)	kg CO_2 /TJ	kg CH_4 /TJ	kg N_2O /TJ
Diesel	43.0	74100	10	0.6
Other Kerosene	43.8	71900	10	0.6
LPG	47.3	63100	5	0.1
RFO	40.4	77400	10	0.6
Solid Biomass		100000	300	4
Charcoal	29.5	112000	200	1
Gas biomass		54600	5	0.1

3.2.6.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

3.2.6.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

3.2.6.5. Source-specific recalculations

RFO consumption by commerce has been revised due to the addition of Pulp, Paper and Print industries. Diesel consumption by agriculture has been revised to exclude the consumption for fishing, which is now reported separately.

3.2.6.6. Source-specific planned improvements

Improve collaboration between involved authorities of the government, to increase the accuracy in data collection.

3.2.7. Other (CRF 1A5)

3.2.7.1. Source category description

Fuel consumption not elsewhere specified, has been allocated to an additional category CRF 1A5. The emissions during the period 1990-2014 are presented in Table 3.27 and Figure 3.6.

Table 3.27. GHG emissions from Other (Not elsewhere specified-Stationary) 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 (Gg)	11.00	17.17	21.43	19.03	20.29	23.44	34.98
CH4 (Gg)	0.0015	0.0023	0.0029	0.0060	0.0062	0.0066	0.0048
N2O (Gg)	0.00009	0.00014	0.00017	0.00016	0.00018	0.00020	0.00029
Total (Gg CO2 eq.)	11.06	17.27	21.55	19.23	20.49	23.66	35.19

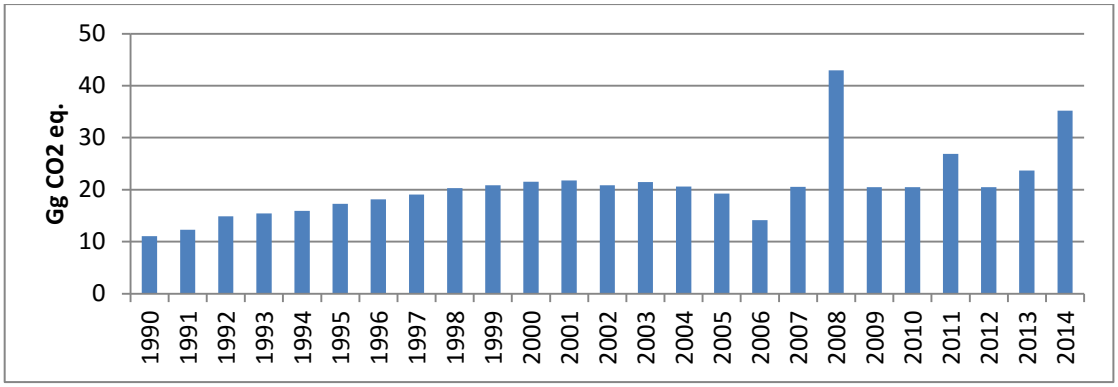

Figure 3.6. GHG emissions from Other (Not elsewhere specified-Stationary) (1A5) 1990-2014

3.2.7.2. Methodological issues

Data

Due to the unavailability of consumption data for several years and sectors, using the fuel consumption data as published by the Statistical Service, would create issues of consistence and comparability. Therefore it was decided to complete the period using assumptions. The activity data used for the estimation of GHG emissions of other sectors is presented in Table 3.28.

The consumption of lignite has been revised for the years 1990-2013 because there was a mistake identified in the transfer of the data. All fuel consumption is allocated to stationary consumption.

Table 3.28. Other non-specified fuel consumption 1990-2014

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Gas-diesel oil (kt)	3	4	5	5	5	5	6	6	6
Lignite (kt)	0	0	0	0	0	0	0	0	0
Jet kerosene (kt)	0	0	0	0	0	0	0	0	0

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Gas-diesel oil (kt)	7	7	7	7	7	6	6	4	6
Lignite (kt)	0	0	0	0	0	1	1	1	1
Jet kerosene (kt)	0	0	0	0	0	0	0	0	0

	2008	2009	2010	2011	2012	2013	2014
Gas-diesel oil (kt)	13	5	5	6	5	5	9
Lignite (kt)	1	1	1	1	1	1	0
Jet kerosene (kt)	0	1	1	2	1	2	2

Methodology

The GHG emissions were estimated according to the IPCC2006 guidelines. Fuel consumption was converted to TJ using the default NCV proposed by the IPCC 2006 guidelines (Table 1.23). The CO2, CH4 and N2O emissions were estimated using the default emission factors proposed by the IPCC2006 guidelines (volume 2, pg. 2.22) as presented in Table 3.29.

Table 3.29. Parameters used for the estimation of other emissions

Fuel	NCV (TJ/kt)	kg CO_2 /TJ	kg CH_4 /TJ	kg N_2O /TJ

Diesel	43.0	74100	10	0.6
Jet kerosene	44.1	71500	10	0.6
Lignite	11.9	101000	300	1.5
Solid Biomass	11.6	100000	300	4.0

3.2.7.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section1.7.

3.2.7.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section1.6.

3.2.7.5. Source-specific recalculations

Recalculations have been caused by the revision of lignite consumption due to the correction of a mistake identified in the transfer of the data.

3.2.7.6. Source-specific planned improvements

Improve collaboration between involved authorities of the government, to increase the accuracy in data collection.

3.2.8. Reference approach (CRF 1AB)

The Reference Approach requires statistics for production of fuels and their external trade as well as changes in their stocks. It also needs a limited number of figures for the consumption of fuels used for non-energy purposes where carbon may be stored. It uses a simple assumption: once carbon is brought into a national economy in fuel, it is either saved in some way (e.g., in increases of fuel stocks, stored in products, left unoxidised in ash) or it must be released to the atmosphere. The estimation process is divided in six steps that are described below.

Step 1: Estimation of apparent consumption

This step concerns the estimation of apparent consumption in natural units or in the units commonly used for the recording of the relative fuel amounts. For secondary fuels production data are not included in the apparent consumption calculation, since they are already accounted for in the primary fuel consumption, from which they derive. Therefore, the apparent consumption of primary fuels is estimated by the following equation:

Apparent consumption =Primary production + Imports - Exports - International bunkers + Stock change

The apparent consumption of secondary fuels is estimated by the following equation:

Apparent consumption = Imports - Exports - International bunkers + Stock change

Step 2: Conversion of fuel data to a common energy unit

The values were multiplied by the net calorific values listed in Table 3.30 to provide the energy consumed in TJ. The NCV values used were the defaults proposed by the IPCC 2006

guidelines (volume 2, pg. 1.18) except for pet-coke and other bituminous coal. Pet-coke and other bituminous coal are consumed only from one cement producing installation. Therefore the NCV implied by the annual reports submitted according to national ETS legislation (law no. 110(I)/2011), instead of the default proposed by the IPCC were used, which is available for the years 2000-2014; for the years 1990-1999 the NCV was assumed the same as 2000.A typing mistake was identified in the NCV for other bituminous coal for 2011 that was corrected.

Step 3: Estimation of carbon content

Total carbon included in each fuel is calculated by multiplying energy consumption by an emission factor (Table 3.30a and Table 3.30b) that reflects the amount of carbon per energy unit for each fuel. The result gives the maximum amount of carbon that could be potentially released if all carbon in the fuels were converted to CO_2. The carbon emission factor of fuels used in the reference approach, are based predominately on the 2006 IPCC guidelines. The exceptions are pet-coke and other bituminous coal. These fuels are consumed only from one cement producing installation. Therefore it was preferred to use the carbon emission factor implied by the annual reports submitted according to national ETS legislation (law no. 110(I)/2011), instead of the default proposed by the IPCC.

Step 4: Estimation of carbon stored in products

Depending on the end use, non-energy uses of fuels can result in the storage of some or all of the carbon contained in the fuel to the non-energy product. The non-energy consumption of fuels is multiplied by an emission factor that reflects the amount of the carbon content of the fuel stored in non-energy product. The result is the maximum amount of carbon that could potentially be sequestered if that amount of carbon were stored in the non-energy product. By subtracting this amount from the total carbon calculated in step 3, the amount of carbon that could be theoretically converted in CO_2 is calculated.

Step 5: Estimation of carbon unoxidised during fuel use

The amount of carbon that was previously calculated is reduced by a fraction of 1%, in order to take account of the fact that a small part of the fuel carbon entering combustion escapes oxidation. It is assumed that the carbon that remains unoxidised is stored indefinitely.

Step 6: Estimation of CO_2 emissions

Carbon emissions from all fuels are multiplied by 44/12 to be converted to CO_2 emissions and are summed giving the total amount of CO_2 released in the atmosphere. The emissions estimated with the reference approach are presented in Table 3.31. Detailed presentation of the results is available in Annex III. NCV of bituminous coal for 2011 was revised

Table 3.30. Net calorific value (TJ/kt) and carbon emission factors (t CO2/kt) of fuels consumed in Cyprus used for the reference approach

(a) Net calorific value (TJ/kt) and carbon emission factors (t CO2/kt) that remain constant for the period 1990-2013

	Conversion factor (TJ/kt)	Carbon emission factor (tC/TJ)
Crude oil	42.3	20.0

Gasoline	44.3	18.9
Jet kerosene	44.1	19.5
Other kerosene	43.8	19.6
Gas-diesel oil	43.0	20.2
Residual fuel oil	40.4	21.1
LPG	47.3	17.2
Bitumen	40.2	22.0
Lubricants	40.2	20.0
Pet-coke	32.5	table (b)
Other oil-refinery gas	49.5	15.7
Other oil-White spirit & SBP	40.2	20.0
Other bituminous coal	table (b)	table (b)
Lignite	11.9	27.6
Waste (non-biomass fraction)	10	25.0
Industrial waste	NA	39.0

(b) Net calorific value (TJ/kt) and carbon emission factors (t CO2/kt) that are not constant for the period 1990-2013

	1990-2004	2005	2006	2007	2008	2009
NCV (TJ/kt)						
Other bituminous coal	26.0	29.824	29.824	28.360	25.950	26.080
Implied CEF (tC/TJ)						
Pet-coke	23.047	23.047	24.160	24.659	24.486	25.578
Other bituminous coal	25.254	25.254	25.156	22.815	25.788	25.661

	2010	2011	2012	2013	2014
NCV (TJ/kt)					
Other bituminous coal	26.819	25.520	NO	NO	23.21
Implied CEF (tC/TJ)					
Pet-coke	25.515	25.301	24.795	25.238	25.583
Other bituminous coal	25.794	25.620	NO	NO	25.890

Table 3.31. Apparent consumption (TJ) and CO2 emissions (Gg) estimates according to the reference approach

	1990	1991	1992	1993	1994	1995	1996
Liquid Fuels							
Apparent consumption	54,413	56,077	65,228	69,960	79,824	69,164	77,171
CO2	4,049	4,193	4,794	5,140	5,853	5,090	5,670
Solid Fuels							
Apparent consumption	2,682	2,682	719	857	747	553	498
CO2	248	248	67	79	69	51	46
Biomass							
Apparent consumption	287	262	260	259	726	686	671
CO2	29	27	26	26	75	71	70
Waste (non-biomass fraction)							
Apparent consumption	NO	NO	NO	NO	NO	NO	NO
CO2	NO	NO	NO	NO	NO	NO	NO

	1997	1998	1999	2000	2001	2002	2003
Liquid Fuels							
Apparent consumption	75,396	80,331	80,895	86,793	85,796	86,919	95,075
CO2	5,535	5,880	6,038	6,317	6,252	6,339	6,983
Solid Fuels							
Apparent consumption	525	719	830	1,355	1,423	1,399	1,447

	1997	1998	1999	2000	2001	2002	2003
CO2	49	67	77	125	132	130	134
Biomass							
Apparent consumption	565	614	487	515	551	606	694
CO2	59	64	51	53	57	63	72
Waste (non-biomass fraction)							
Apparent consumption	NO	NO	NO	NO	18.00	NO	15.00
CO2	NO	NO	NO	NO	2.57	NO	2.15

	2004	2005	2006	2007	2008	2009	2010
Liquid Fuels							
Apparent consumption	88,710	90,431	94,032	98,797	104,335	102,219	98,350
CO2	6,450	6,546	6,873	7,249	7,636	7,518	7,143
Solid Fuels							
Apparent consumption	1,643	1,500	1,632	1,402	1,182	616	709
CO2	152	139	151	117	112	58	67
Biomass							
Apparent consumption	608	565	570	915	1,092	1,122	1,093
CO2	64	60	61	95	106	95	86
Waste (non-biomass fraction)							
Apparent consumption	71.00	138.00	73.00	288.00	239.00	276.00	299.00
CO2	10.15	19.73	10.44	41.18	34.18	39.47	42.76

	2011	2012	2013	2014
Liquid Fuels				
Apparent consumption	95,237	89,107	76,342	77,862
CO2	6,931	6,536	5,626	5,797
Solid Fuels				
Apparent consumption	318	12	12	96
CO2	30	1	1	9
Biomass				
Apparent consumption	1,289	1,188	1,197	1,336
CO2	88	75	77	90
Waste (non-biomass fraction)				
Apparent consumption	56.23	23.06	45.08	390.53
CO2	8.04	3.30	6.45	55.85

3.2.9. Comparison of the sectoral approach with the reference approach (CRF 1AC)

The data used in the reference and the sectoral approach and the resulting emissions are presented in Annex III. The comparison of the fuel consumption and the emissions is summarised in Table 3.32.

The reason for the small differences that occur between the two approaches is the statistical difference that exists in the energy balance, between the Gross inland deliveries (Calculated) and the Gross inland deliveries (Observed). For some fuels and years the statistical difference is extremely large. The statistical difference of the energy balance is presented in detail in Annex III.

Table 3.32. Difference between Reference and Sectoral Approach 1990-2014

	1990	1991	1992	1993	1994	1995	1996
Fuel consumption (PJ)							
Sectoral approach	52.0	58.7	63.5	65.6	68.5	67.2	71.0
Apparent energy consumption*	57.1	58.6	64.9	69.5	79.2	68.7	76.2

Difference	*9.9%*	*-0.1%*	*2.2%*	*6.0%*	*15.6%*	*2.2%*	*7.3%*
CO2 (Gg)							
Reference approach	2,324.2	2,127.5	2,605.0	2,796.5	3,112.2	2,572.6	3,358.5
Sectoral approach	3,895.6	4,423.6	4,748.1	4,927.0	5,134.3	5,038.7	5,288.9
Difference	*-40.3%*	*-51.9%*	*-45.1%*	*-43.2%*	*-39.4%*	*-48.9%*	*-36.5%*

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Fuel consumption (PJ)							
Sectoral approach	72.7	77.2	80.6	83.5	82.1	84.2	89.4
Apparent energy consumption*	74.6	79.4	79.6	85.9	85.3	85.9	94.4
Difference	*2.5%*	*2.8%*	*-1.3%*	*2.9%*	*3.9%*	*2.0%*	*5.6%*
CO2 (Gg)							
Reference approach	2,348.0	2,590.7	2,454.0	2,803.6	2,800.5	3,099.6	4,107.4
Sectoral approach	5,453.5	5,793.7	6,054.7	6,280.3	6,170.4	6,327.6	6,713.3
Difference	*-56.9%*	*-55.3%*	*-59.5%*	*-55.4%*	*-54.6%*	*-51.0%*	*-38.8%*

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Fuel consumption (PJ)							
Sectoral approach	91.3	93.4	94.3	98.5	100.8	100.2	97.2
Apparent energy consumption*	87.4	88.8	92.7	97.7	102.6	100.4	95.9
Difference	*-4.2%*	*-4.9%*	*-1.8%*	*-0.9%*	*1.8%*	*0.2%*	*-1.3%*
CO2 (Gg)							
Reference approach	5,749.6	6,704.9	7,034.0	7,407.6	7,781.9	7,615.9	7,253.2
Sectoral approach	6,872.9	7,048.9	7,228.9	7,544.8	7,707.4	7,631.3	7,402.0
Difference	*-16.3%*	*-4.9%*	*-2.7%*	*-1.8%*	*1.0%*	*-0.2%*	*-2.0%*

	2011	**2012**	**2013**	**2014**			
Fuel consumption (PJ)							
Sectoral approach	94.3	87.9	75.5	76.7			
Apparent energy consumption*	92.6	87.4	75.1	77.2			
Difference	*-1.7%*	*-0.6%*	*-0.6%*	*0.6%*			
CO2 (Gg)							
Reference approach	6,969.1	6,540.4	5,633.4	5,861.5			
Sectoral approach	7,111.3	6,621.0	5,674.0	5,883.0			
Difference	*-2.0%*	*-1.2%*	*-0.7%*	*-0.4%*			

* excluding non-energy use, reductants and feedstocks

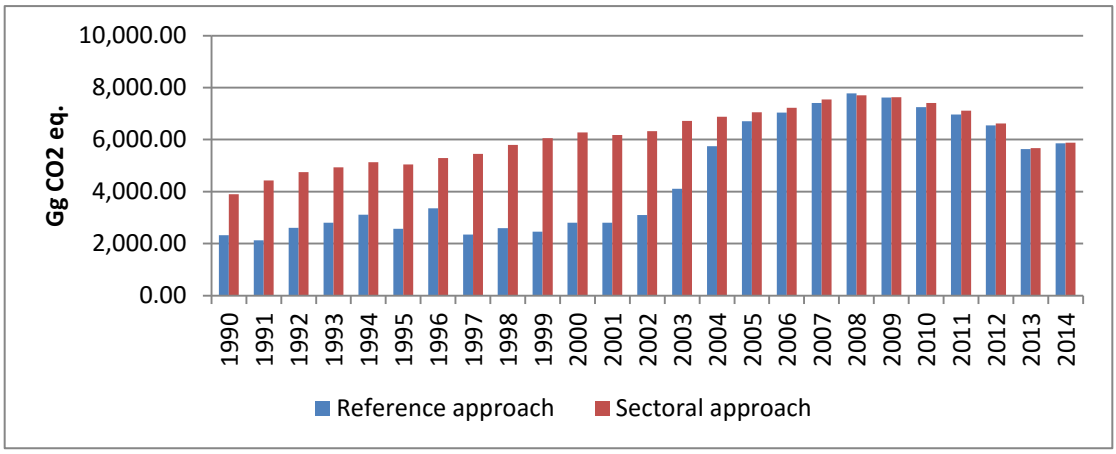

Figure 3.7. Emissions from fuel combustion using sectoral and reference approach

3.2.10. Feedstocks and non-energy use of fuels (CRF source 1AD)

Non-energy fuel use concerns the consumption of fuels as raw materials (e.g. in chemical industry, metal production) for the production of other products, or the use of fuels for non-energy purposes (e.g. bitumen). Part of the carbon content of fuels is stored in final products and is not oxidised into carbon dioxide for a certain time period. The fraction of the carbon contained in final products and the time period for which carbon is stored in them, depend on the type of fuel used and of the products produced.

The oxidation of the carbon stored in final products occurs either during the use of the product (e.g. solvents) or during their decomposition (e.g. through combustion). It should be noted that emissions from burning of products should be reported under the waste sector or energy sector (as long as energy exploitation takes place). In the case of Cyprus the products are used in the energy sector (it is assumed that 100% is collected and converted to fuel that is then consumed).

Non-energy use of fuels in Cyprus refers to the consumption of lubricants in transport and bitumen in construction. Data on the non-energy consumption of fuels was obtained from the national energy balance (Gross inland deliveries (Calculated)).

The calculation of carbon dioxide emissions from non-energy use of fuels is according to the methodology proposed by the IPCC2006 guidelines. NCVs, carbon emission factor and fraction of C stored are according to the guidelines (Table 3.33). Non-energy fuel use, carbon dioxide emissions and the amount of carbon stored in the final products are presented in Table 3.34.

The emissions are reported under 2D.The large difference that occurs for bitumen between the C stored estimated in Reference and 1AD between 1990-2004 is due to the production of bitumen by the refinery.

Table 3.33. Parameters used for the calculation of emissions

	Lubricants	**Bitumen**
NCV (TJ/kt)	40.2	40.2
Carbon emission factor (t/TJ)	20.00	22.00
Oxidation factor	1	1

Table 3.34. Fuel consumption, carbon stored and CO2 emissions for Feedstocks and non-energy use of fuels

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Lubricants							
Consumption (kt)	0	0	0	6	11	11	12
Carbon excluded (Gg)	0	0	0	4.824	8.844	8.844	9.648
CO_2 (Gg)	0.00	0.00	0.00	17.69	32.43	32.43	35.38
Bitumen							
Consumption (kt)	33	19	50	59	58	51	55
Carbon excluded (Gg)	29.19	16.80	44.22	52.18	51.30	45.10	48.64
CO_2 (Gg)	107.01	61.61	162.14	191.33	188.08	165.38	178.35

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Lubricants							
Consumption (kt)	11	4	5	7	9	8	8
Carbon excluded (Gg)	8.844	3.216	4.02	5.628	7.236	6.432	6.432

CO_2 (Gg)	32.43	11.79	14.74	20.64	26.53	23.58	23.58
Bitumen							
Consumption (kt)	60	75	86	85	81	84	69
Carbon excluded (Gg)	53.06	66.33	76.06	75.17	71.64	74.29	61.02
CO_2 (Gg)	194.57	243.21	278.88	275.64	262.67	272.40	223.75

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Lubricants							
Consumption (kt)	11	10	11	10	10	10	11
Carbon excluded (Gg)	8.844	8.04	8.844	8.04	8.04	8.04	8.844
CO_2 (Gg)	32.43	29.48	32.43	29.48	29.48	29.48	32.43
Bitumen							
Consumption (kt)	66	71	65	60	69	57	74
Carbon excluded (Gg)	58.37	62.79	57.49	53.06	61.02	50.41	65.45
CO_2 (Gg)	214.02	230.24	210.78	194.57	223.75	184.84	239.97

	2011	**2012**	**2013**	**2014**
Lubricants				
Consumption (kt)	10	9	7	7
Carbon excluded (Gg)	8.04	7.236	5.628	5.628
CO_2 (Gg)	29.48	26.53	20.64	20.64
Bitumen				
Consumption (kt)	64	35	26	22
Carbon excluded (Gg)	56.60	30.95	22.99	19.46
CO_2 (Gg)	207.54	113.50	84.31	71.34

3.2.11. CO_2 capture from flue gases and subsequent CO_2 storage

Not applicable.

3.2.12. Country-specific issues

Not applicable.

3.3. Fugitive emissions from solid fuels and oil and natural gas (CRF source 1B)

Activities related to primary production (extraction), processing, storage and transmission/ distribution of fossil fuels should be included in this sector. GHG released in the atmosphere during these operations is the direct result of leaks, disruptions and maintenance procedures. Moreover, the sector should also include emissions resulting from venting and flaring of gases that cannot be controlled by other means.

In Cyprus, there is no primary production of fuels or processing. There was one refinery in the country, which ceased its operation in 2004. Since then all fuels are imported. All transport of liquid fuels in Cyprus takes place by road transport. No central pipeline system is in place.

Based on the above, the fugitive emissions from oil for Cyprus are caused by refining. For refining, no emissions are reported after 2004 when the refinery stop operating (NO). Table 3.35 presents the emissions of the source. All emissions are methane emissions and are from refining activities (1B2A.4) and only occur during 1990-2004 when the refinery was operating.

Table 3.35. CH4 fugitive emissions from oil during 1990-2004, in tons

CH_4, t	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Refining	0.002	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.004	0.005

CH_4, t	2000	2001	2002	2003	2004
Refining	0.005	0.005	0.004	0.004	0.001

Methodological issues

GHG emissions from oil until 2004 when the refinery was operating are estimated according to the Tier 1 methodology described in the IPCC 2006 guidelines. The activity data used in presented in Table 3.36.

Table 3.36. Oil refined during 1990-2004, kt

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Oil refined, kt	743	891	849	912	1058	967	888	1218	1264	1379

	2000	2001	2002	2003	2004
Oil refined, kt	1370	1350	1269	1134	326

The activity data is from the energy balance of the National Statistical Service. The emission factor 0.00335[14]CH4 (t/m3) for oil refined is according to the IPCC 2006 guidelines, Table 4.2.4, pg. 4.53.

Uncertainties and time-series consistency

The uncertainty analysis of all sectors is presented in Section 1.7. Time-series consistency is ensured by (a) using the same source of data for all years and (b) using the same methodology for the estimation of emissions for all years.

Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

Source-specific recalculations

No recalculations.

Source-specific planned improvements

No source specific improvements are planned.

3.4. CO2 Transport and Storage (CRF source 1C)

Not applicable

[14] $(2.6+4.1)/2)x10^{-3}=0.00335$

3.5. Memo items (CRF source 1D)

Memo items are emissions from source that have to be estimated and reported but do not count towards the national total. The activities that occur in Cyprus are International bunkers (1D1) and CO2 from biomass (1D3). The emissions during the period 1990-2014 are presented below.

Table 3.37. Emissions from memo items (Gg CO2 eq.)

Gg CO2 eq.	**1990**	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
1D1. International bunkers	925	1034	1453	1780	1439	1547	1521
1D3. CO2 from biomass	17.9	33.3	29.1	44.1	142.6	142.6	144.8

3.5.1. International bunkers (CRF 1D1)

3.5.1.1. Source category description

According to the IPCC guidelines, fuels used for international transport should not be included in national totals of emissions from fuels used. However, the emissions from international bunkers should not be omitted entirely but reported separately. Emissions from international bunkers as estimated for the period 1990-2014 are presented in Table 3.38.

Table 3.38. Emissions from international bunkers 1990-2014

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO2 (Gg)	916	1024	1439	1763	1424	1531	1510
CH4 (Gg)	0.019	0.023	0.055	0.081	0.053	0.064	0.062
N2O (Gg)	0.028	0.029	0.043	0.053	0.046	0.048	0.034
Total (Gg CO2 eq.)	925	1034	1453	1780	1439	1547	1521
Gg CO2 eq.							
1D1a. International Aviation	739.4	814.6	839.7	852.8	842.9	782.4	783.0
1D1b. International Navigation	185.4	219.1	613.6	927.7	595.9	764.8	738.4

3.5.1.2. Methodological issues

Activity data used for the estimation of emissions from bunkers is presented in Table 3.39. Data for all fuels except jet-kerosene, was obtained from the energy balance of the national statistical service in kt of fuel consumed. Information on fuel consumption for domestic flights is not available from national statistics. To estimate the emissions from aviation, the available information on fuel consumption from EUROCONTROL was used for 2005-2014. To complete the time series back to 1990, it was assumed that domestic flights during the period 1990-2004 had the same contribution to the total consumption as 2005 (1.48%). Total consumption for 1990-2004 was obtained from the National Statistics.

NCV and emission factors (Table 3.40) are the defaults proposed by the IPCC 2006 guidelines; i.e. 44.1 TJ/kt, 71.5 t CO2/TJ, 0.5 kg CH4/TJ and 2 kg N2O/TJ.

All data and emission factors for jet kerosene have been revised due to the change of data source.

Table 3.39. Fuel consumption for international aviation and maritime activities 1990-2014 (kt)

kt	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Jet Kerosene	232.5	275.9	268.0	227.6	233.5	256.2	245.3	241.4	254.2	260.1
Gas/Diesel Oil	24	20	21	14	12	15	25	27	35	46
RFO	34	36	38	36	50	54	65	71	63	108

kt	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Jet Kerosene	264.0	309.4	297.5	318.2	290.6	264.2	266.4	262.4	272.3	257.4
Gas/Diesel Oil	50	47	33	36	27	67	106	104	88	73
RFO	143	145	105	88	27	225	190	171	165	146

kt	2010	2011	2012	2013	2014
Jet Kerosene	262.6	272.5	263.4	245.7	246.0
Gas/Diesel Oil	53	58	69	83	80
RFO	134	141	128	157	153

Table 3.40. Parameters used for the calculation of emissions

Fuel	NCV (TJ/kt)	kg CO2/TJ	kg CH4/ TJ	kg N2O/ TJ
Jet Kerosene	44.10	71500	0.5	2
Gas/Diesel Oil	43	74100	3.9	3.9
RFO	40.4	77400	3	0.6

3.5.1.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

3.5.1.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

3.5.1.5. Source-specific recalculations

Recalculations have been performed due to change in the method caused by new data that was obtained from EUROCONTROL for domestic and international aviation. In previous submissions LTO data was used and EFs based on LTOs. In this submission emission factors are according to the IPCC2006 guidelines.

3.5.1.6. Source-specific planned improvements

The options for improving the accuracy in fuel consumption are currently examined.

3.5.2. CO2 from biomass (CRF 1C3)

The total national CO2 emissions from biomass are presented in Table 3.41.

Table 3.41. Emissions from CO2 from biomass 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 from biomass (Gg)	17.9	33.3	29.2	44.1	142.6	142.6	144.8

3.5.2.1. Methodological issues

Methodological issues have already been described in the Sections where the biomass consumption occurs.

3.5.2.2. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

3.5.2.3. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

3.5.2.4. Source-specific recalculations

2013 consumption of liquid biomass has been revised by the statistical service leading to changes in the emissions of the particular year.

NCV of biodiesel has been revised from 27 TJ/kt (default IPCC 2006 guidelines) to country specific (37 TJ/kt) which was obtained from the national energy balance.

Chapter 4: Industrial processes (CRF sector 2)

4.1. Overview of sector

This chapter includes information on GHG emissions from Industrial processes and description of the methodologies applied per source for the calculation of emissions. The main industrial activities that take place in Cyprus are food and beverage processing, cement and gypsum production, light chemicals (predominately pharmaceuticals), metal and wood products. Therefore, the following source categories are applicable for Cyprus in this sector: Mineral products (2A), Non – energy products from Fuels and Solvent Use (2D), Product Uses as Substitutes for ODS (2F) and Other Product Manufacture and Use (2G). Activity data for Non – energy products from Fuels and Solvent Use is not available therefore emissions for source 2D have not been estimated.

4.1.1. Emissions trends

In 2014, GHG emissions from Industrial processes accounted for 16.3% of total emissions excluding LULUCF compared to 14% in 1990. The emissions have increased by 70% compared to 1990. 71.7% of the industrial processes emissions are from mineral production, 23.2% is from consumption of Halocarbons and SF6, 4.3% is from Other Product Manufacture and Use and the remaining 0.7% is from non-energy products from fuels and solvent use.

Table 4.1. Total GHG emissions (in Gg CO_2 eq) from Industrial Processes, 1990 – 2014

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO_2 (Gg)	765.5	851.8	857.6	911.8	601.8	774.6	995.0
N_2O (Gg CO_2 eq.)	41.3	46.2	49.1	52.4	59.1	60.4	59.6
HFCs (Gg CO_2 eq.)	0.15	8.9	20.0	90.9	245.4	323.9	319.8
SF6 (Gg CO2 eq.)	0.03	0.06	0.08	0.12	0.15	0.15	0.15
Total (Gg CO_2 eq.)	807.0	907.0	927.3	1055.2	906.5	1159.1	1374.6
2A. Mineral Industry	759.2	838.8	845.5	894.2	584.7	765.1	985.7
2D. Non-energy products	6.24	13.06	10.90	17.59	17.16	9.47	9.26
2F. Product Uses as Substitutes for ODS	0.15	8.9	20.0	90.9	245.4	323.9	319.8
2G. Other Product Manufacture and Use	41.3	46.3	49.2	52.5	59.2	60.5	59.8

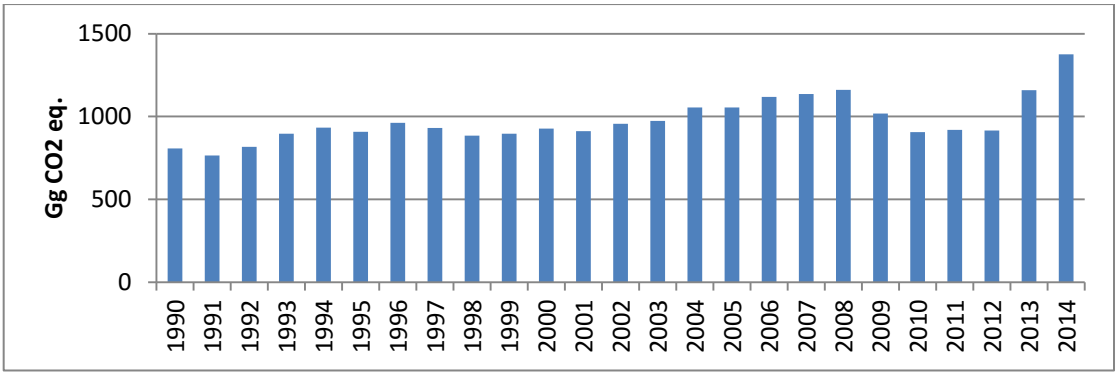

Figure 4.1. GHG emissions from Industrial Processes (sector 2) for the period 1990 – 2014

4.1.2. Methodology

The calculation of GHG emissions from Industrial Activities is based on the methodologies and emission factors suggested by the IPCC 2006 Guidelines and the GPG. Data used for the estimation on emissions was obtained from the National Statistical Service, and the installations (cement, lime, limestone and dolomite, and ceramics). Tier 1 method with default IPCC 2006 emission factors are used for all calculations. The methodologies and emission factors used are summarised in Table 4.2.

Table 4.2. Industrial processes – methodologies and emission factors applied

	CO_2		N_2O		HFC	
	Method	**EF**	**Method**	**EF**	**Method**	**EF**
2A1. Mineral Industry – cement production	CS	CS				
2A2. Mineral Industry – lime production	T1	D				
2A4a. Other Process - Ceramics	CS	CS				
2D1. Lubricant Use	D	D				
2D3. Solvent Use	CS	CS				
Urea-based catalysts	T1	D				
2F. Consumption of F-gases					CS	CS
2G3a. N_2O from products uses – medical applications			CS	CS		
2G3b. Propellant for pressure and aerosol products			CS	CS		
2G4. Other	CS	CS				

T1: IPCC methodology Tier 1; D: IPCC default methodology and emission factor; CS: Country specific

Key categories

The results of the key categories assessment are presented in Section 1.5.

Uncertainty

The uncertainty analysis is presented in Section 1.7.

4.1.3. Completeness

Table 4.3 gives an overview of the IPCC source categories included in this chapter and presents the status of emissions estimates from all sub-sources in industrial processes. The

CO2 emissions from asphalt roofing and road paving with asphalt have not been estimated due to lack of methodology. Emissions from food and drink production (2D2) is not available therefore emissions for source have not been estimated either. Several sources from Consumption of halocarbons & SF6 are also not reported due to lack of activity data.

Table 4.3. Industrial Processes – completeness

	CO_2	N_2O	HFC	PFC	SF_6
2A. Mineral products					
2A1.Cement production	✓				
2A2. Lime production	✓				
2A3. Glass production	NO				
2A4a. Other process Uses of Carbonates - Ceramics	✓				
2B. Chemical industry	NO				
2C. Metal Industry	NO				
2D1. Non-energy Products from Fuels and Solvent Use – Lubricant Use	✓				
2D2. Paraffin wax Use	IE				
2D3. Lubricant Use	✓				
2E. Electronics Industry			NO	NO	NO
2F. Product Uses as Substitutes for ODS					
2F1. Refrigeration & air conditioning			✓	NO	NO
2F2. Foam blowing agents			✓	NO	NO
2F3. Fire protection			✓	NO	NO
2F4a. Metered dose inhalers			✓	NO	NO
2F5. Solvents			NO	NO	NO
2G1. Electrical equipment			NO	NO	✓
2G3. N2O from product uses		✓	NO	NO	NO
2G4. Other	✓				

NO: Not occurring; IE: Included Elsewhere

4.2. Mineral products (2A)

The mineral products that are produced in Cyprus are cement, lime and ceramics. Other products that are consumed in Cyprus are limestone (only in cement and lime production - already accounted for in 2A1 and 2A2). The emissions estimated by product are presented in Table 4.4.

Table 4.4. Emissions from mineral products (Gg CO_2)

Gg CO2	1990	1995	2000	2005	2010	2013	2014
CO2	759	839	847	894	585	765	986
Total	759	839	847	894	585	765	986
2A1. Cement production	697	784	797	822	555	752	974
2A2. Lime production	5.5	4.5	5.6	12.4	7.4	2.8	2.5
2A4. Other Process Uses of Carbonates	56.8	50.4	44.2	60.0	22.2	10.0	9.4

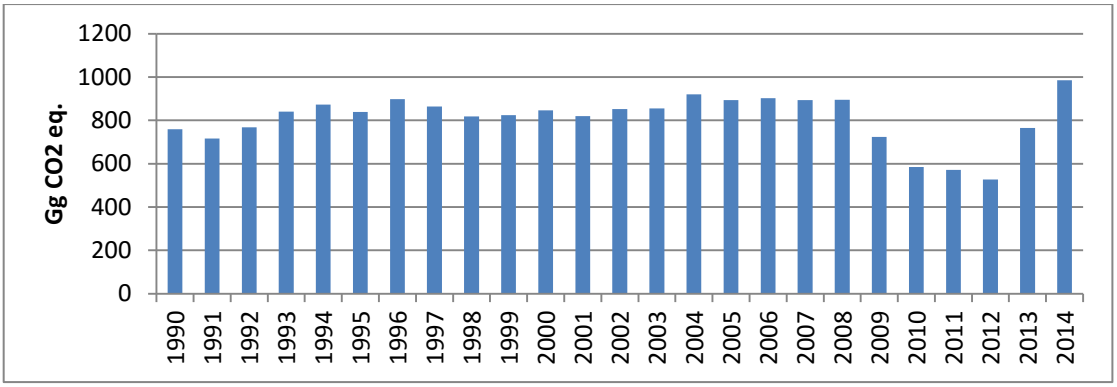

Figure 4.2. GHG emissions from Mineral products (2A) for the period 1990 – 2014

4.2.1. Methodological issues

Cement production (2A1)

Data for clinker production was obtained from the installations that operate in Cyprus (2 installations 1990-2011, one installation thereafter). Data was compared to the data reported by the statistical service and the data used by the department of Labour Inspection for the preparation of air pollutants inventories under Directive 2001/81/EC. The emission factor of 0.5581 tCO2/t clinker was used, which is the implied emission factor estimated from the CO2 process emissions reported by the two cement producing installations for the 2005 according to the ETS national law. The CO2 emissions from 2005 were used as reported by the installations for ETS purposes.

All the CKD is bound and recycled into the production process and that therefore emissions from CKD are not estimated, since no CKD is being exported from the system. According to the ETS inspectors this is the case for the two installations that were operating before 2011 and the one installation that has been operating since. The two installations operating before 2011 have been using the same production technologies and process.

The total clinker production and the reported process CO2 emissions are presented in Table 4.5. The activity data for 2005 and 2006 has been revised due to an identification of a mistake.

Table 4.5. Total clinker production (kt)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Clinker production (kt)									
Installation 1	353	390	380	382	383	369	359	374	337
Installation 2	895	786	902	1015	1083	1035	1158	1085	1045
Total	1249	1176	1282	1397	1466	1405	1516	1459	1382

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Clinker production (kt)									
Installation 1	334	362	361	373	363	367	330	365	350
Installation 2	1047	1065	1033	1059	1043	1142	1143	1177	1166
Total	1382	1428	1394	1432	1405	1509	1473	1542	1515
CO2 process emissions									
Installation 1 (t)							195	198	190
Installation 2 (t)							626	623	622
Total (Gg)							822	821	812

	2008	2009	2010	2011	2012	2013	2014
Clinker production (kt)							
Installation 1	368	231	260	76	0	0	0
Installation 2	1158	1033	783	961	953	1418	1822
Total	1526	1264	1043	1037	953	1418	1822
CO2 process emissions							
Installation 1 (t)	200	125	140	41	0	0	0
Installation 2 (t)	618	548	415	505	505	752	974
Total (Gg)	818	673	555	546	505	752	974

Lime production (2A2)

The activity data for lime production was obtained from the one installation in Cyprus that produces slaked lime. The emission factor chosen was the one for high calcium lime according to the 2006 IPCC Guidelines (volume 3, pg. 2.22, table 2.4), 0.75 t CO2/t lime produced.

Other process uses of carbonates – ceramics production (2A4)

The CO_2 process emissions from ceramics production were estimated following the methodology below:

(a) The activity data (Table 4.6) and CO_2 process emissions from the 8 ETS installations were tabulated. The years for which activity data and CO_2 emissions are available are 2001-2014. For 2001-2004 data was obtained during the preparation of the first ETS national allocation plan of Cyprus and for 2005-2014 the data was obtained from the verified emissions reports submitted annually according to the ETS legislation.

(b) Dividing the total CO_2 process emissions of the ETS installations by the total production, the annual implied emission factor was estimated for the years 2005-2014.

(c) The activity data for the non-ETS installation for the years 2001-2014 was estimated by subtracting from the total annual production of ceramics obtained from the Department of Labour Inspection, the total annual production of the ETS installations collected from (a).

(d) The CO_2 process emissions of the non-ETS installation for 2001-2014 were estimated by multiplying the implied emission factor estimated in (b) for 2003 (0.15988 tCO_2/t, which was the highest of the available emission factors) by the annual production.

(e) For the years 1990-2000 the total annual ceramics production data was obtained from the Department of Labour Inspection. For the estimation of total CO_2 process emissions, the highest emissions factor of the estimated ETS annual implied emission factor was used (0.15988 tCO_2/t product in 2003).

The reports for the ETS are prepared annually by the installations according to the EU regulations that are based on the IPCC methodologies. The latest regulation that is in force is no. 601/2012. The reports are also verified by an accredited verifier according to the national legislation (law no. 110(I)/2011).

According to information received from the two cement companies that existed before 2011 and one company that exists after 2011, the same production technologies were used and all the CKD was and is bound and recycled into the production process. Therefore emissions from CKD are not included in the EU ETS reports since no CKD is being exported from the system.

Table 4.6. Ceramics production (Gg)

	1990	1991	1992	1993	1994	1995	1996
Total production (Gg)	355	343	300	354	311	315	301
ETS production (Gg)							
Non-ETS production (Gg)							

	1997	1998	1999	2000	2001	2002	2003
Total production (Gg)	282	261	298	276	278	332	378
ETS production (Gg)					271	314	364
Non-ETS production (Gg)					6.3	17.9	13.7

	2004	2005	2006	2007	2008	2009	2010
Total production (Gg)	484	504	491	512	546	356	291
ETS production (Gg)	470	493	484	500	533	338	282
Non-ETS production (Gg)	13.6	10.8	7.8	12.0	13.0	17.8	9.3

	2011	2012	2013	2014			
Total production (Gg)	223	168	90	84			
ETS production (Gg)	211	162	90	84			
Non-ETS production (Gg)	11.5	6.3	0	0			

4.2.2. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

4.2.3. Source-specific QA / QC and verification

Cement production: the emissions estimated were compared to the verified emissions reported for ETS. Clinker production data was compared to the data reported by the statistical service and the data used by the department of labour inspection department for the estimation of air pollutants for the preparation of the air pollutants inventory for the purposes of Directive 2001/81/EC.

All the QA/QC and verification activities are presented in Section 1.6.

4.2.4. Source-specific recalculations

No recalculations to be reported.

4.2.5. Source-specific planned improvement

Cement production: improve data quality regarding the materials used in cement production to implement the detailed methodologies of the GPG for all years.

Ceramics production: improve methodology for the estimation of emissions to improve consistency.

4.3. Non-energy Products from Fuels and Solvent Use (CRF source category 2D)

4.3.1. Source category description

According to the 2006 IPCC Guidelines, lubricants are mostly used in industrial and transportation applications. In Cyprus, lubricants are consumed in transport. The total

emissions from lubricants use are presented in Table 4.7 and Figure 4.3. CO2 emissions from paraffin wax use (2D2) are included in other product use (2G4), while CO2 emissions from activities included in 2D3 are estimated for the first time.

Table 4.7. CO2 emissions from non-energy Products from Fuels and Solvent Use

	1990	1995	2000	2005	2010	2013	2014
2D1 Lubricant Use	NO	6.49	4.13	5.90	6.49	4.13	4.13
2D3 Other	6.24	6.57	6.77	11.69	10.67	5.34	5.13
TOTAL	6.24	13.06	10.90	17.59	17.16	9.47	9.26

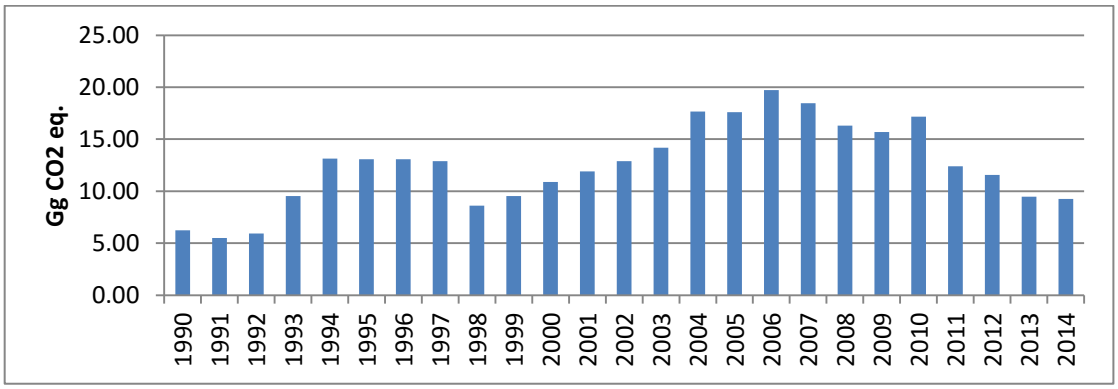

Figure 4.3. Emissions from non-energy Products from Fuels and Solvent Use(2D) 1990-2014

4.3.2. Methodological issues

2D1 Lubricant Use

Amount of lubricant consumption was obtained from Energy balance 2014 by the National Statistical Service. The calculation of CO2 emissions from Lubricants was estimated using Tier1 methodology suggested by the IPCC Guidelines (equation 5.2, pg. 5.7, volume 3).

CO2 Emissions = LC •CCLubricant•ODULubricant• 44 /12

Carbon content (*CCLubricant*) is assumed to be 20, as proposed by the IPCC 2006 guidelines (table 1.3, pg.1.21, volume 2) used for the calculations ODU factor is assumed to be 0.2, as proposed by the IPCC 2006 guidelines (table 5.2, pg. 5.9, volume 3).

2D3 Solvent Use

Carbon dioxide emissions from other product use are calculated from NMVOC emissions (Table 4.17), assuming that the carbon content of NMVOC is 60%[15]. NMVOC emissions are obtained from the Department of Labour Inspection that is responsible for the preparation of the air pollutants inventory for Directive 2001/81/EC. The estimation of NMVOC emissions is based on the CONINAIR methodology. Therefore assuming also that oxidation of carbon is 99%, the equation applied for the estimation of the CO_2 emissions is the following:

CO_2 emissions (Gg) = 60% * NMVOC emissions (Gg) * 44/12 * 99%

[15]2006 IPCC Guidelines volume 3, p. 5.17, the default fossil carbon content fraction of NMVOC is 60 per cent by mass

Table 4.8. NMVOCs emissions used for the estimation of CO2 emissions from Solvent use

	1990	1991	1992	1993	1994	1995	1996
Dry cleaning	0.2002	0.2003	0.2003	0.2004	0.2005	0.2005	0.2007
Coating applications	1.7387	1.4241	1.5170	1.5202	1.7083	1.7083	1.4097
Chemical products	0.0388	0.0388	0.0388	0.0413	0.0442	0.0442	0.0498
Asphalt roofing	0.0325	0.0325	0.0325	0.0325	0.0325	0.0325	0.0325
Domestic solvent use	0.1403	0.1441	0.1480	0.1513	0.1543	0.1543	0.1592
Road paving with asphalt	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075
Printing	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000

	1997	1998	1999	2000	2001	2002	2003
Dry cleaning	0.2008	0.2009	0.2012	0.2021	0.2005	0.2004	0.2001
Coating applications	1.5604	1.4476	1.4578	1.6020	1.4785	2.2579	2.8364
Chemical products	0.0474	0.0490	0.0512	0.0500	0.0597	0.0636	0.0625
Asphalt roofing	0.0325	0.0325	0.0325	0.0366	0.0298	0.0324	0.0308
Domestic solvent use	0.1614	0.1632	0.1650	0.1667	0.1686	0.1706	0.1728
Road paving with asphalt	0.0075	0.0075	0.0075	0.0084	0.0069	0.0075	0.0071
Printing	0.2000	0.2000	0.2242	0.2298	0.2604	0.2106	0.1975

	2004	2005	2006	2007	2008	2009	2010
Dry cleaning	0.1998	0.1930	0.1100	0.1110	0.0789	0.0602	0.0605
Coating applications	3.5522	3.8150	4.6373	4.3205	3.3507	3.1421	3.4997
Chemical products	0.0674	0.0574	0.0600	0.0580	0.0254	0.0278	0.0302
Asphalt roofing	0.0368	0.0293	0.0265	0.0246	0.0233	0.0396	0.0529
Domestic solvent use	0.1752	0.1778	0.1811	0.1856	0.1905	0.1958	0.2007
Road paving with asphalt	0.0085	0.0068	0.0061	0.0057	0.0054	0.0091	0.0122
Printing	0.2328	0.2360	0.2485	0.2189	0.3061	0.2233	0.2411

	2011	2012	2013	2014			
Dry cleaning	0.0600	0.0539	0.0265	0.0262			
Coating applications	1.5792	1.6311	1.4271	1.3023			
Chemical products	0.0137	0.0145	0.0120	0.0120			
Asphalt roofing	0.0516	0.0403	0.0213	0.0213			
Domestic solvent use	0.2060	0.2070	0.2051	0.2051			
Road paving with asphalt	0.0119	0.0093	0.0049	0.0049			
Printing	0.3275	0.2601	0.2027	0.2562			

Urea-based catalysts

This is the first submission for which emissions from urea-based catalysts have been estimated. The methodology applied is the recommended by the IPCC2006 guidelines (pg. 3.12, volume 2). More specifically equation 3.2.2 (emission=activity*12/60*purity*44/12) is applied. No national data is available, therefore (a) Activity data is estimated using the recommendation given in the guidelines, i.e. 1-3% of diesel consumption by vehicle; 2% is used.(b) Purity is assumed 32.5%, which is also recommended by the guidelines, i.e. 1-3% of diesel consumption by vehicle; 2% is used.

The diesel consumption used is the same as presented in Table 3.20. The resulting activity data used is presented in Table 4.9.

Table 4.9. Activity data used for estimation of emissions from Urea-based catalysts

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Activity (kt)	4.19	4.03	4.90	5.08	5.20	5.68	5.94	6.26	6.66	6.78

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Activity (kt)	6.99	7.09	6.81	7.01	7.07	6.91	6.45	6.73	6.58	6.39

	2010	2011	2012	2013	2014
Activity (kt)	6.56	6.24	5.43	4.61	4.47

4.3.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

4.3.4. Source-specific QA / QC and verification

All the QA/QC and verification activities are presented in Section 1.6.

4.3.5. Source-specific recalculations

Emissions from Urea-based catalysts have been estimated for the first time for the complete time-series.

4.3.6. Source-specific planned improvement

No planned source-specific improvements to report.

4.4. Product Uses as Substitutes for ODS (CRF source category 2F)

4.4.1. Source category description

According to the 2006 IPCC Guidelines there are five categories accounting for emissions from the use of fluorinated greenhouse gases (HFCs, PFCs, SF6; together called "F-gases"). In order to obtain a reliable estimation of F-gases emissions, the collection of detailed data for all the activities (e.g. number of refrigerators, type and amount of refrigerant used by each market label, substitutions of refrigerants that took place the late years etc.) is required. The availability of official data in Cyprus is limited and therefore the estimations presented hereafter include the application of country specific methodologies. The emissions have been recalculated for all sources of this sector.

The total emissions by gas and source for the period 1999-2014 are presented in Table 4.10 and Figure 4.4.

Table 4.10. Emissions from consumption of halocarbons 2000-2014

	1990	1995	2000	2005	2010	2013	2014
HFC-134a (t)		0.003	0.05	1.08	1.99	2.35	2.32
HFC-227ea (t)		0.002	0.09	0.38	0.84	1.04	1.02
Unspecified mix of HFCs (t CO2 eq.)	145.6	8926	19637	88156	239897	317282	313214
Total (Gg CO2 eq.)	0.15	8.94	20.00	90.93	245.43	323.98	319.83
t CO2 eq.							
2F1. Refrigeration and air conditioning	146	8926	19637	88156	239897	317282	313214
2F2. Foam Blowing Agents		4.71	67.5	408.6	822.9	971.5	959.1
2F3. Fire Protection		7.4	297	1239	2693	3338	3296
2F4. Aerosols				1131	2019	2388	2357

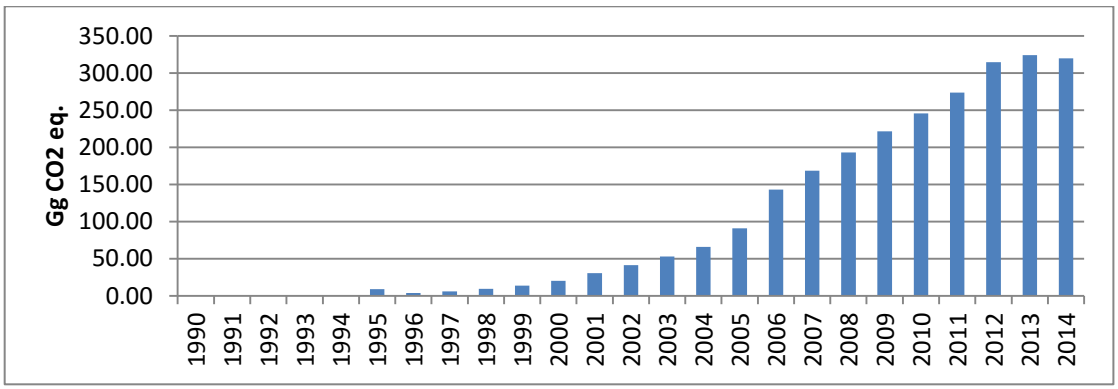

Figure 4.4. Emissions from consumption of halocarbons 2000-2014

4.4.2. Methodological issues

Due to insufficient information for a long period of time, it was decided to use a country specific methodology for the estimation of the emissions from Product Uses as Substitutes for ODS (2F).

The methodology applied consisted of the following steps:

(a) The stock emissions from the four sources (2F1, 2F2, 2F3 and 2F4) for Greece, Italy, Malta and Spain were obtained from the NIR2015 submissions to the UNFCCC for the years 1990-2013 (CRF – Table 2(II).B-H). The four countries were selected due to their similarity in social and economic conditions to Cyprus. Any fluorinated ozone-depleting substances (ODSs) not imported to Cyprus in bulk, as well as emissions other than those from stocks were disregarded in an effort to better historically match and appraise the situation.

(b) The amounts of substitutes of ODSs used by the four model countries were tabulated in tonnes and modified by their 100-year global warming potential (GWP) to calculate the t CO2equivalent emissions from each source. The substitutes of ODSs applicable to the estimation of emissions from stocks in Cyprus are listed in Table 1.4 (Section 1.4.3). The equivalent emissions are thus calculated as: substitute of ODS amount (t) × GWP (t CO2eq/t).

(c) The t CO2 equivalent emissions from each substance and 2F subcategory are, then, summed per year and divided by the average total population of each country obtained from EUROSTAT (Table 4.11) to provide for the annual per capita emissions (Table 4.12) for the years 1990-2013.

Table 4.11. Average total population used for the estimation of per capita emissions from 2F activities (EUROSTAT)

	1990	1991	1992	1993	1994	1995	1996
Greece	10196792	10319927	10399061	10460415	10512922	10562153	10608800
Italy	56719240	56758521	56797087	56831821	56843400	56844303	56860281
Malta	354170	357727	361260	364704	367941	370433	372687
Spain	38850435	38939049	39067745	39189400	39294967	39387017	39478186

	1997	1998	1999	2000	2001	2002	2003
Greece	10661259	10720509	10761698	10805808	10862132	10902022	10928070
Italy	56890372	56906744	56916317	56942108	56974100	57059007	57313203
Malta	375236	377516	379360	381363	393028	395969	398582
Spain	39582413	39721108	39926268	40263216	40756001	41431558	42187645

	2004	2005	2006	2007	2008	2009	2010
Greece	10955141	10987314	11020362	11048473	11077841	11107017	11121341
Italy	57685327	57969484	58143979	58438310	58826731	59095365	59277417
Malta	401268	403834	405308	406724	409379	412477	414508
Spain	42921895	43653155	44397319	45226803	45954106	46362946	46576897

	2011	2012	2013
Greece	11104899	11045011	10965211
Italy	59379449	59539717	60233948
Malta	416268	419455	423374
Spain	46742697	46773055	46620045

Table 4.12. Per capital emissions by source from 2F activities (kg CO2 eq.)

	1990	1991	1992	1993	1994	1995	1996	1997
2F1								
Malta	0	0	0	0	0.003	42.17	0.01	0.01
Spain	0.99	1.03	1.05	1.34	2.63	4.81	7.58	11.23
Italy	0	0.005	0.013	0.026	1.70	3.64	6.43	10.74
Greece	0	0	0	0.003	0.007	3.79	7.40	13.67
AVERAGE	0.25	0.26	0.27	0.34	1.09	13.60	5.35	8.91
2F2								
Malta	0	0	0	0	0	0.029	0	0
Spain	0	0	0	0	0	0	0	0
Italy	0	0	0	0	0	0	0	0
Greece	0	0	0	0	0	0	0	0
AVERAGE	0	0	0	0	0	0.007	0	0
2F3								
Malta	0	0	0	0.004	0.012	0.034	0.057	0.115
Spain	0	0	0	0	0	0	0	0
Italy	0	0	0	0	0	0	0.031	0.090
Greece	0	0	0	0.001	0.004	0.011	0.029	0.068
AVERAGE	0	0	0	0.001	0.004	0.011	0.029	0.068
2F4								
Malta	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0.059	0.122	0.129
Italy	0	0	0	0	0	0.003	0.004	0.003
Greece	0	0	0	0	0	0	0	0
AVERAGE	0	0	0	0	0	0.021	0.042	0.044

	1998	1999	2000	2001	2002	2003	2004	2005
2F1								
Malta	0.02	0.03	5.42	20.38	32.71	39.19	58.54	137.03
Spain	16.02	23.16	33.59	46.28	58.41	74.12	81.41	92.21
Italy	16.37	24.53	29.59	39.23	49.70	60.93	72.87	85.76
Greece	21.74	31.10	45.16	63.34	83.63	107.66	134.39	158.96
AVERAGE	13.54	19.71	28.44	42.31	56.11	70.47	86.81	118.49
2F2								
Malta	0	0	0	0	0.023	0.027	0.020	0.029
Spain	0	0	0	0	0	0.006	0.060	0.115
Italy	0.102	0.229	0.391	0.596	0.859	1.192	1.615	2.025
Greece	0	0	0	0.006	0.029	0.029	0.029	0.029
AVERAGE	0.025	0.057	0.098	0.151	0.228	0.313	0.431	0.549
2F3								
Malta	0.211	0.340	0.501	0.680	0.850	1.100	1.537	1.873
Spain	0	0.295	0.404	0.543	0.694	0.897	1.189	1.496
Italy	0.225	0.299	0.383	0.528	0.729	0.982	1.281	1.628
Greece	0.146	0.311	0.429	0.583	0.758	0.993	1.336	1.666
AVERAGE								
2F4								
Malta	0	0	0	0	0	0	8.184	10.501
Spain	0.105	0.099	0.120	0.120	0.101	0.092	0.100	0.087
Italy	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.004
Greece	0	1.528	2.053	2.605	2.338	3.504	4.024	4.468
AVERAGE	0.036	0.543	0.725	0.910	0.814	1.200	1.376	1.520

	2006	2007	2008	2009	2010	2011	2012	2013
2F1								
Malta	357.31	424.99	487.04	567.33	632.88	717.18	892.22	942.72
Spain	99.85	106.48	112.97	117.92	122.45	123.92	121.78	122.18
Italy	98.26	109.79	120.14	129.96	139.48	148.73	157.35	163.97
Greece	183.65	206.39	225.85	240.05	247.82	252.12	253.26	250.30
AVERAGE	184.77	211.91	236.50	263.82	285.66	310.49	356.15	369.79
2F2								
Malta	0.029	0.039	0.070	0.135	0.221	0.336	0.398	0.403
Spain	0.163	0.201	0.225	0.234	0.245	0.252	0.263	0.270
Italy	2.391	2.710	2.985	3.229	3.425	3.581	3.693	3.738
Greece	0.029	0.029	0.028	0.028	0.028	0.028	0.032	0.119
AVERAGE	0.653	0.745	0.827	0.907	0.980	1.049	1.097	1.132
2F3								
Malta	2.190	2.638	3.050	3.414	3.766	4.115	4.390	4.663
Spain	1.778	2.109	2.344	2.578	2.778	2.927	3.072	3.272
Italy	1.957	2.263	2.546	2.816	3.075	3.323	3.554	3.738
Greece	1.975	2.337	2.647	2.936	3.206	3.455	3.672	3.891
AVERAGE								
2F4								
Malta	9.704	9.177	14.120	5.369	6.753	7.654	8.439	6.161
Spain	0.069	0.065	0.072	0.072	0.050	0.025	0.014	0.014
Italy	0.003	0.004	0.005	0.005	0.004	0.004	0.004	0.004
Greece	4.401	5.680	6.253	7.258	7.157	7.070	6.415	8.330
AVERAGE	1.491	1.916	2.110	2.445	2.404	2.367	2.145	2.783

(d) The annual per capita emissions average of the four countries were, in turn, used to calculate the total t CO2 equivalent annual emissions from stocks in Cyprus, based on the population of Cyprus for each corresponding year (Table 4.13).

Table 4.13. Total population used for the estimation of emissions from 2F activities

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Population	10196792	10319927	10399061	10460415	10512922	10562153	10608800

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Population	10661259	10720509	10761698	10805808	10862132	10902022	10928070

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Population	10955141	10987314	11020362	11048473	11077841	11107017	11121341

	2011	**2012**	**2013**	**2014**
Population	11104899	11045011	10965211	10869637

(e) The emissions estimated have been reported in CRFreporter as an unspecified mix of hydrofluorocarbons, and divided in each sector (e.g. commercial, industrial refrigeration etc.) by factoring the t CO2 eq% contribution (Table 4.14) to their combined total annual emission estimated for Cyprus (**Error! Reference source not found.**).The emissions for 2014 were estimated assuming the same factors and contribution as 2013. Moreover, the following have been taken into account during the calculations:

- 2F2: According to the information submitted by the four countries and imports of bulk gases in Cyprus, all emissions have been assumed to be HCF-134a and from closed cells.
- 2F3: According to the information submitted by the four countries, all emissions have been assumed to be HFC-227ea.
- 2F4: For the source MDI-aerosols, only the emissions from Metered Dose Inhalers have been taken into account, since Aerosols do not occur in Cyprus. Moreover, according to the information submitted by the four countries, all emissions have been assumed to be HFC-134a.

Table 4.14. Contribution of activities to 2F emissions

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
2F1								
Commercial refrigeration	0%	0%	0%	6%	11%	22%	27%	31%
Domestic refrigeration	0%	0%	0%	0%	0%	0%	0%	0%
Industrial refrigeration	100%	99%	98%	77%	25%	16%	13%	11%
Transport refrigeration	0%	0%	0%	0%	1%	2%	3%	3%
Mobile air-conditioning	0%	1%	2%	16%	61%	59%	55%	53%
Stationary air-conditioning	0%	0%	0%	1%	1%	1%	2%	2%
2F2								
Closed cells	100%	100%	100%	100%	100%	100%	100%	100%
2F4								
Metered dose inhalers	100%	100%	100%	100%	100%	100%	100%	100%

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
2F1								
Commercial refrigeration	34%	39%	43%	47%	49%	52%	53%	54%
Domestic refrigeration	0%	0%	0%	0%	0%	0%	0%	0%
Industrial refrigeration	10%	9%	9%	9%	8%	8%	7%	7%
Transport refrigeration	3%	3%	3%	3%	2%	2%	2%	2%
Mobile air-conditioning	48%	41%	39%	35%	32%	28%	26%	24%

Stationary air-conditioning	5%	7%	6%	7%	8%	9%	11%	12%
2F2								
Closed cells	100%	100%	100%	100%	100%	100%	100%	100%
2F4								
Metered dose inhalers	100%	100%	100%	100%	100%	100%	100%	100%

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
2F1								
Commercial refrigeration	55%	55%	55%	56%	57%	57%	57%	58%
Domestic refrigeration	0%	0%	0%	0%	0%	0%	0%	0%
Industrial refrigeration	7%	6%	6%	7%	7%	7%	6%	6%
Transport refrigeration	2%	2%	2%	2%	2%	1%	1%	1%
Mobile air-conditioning	23%	22%	21%	19%	18%	17%	16%	16%
Stationary air-conditioning	13%	15%	16%	17%	17%	18%	18%	19%
2F2								
Closed cells	100%	100%	100%	100%	100%	100%	100%	100%
2F4								
Metered dose inhalers	100%	100%	100%	100%	100%	100%	100%	100%

Table 4.15. Total 2F emissions from Stocks estimated for Cyprus

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
2F1	146	156	164	216	700	8926	3567	6019	9243
2F2	0	0	0	0	0	4.71	0	0	17
2F3	0	0	0	0.87	2.60	7.42	19	46	99
2F4	0	0	0	0	0	14	28	30	25

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
2F1	13608	19638	29849	40049	50946	63629	88156	140036	164529
2F2	40	67	106	162	227	316	409	495	578
2F3	215	297	412	541	718	979	1239	1497	1814
2F4	375	501	642	581	867	1008	1131	1130	1488

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
2F1	188467	216091	239897	267642	308394	317282	313214
2F2	659	743	823	904	949	972	959
2F3	2109	2405	2693	2978	3179	3338	3296
2F4	1681	2003	2019	2040	1857	2388	2357

4.4.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

4.4.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

4.4.5. Source-specific recalculations

The emissions for the whole period have been recalculated due to change of methodology.

4.4.6. Source-specific planned improvement

Data collection will be improved to apply the appropriate IPCC methodologies.

4.5. Other Product Manufacture and Use (CRF source category 2G)

4.5.1. Source category description

According to 2006 IPCC Guidelines, electrical equipment is the largest consumer and most important use of SF6, globally. Due to insufficient data availability, it was decided to use a country specific methodology for the estimation of the emissions from 2G1 and 2G3. CO2 emissions from other product use (2G4) have been estimated from the NMVOCs emissions. The total emissions by gas and source for the period 1999-2014 are presented in Table 4.16 and Figure 4.5.

Table 4.16. Emissions from Other Product Manufacture and Use 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 (t)	58.4	17.5	163.0	43.8	32.9	23.0	9.1
N2O (t)	139	155	165	176	198	203	200
SF6 (t)	0.0011	0.0026	0.0033	0.0051	0.0066	0.0066	0.0065
Total (Gg CO2 eq.)	41.39	46.27	49.35	52.52	59.28	60.55	59.79
t CO2 eq.							
2G1. Electrical Equipment	0.03	0.06	0.08	0.12	0.15	0.15	0.15
2G.3a. Medical Applications	3.87	4.35	4.62	4.92	5.54	5.66	5.60
2G3b. Propellant for Pressure and Aerosol Products	37.4	41.8	44.5	47.4	53.5	54.7	54.0
2G4. Other	58.4	17.5	163.0	43.8	32.9	23.0	9.1

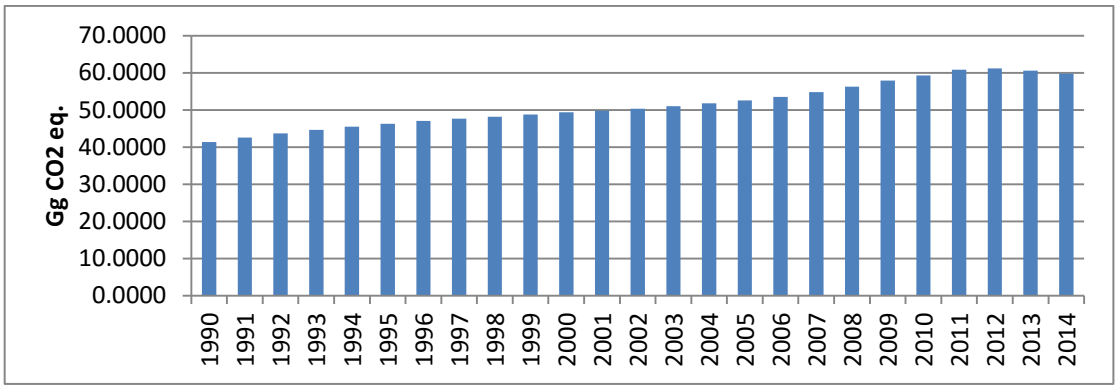

Figure 4.5. Emissions from Other Product Manufacture and Use 1990-2014

4.5.2. Methodological issues

Due to insufficient information for a long period of time, it was decided to use country specific methodologies for the estimation of the emissions from Other Product Manufacture and Use (2G). While the methodology applied for the estimation of emissions from N2O from Product Uses (2G3) is the same as in NIR2015, the methodology applied for the estimation of emissions from Electrical Equipment (2G1) has been revised. CO2 emissions from other product use (2G4) are estimated for the first time.

4.5.2.1. Electrical Equipment (2G1)

The methodology applied consisted of the following steps:

(a) The stock emissions from 2G1 for Greece, Italy, Malta and Spain were obtained from the NIR2015 submissions to the UNFCCC for the years 1990-2013 (CRF – Table 2(II).B-H). The four countries were selected due to their similarity in social and economic conditions to Cyprus.
(b) The amounts of SF6 used by the four model countries were tabulated in tonnes and modified by their 100-year global warming potential (GWP) to calculate the t CO2equivalent emissions. The ODSs applicable to the estimation of emissions from stocks in Cyprus are listed in Table 1.4 (Section 1.4.3). The equivalent emissions are thus calculated as: ODS amount (t) × GWP (t CO2eq/t).
(c) The t CO2 equivalent emissions are then divided by the average total population of each country obtained from EUROSTAT (Table 4.11) to provide for the annual per capita emissions (Table 4.17) for the years 1990-2013 for each country.

Table 4.17. Per capita emissions from 2G1 (kg CO2 eq.)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Malta	0.002	0.002	0.248	0.245	0.244	0.349	0.244	0.242
Spain	0.102	0.106	0.109	0.112	0.115	0.123	0.129	0.133
Italy	0.012	0.025	0.038	0.052	0.099	0.123	0.147	0.155
Greece	0.018	0.018	0.019	0.019	0.020	0.020	0.021	0.021
AVERAGE	0.033	0.038	0.103	0.107	0.119	0.154	0.135	0.138

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Malta	0.243	0.242	0.242	0.238	0.237	0.324	0.241	0.243
Spain	0.137	0.140	0.143	0.147	0.153	0.161	0.176	0.196
Italy	0.138	0.121	0.162	0.156	0.169	0.185	0.210	0.237
Greece	0.021	0.022	0.022	0.022	0.023	0.023	0.024	0.035
AVERAGE	0.135	0.131	0.142	0.141	0.145	0.173	0.163	0.178

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Malta	0.244	0.244	0.268	0.228	0.256	0.692	0.068	0.397
Spain	0.213	0.229	0.239	0.246	0.257	0.253	0.260	0.260
Italy	0.227	0.252	0.295	0.316	0.249	0.248	0.257	0.235
Greece	0.045	0.054	0.041	0.028	0.033	0.029	0.029	0.029
AVERAGE	0.182	0.195	0.211	0.204	0.199	0.306	0.153	0.230

(d) The annual per capita emissions average of the four countries were, in turn, used to calculate the total t CO2 equivalent annual emissions from stocks in Cyprus, based on the population of Cyprus for each corresponding year (Table 4.13).
(e) The emissions were converted back to t SF6 by dividing by the SF6 100 years GWP (22800).

4.5.2.2. N2O from Product Uses (2G3)

Evaporative emissions of nitrous oxide (N_2O) can arise from medical applications (anaesthetic use) and from propellant for pressure and aerosol products. An emission factor was multiplied by the population of Cyprus to estimate the total emissions for each source for the given year. The implied emission factor per capita from Greece NIR2013 was used, since the necessary activity data for Cyprus is not available to apply the IPCC methodologies. More specifically, for medical applications it was used 0.0222 kg N20/capita and for Propellant for Pressure and Aerosol Products (Aerosol cans) it was used (0.214 kg N20/capita).

4.5.2.3. Other (2G4)

Carbon dioxide emissions from other product use are calculated from NMVOC emissions (Table 4.17), assuming that the carbon content of NMVOC is 60%[16]. NMVOC emissions are obtained from the Department of Labour Inspection that is responsible for the preparation of the air pollutants inventory for Directive 2001/81/EC. The estimation of NMVOC emissions is based on the CONINAIR methodology. Therefore assuming also that oxidation of carbon is 99%, the equation applied for the estimation of the CO_2 emissions is the following:

$$CO_2 \text{ emissions (Gg)} = 60\% * \text{NMVOC emissions (Gg)} * 44/12 * 99\%$$

Table 4.18. NMVOCs emissions used for the estimation of CO2 emissions from other product use

	1990	1991	1992	1993	1994	1995	1996
NMVOC (kt)	0.0185	0.0185	0.0202	0.0056	0.0056	0.0056	0.0173

	1997	1998	1999	2000	2001	2002	2003
NMVOC (kt)	0.0193	0.0197	0.0275	0.0518	0.0159	0.0149	0.0107

	2004	2005	2006	2007	2008	2009	2010
NMVOC (kt)	0.0160	0.0139	0.0087	0.0091	0.0088	0.0098	0.0105

	2011	2012	2013	2014			
NMVOC (kt)	0.0086	0.0093	0.0073	0.0029			

4.5.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

4.5.4. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

4.5.5. Source-specific recalculations

The emissions for 2G4 the whole period have been recalculated due to change of the fossil carbon content fraction of NMVOC from 85% to 60%.

4.5.6. Source-specific planned improvement

Data collection will be improved to apply the appropriate IPCC methodologies.

[16] 2006 IPCC Guidelines volume 3, p. 5.17, the default fossil carbon content fraction of NMVOC is 60 per cent by mass

Chapter 5: Agriculture (CRF sector 3)

5.1. Overview of sector

In this chapter, GHG emissions estimates from the sector Agriculture are presented and the calculation methodologies per source category are described. According to the IPCC Guidelines, the following source categories are included in this sector: Enteric fermentation (3.A), Manure management (3.B), Rice cultivation (3.C), Agricultural soils (3.D), Prescribed burning of savannas (3.E), Field burning of agricultural residues (3.F), Liming (3.G), Urea Application (3.H), Other Carbon-containing fertilizers (3.I). In Cyprus, activities 3C (rice cultivation), 3E (prescribed burning of savannas), 3G (Liming) and 3I (other carbon-containing fertilizers) do not take place and are therefore reported as NO.

5.1.1. Emission trends

Emissions from Agriculture accounted for 7% of total emissions in 2014 (without LULUCF), compared to 9.5% in 1990. Emissions increased by 4.5% compared to 1990. The peak of Agriculture emissions was in 2002 (724 Gg CO2 eq.) when an increase of 35% compared to 1990 was observed. Since 2002 a reduction in emissions was observed, due to the reduction of N_2O emissions from agricultural soils, because of the reduction in the use of synthetic nitrogen fertilisers. The reduction of the use of fertilisers was caused by the drought that was taking place during the same period that had an extreme in 2008. Further reduction was caused by the recent changes in manure management. Agriculture is responsible for mainly methane and nitrous oxide emissions. In 2014 agriculture has contributed 42% to the total methane emissions and 58% to the total nitrous oxide emissions. The total emissions by gas and source from agricultural activities for the period 1990-2014 in Cyprus are presented in Table 5.1 and Figure 5.1.

Table 5.1. GHG emissions from Agriculture, for the period 1990 – 2014

Year	**1990**	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CO_2 (Gg)	1.82	1.54	1.67	0.97	0.74	0.79	0.41
CH_4 (Gg)	12.5	14.9	15.4	15.9	16.5	14.6	14.7
N_2O (Gg)	0.75	1.00	0.84	0.78	0.77	0.64	0.65
Total (Gg CO_2 eq.)	535.8	672.3	638.2	630.2	643.7	556.4	559.9
3A. Enteric fermentation	199.6	225.3	227.5	231.8	238.8	227.7	233.1
3B. Manure management	183.9	233.1	252.4	253.7	256.7	207.0	206.1
3D. Agricultural soils	150.0	212.2	156.3	143.5	147.2	120.7	120.1
3F. Field burning of agricultural residues	0.45	0.26	0.36	0.23	0.27	0.24	0.22
3H. Urea application	1.82	1.54	1.67	0.97	0.74	0.79	0.41

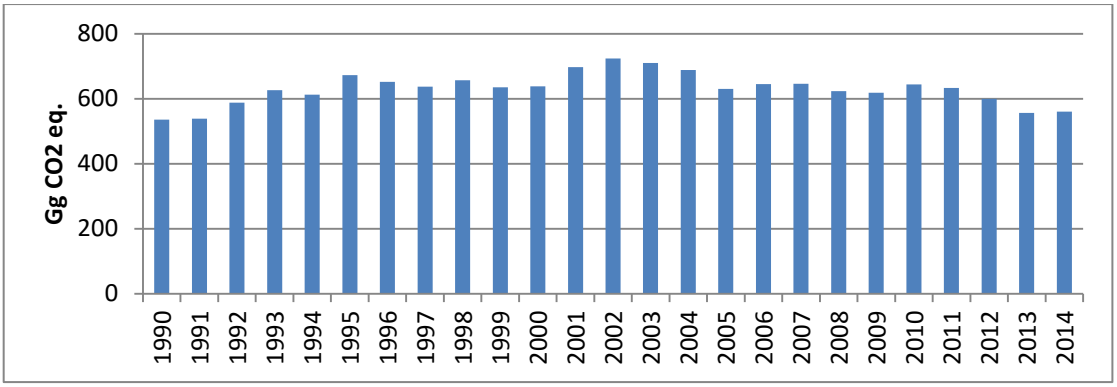

Figure 5.1. Emissions from Agriculture, 1990 – 2014

5.1.2. Methodology

The calculation of GHG emissions from Agriculture is based on the methodologies and emission factors suggested by the IPCC Guidelines. Data used for the estimation of the emissions was obtained from the National Statistical Service. Tier 1 method with default IPCC 2006 emission factors are used for all calculations except enteric fermentation emissions from dairy cattle that are estimated using Tier 2. The methodologies and emission factors used are summarised in Table 5.2.

Table 5.2. Agriculture – methodologies and emission factors applied

Source category	CO_2		CH_4		N_2O	
	Method	**EF**	**Method**	**EF**	**Method**	**EF**
3.1.A1. Livestock - Enteric fermentation – dairy cattle			T2	CS		
3.1.A1.Livestock - Enteric fermentation – non-dairy cattle, sheep, market swine and breeding swine, goats, horses, mules and asses			T1	D		
3.1.B1. Livestock - Manure management - dairy cattle, non-dairy cattle			T2	D	T1	D
3.1.B1. Livestock - Manure management - sheep, market swine and breeding swine, goats, horses, mules and asses and poultry			T1	D	T1	D
3.1.C. Rice cultivation			NO			
3.1.D. Agricultural soils – Inorganic N Fertilizers					T1	D
3E. Prescribed burning of savannahs			NO		NO	
3F. Field burning of agricultural residues			T1	D	T1	D
3G. Liming	NO					
3H. Urea Application	T1	D				
3I. Other Carbon – containing Fertilizers						

T1, T2: IPCC methodology Tier 1, 2 respectively; D: IPCC default methodology and emission factor;

Key categories

The results of the key categories assessment are presented in Section 1.5.

Uncertainty

The uncertainty analysis is presented in Section 1.7.

5.1.3. Completeness

Table 5.3 gives an overview of the IPCC source categories included in this chapter and presents the status of emissions estimates from all sub-sources in agriculture. Methane emissions from agricultural soils are not estimated since appropriate methodologies have not been developed yet.

Table 5.3. Agriculture – Inventory completeness

Source category	CO_2	CH_4	N_2O
3A. Enteric fermentation		✓	
3B. Manure management		✓	✓
3C. Rice cultivation		NO	
3D. Agricultural soils		NE	✓
3E. Prescribed burning of savannahs		NO	NO
3F. Field burning of agricultural residues		✓	✓
3G. Liming	NO		
3H. Urea Application	✓		
3I. Other Carbon – containing Fertilizers	NO		

NO: Not occurring; NE: Not estimated due to method unavailability

5.2. Enteric fermentation (CRF source category 3A)

5.2.1. Source category description

Methane is produced during the normal digestion of food by herbivorous animals and the amount emitted depends on the animal species, their digestive system and feed intake.

Enteric fermentation (CH_4 emissions) has been assessed as a key category according to the level and trend. Tier 1 methodology is applied and the default emission factors suggested by the IPCC Guidelines are used for the estimation of methane emissions from enteric fermentation for non-dairy cattle, sheep, goats, horses, mules and asses and swine. The emissions from dairy cattle are estimated using Tier 2 methodology. Poultry emissions were not estimated, since an emission factor is not available in the IPCC guidelines.

Methane emissions from enteric fermentation in 2014 account for 64% of total GHG emissions from Agriculture, 27% of the total methane emissions excluding LULUCF. Methane emissions from enteric fermentation are presented in Table 5.4 and Figure 5.2.

Table 5.4. CH_4 emissions from enteric fermentation for 1990 – 2014

	1990	1995	2000	2005	2010	2013	2014
CH_4 (kt)	7.99	9.01	9.10	9.27	9.55	9.11	9.32

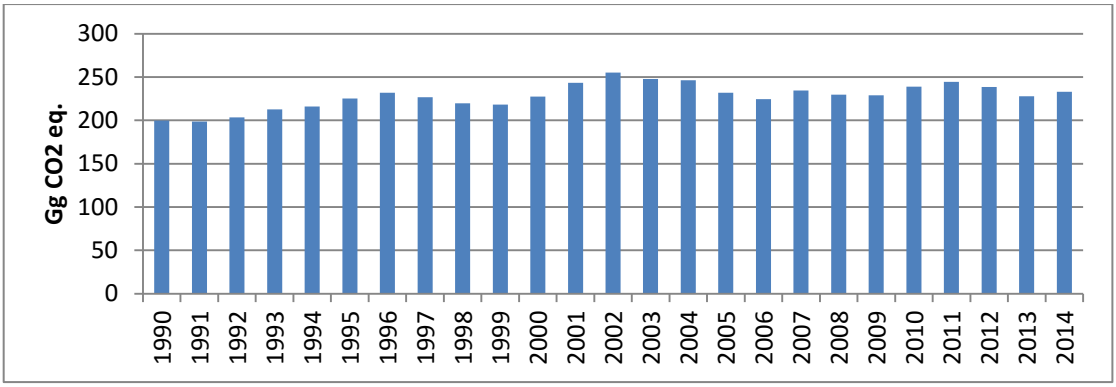

Figure 5.2. Emissions from enteric fermentation, 1990 – 2014

5.2.2. Methodological issues

Tier 1 methodology is applied and the default emission factors suggested by the IPCC Guidelines are used for the estimation of methane emissions from enteric fermentation for non-dairy cattle, sheep, goats, horses, mules and asses and swine. The emissions from dairy cattle are estimated using Tier 2 methodology. Poultry emissions were not estimated, since an emission factor is not available in the IPCC guidelines.

Activity data

The animal population used for the calculation of methane emissions from enteric fermentation is the annual average and it is presented in Table 5.5. The source of animal population is the Department of Agriculture, except mules and asses that is not available from national statistics and was obtained from FAOSTAT[17]. There are some changes in the animal population after 2011. The changes are marked with red.

Table 5.5. Animal population for 1990 – 2014 (in 1000s)

	Dairy cattle	Other cattle	Market swine (all except sows)	Breeding swine (sows)	Sheep	Goats	Horses	Mules and Asses
1990	22.4	32.3	244.2	33.8	290.0	205.0	5.5	6.7
1991	23.1	31.9	258.7	37.6	295.0	205.0	5.5	6.7
1992	23.9	31.9	299.5	42.4	285.0	200.0	5.5	6.7
1993	25.6	35.5	325.8	43.6	275.0	198.0	5.5	6.7
1994	27.6	36.8	308.2	48.0	255.0	210.0	5.5	6.7
1995	29.5	38.6	325.7	48.4	250.0	220.0	5.5	6.7
1996	27.3	42.8	350.7	48.9	252.0	240.0	5.5	6.7
1997	25.5	36.9	361.5	53.3	245.0	302.0	5.5	6.7
1998	23.8	32.0	381.5	49.8	240.0	322.0	5.5	6.7
1999	24.1	30.2	374.3	44.2	233.0	346.0	5.5	6.7
2000	23.5	30.7	356.3	52.1	246.0	378.6	5.5	6.7
2001	24.4	29.1	395.6	55.7	296.6	427.1	5.5	6.7
2002	26.2	31.9	435.1	56.3	294.0	459.5	6.0	6.7
2003	26.6	31.9	432.5	55.6	264.6	407.9	5.5	6.7
2004	26.1	34.2	418.8	51.7	279.0	378.0	5.5	6.7
2005	24.6	33.0	379.1	50.6	268.9	329.3	5.5	6.7

[17]FAO estimate, http://faostat3.fao.org/download/FB/FBS/E

	Dairy cattle	Other cattle	Market swine (all except sows)	Breeding swine (sows)	Sheep	Goats	Horses	Mules and Asses
2006	23.9	32.2	399.7	53.0	272.2	344.9	5.5	6.7
2007	23.7	31.2	413.0	54.0	292.2	368.1	5.0	6.7
2008	23.6	32.0	416.6	48.3	267.3	318.4	5.0	6.7
2009	23.2	30.9	416.2	47.0	300.2	280.8	5.0	6.7
2010	23.4	31.3	417.4	46.3	328.9	307.4	5.0	6.7
2011	24.1	32.8	398.7	40.5	355.9	290.2	5.0	6.7
2012	24.1	32.8	358.4	36.3	346.8	271.2	5.0	6.7
2013	24.7	32.5	322.8	35.1	313.5	243.1	5.0	6.7
2014	25.3	34.2	308.1	34.0	322.4	240.0	5.0	6.7

Dairy cattle, Tier 2

Methane emissions from the enteric fermentation of dairy cattle are estimated according to the Tier 2 IPCC methodology, as it is described in the IPCC Guidelines (pg. 10.31, volume 4). The calculation of the CH_4 emission factor for is based on the following equation (eqn 10.21, pg. 10.30, volume 4):

$$EF = [[(GE * (YM/100) * 365\ days/yr] / 55.65\ MJ/kg\ CH_4]$$

where EF is the estimated emission factor for CH4 (kg CH_4/head/yr), GE is the gross energy intake (MJ/head/day) and Ym is the methane conversion rate which is the fraction of the gross energy in feed converted to CH_4.The calculation of gross energy is based on the following equation (eqn 10.16, pg. 10.21, volume 4):

$$GE = \{[(NE_m + NE_a + NE_l + NE_{work} + NE_p) / REM] + [(NE_g + NE_{wool}) / REG]\} / (DE\% / 100)$$

where NE_m is the net energy required for animal maintenance in MJ/day, NE_a is the net energy for animal activity in MJ/day, NE_l is the net energy for lactation in MJ/day, NE_{work} is the net energy for work, NE_p is the net energy required for pregnancy in MJ/day, REM is the ratio of the net energy available in a diet for maintenance to digestible energy consumed, NE_g is the net energy for growth in MJ/day, $NE_{wool}$is the net energy required to produce a year of wool, REG is the ratio of net energy available for growth in a diet to digestible energy consumed and DE% is the digestible energy expressed as a percentage of gross energy.

The dairy cattle population used for the calculation of methane emissions from enteric fermentation is presented in Table 5.6. Information for average weight (W), live body weight (BW), mature body weight (MW), milk production and digestibility of feed has been obtained from the Department of Agriculture[18]. The remaining parameters have the value of the default proposed by the IPCC GPG. The fat percentage in milk is assumed 3.5% taking into account the suggestion that was made during the volunteered participation of Cyprus in the Effort Sharing Decision review (ESD review) that was took place last year. Table 5.6 presents the values used for the calculations, while Table 5.7 presents the daily milk production and the % pregnant population. The resulting Gross energy (GE) and the emissions factors (EFs) for the period 1990-2014 are presented in Table 5.8.

[18]Mr. George Papaioannou, Agricultural Officer, Department of Agriculture, tel. no. +357 22408566

GE estimates have been revised due to the Identification of a mistake in the calculations. More specifically, it was found that GE was calculated with constant milk production of 1990 instead of annual milk production, which was corrected in this submission. The revised GE and the respective EF estimated are presented in Table 5.8

Moreover, GE estimates have been affected of the change of DE from 60 to 68.

Table 5.6. Information for the application of Tier 2 methodology for dairy cattle

Parameter	Value	Source
Average weight (W), kg	550	Department of Agriculture
Net energy maintenance coefficient (Cf_i)	0.386	IPCC Guidelines (cattle, Table 10.4, pg. 10.16, vol. 4)
Activity coefficient (C_a)	0.00	IPCC Guidelines (stall, Table 10.5, pg. 10.17, vol. 4)
Live body weight (BW), kg	550	Department of Agriculture
Growth coefficient (C)	0.8	IPCC Guidelines (eqn.10.6, pg. 10.17, vol. 4)
Mature body weight of an adult animal (MW), kg	550	Department of Agriculture
Daily weight gain (WG), kg/day	0	IPCC Guidelines (footnote 1, pg. 10.12,vol.4)
Fat in milk	3.5%	Recommendation which was identified by technical Expert review team during the ESD trial Review
Hours of work / day	0	Department of Agriculture
$C_{pregnancy}$	0.10	IPCC Guidelines (table 10.7, pg.10.20, vol.4)
Digestibility of feed, DE	68	recommendation of the review expert of the TERT (comment no. CY-3A-2016-0002)
CH4 conversion rate (Ym)	0.065	IPCC Guidelines (table 10.12, pg.10.30, vol.4)

Table 5.7. Daily milk production per dairy cow (kg) and per cent pregnant population of cows in Cyprus

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
Milk production (kg/day/cow)	12.22	12.30	12.25	12.60	12.49	12.90	13.84	14.30	15.40
% pregnant population*	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
Milk production (kg/day/cow)	15.07	17.07	15.89	14.77	16.71	15.86	16.41	17.01	16.65
% pregnant population	81.3	81.3	81.3	81.3	81.3	81.3	80.3	80.7	79.4

Year	2008	2009	2010	2011	2012	2013	2014
Milk production (kg/day/cow)	17.64	17.95	17.64	17.42	17.29	16.96	17.18
% pregnant population	77.6	76.3	76.3	72.2	72.2	72.2	72.2

* No data available for 1990-2003, 2010 and 2011. 1990-2003 assumed that is equal to 2004, 2010 assumed equal to 2009 and 2011, 2013 and 2014 assumed equal to 2012.

Table 5.8. Gross energy (GE) and emissions factor (EF) for dairy cattle for the period 1990 – 2014

Year	1990	1991	1992	1993	1994	1995	1996
GE (MJ/head/day)	212.6	213.2	212.8	215.4	214.6	217.6	224.5
EF (kg CH_4/head/yr)	90.6	90.9	90.7	91.8	91.5	92.8	95.7

Year	1997	1998	1999	2000	2001	2002	2003
GE (MJ/head/day)	228.0	236.1	233.6	248.4	239.7	231.4	245.8
EF (kg CH_4/head/yr)	97.2	100.6	99.6	105.9	102.2	98.7	104.8

Year	2004	2005	2006	2007	2008	2009	2010
GE (MJ/head/day)	239.5	243.4	248.0	245.2	252.3	254.4	252.1
EF (kg CH_4/head/yr)	102.1	103.8	105.7	104.5	107.5	108.4	107.5

Year	2011	2012	2013	2014
GE (MJ/head/day)	250.0	249.0	246.6	248.3
EF (kg CH_4/head/yr)	106.6	106.2	105.1	105.8

Non-dairy cattle, sheep, goats, horses, mules and asses and swine; Tier 1

The methane emission factors used for enteric fermentation of non-dairy cattle, sheep, goats, horses, mules and asses and swine for the application of the Tier 1 methodology, are according to the IPCC 2006 guidelines (volume 4, pg. 10.29, Table 10.11) and are presented in Table 5.9.

Poultry emissions were not estimated, since an emission factor is not available in the IPCC guidelines (volume 4, pg.10.28, Table 10.10).The animal populations used are presented in Table 5.5.

Table 5.9. Methane emission factor applied for enteric fermentation, according to animal

	Emission factor (kg CH_4/head)	Source
Non-dairy cattle	57	IPCC 2006, pg10.29@ volume 4, western Europe*
Sheep	8	IPCC 2006, pg10.28@ volume 4, developed
Goats	5	IPCC 2006, pg10.28@ volume 4, developed
Horses	18	IPCC 2006, pg10.28@ volume 4, developed
Mules and asses	10	IPCC 2006, pg10.28@ volume 4, developed
Swine	1.5	IPCC 2006, pg10.28@ volume 4, developed
Poultry	Insufficient data for calculation	IPCC 2006, pg10.28@ volume 4

* Milk production closer to North America but production system as west Europe

5.2.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in section 1.7.

5.2.4. Source-specific QA/QC and verification

QA/QC and verification activities are presented in section 1.6.

5.2.5. Source-specific recalculations

Recalculations that took place have been caused by (a) the change of the daily weight gain, the % fat in milk,(b) the change of fat percentage in milk and (c) correction of the calculations

of GE for dairy-cattle. The recalculations have affected the whole reporting period, i.e. 1990-2014.

Change of the daily weight gain

Taking into account that dairy cattle, following the IPCC definition comprises mature animals that have reach their maximum weight, the daily weight gain (WG) is assumed 0 (footnote 1, pg.1.12, volume 4, IPCC Guidelines).

Change of the fat percentage in milk

The fat percentage in milk is assumed 3.5% taking into account the recommendation that was made during the volunteered participation of Cyprus in the 2015 Effort Sharing Decision review (ESD review).

Correction of the calculations of GE for dairy-cattle

GE estimates have been revised due to the identification of a mistake in the calculations. More specifically, it was found that GE was calculated with constant milk production of 1990 instead of annual milk production, which was corrected in this submission. GE estimates have been also been affected by the change of DE from 60 to 68.

5.2.6. Source-specific planned improvements

Source specific improvements are planned to improve data accuracy for the dairy cattle category concerning the average weight.

5.3. Manure management (CRF source category 3B)

5.3.1. Source category description

Animal waste management in Cyprus[19]

Most small-scale pig farms in Cyprus use mechanical separation for the treatment of their waste. The separated liquid is sent to evaporation lagoons or is used for irrigation, and the solid fraction is used as soil improver. Nine large pig farms have installed a combination of anaerobic / aerobic treatment plants (Anaerobic digestion). The treated liquid fraction is used for irrigation or washing the housing areas or placed in evaporation lagoons. The produced biogas is combusted onsite by Combined Heat Power generators for the production of heat and electricity. Both heat and electricity are consumed at the farms. Any excess electricity is sold to the electricity provider and directed to the electricity distribution network. Heat is not distributed outside the farm because there is no heat distribution network in Cyprus. The emissions from the electrical energy from the biogas used onsite and offsite has been taken into account in the energy sector according to the national energy balance.

The waste from cattle, sheep, goats, horses, mules and asses are collected and left to dry before applied on land for soil improver (Solid storage and dry lot). Poultry waste is

[19] Kythreotou, N., G. Florides, S.A. Tassou, 2010. Production and management of biodegradable waste in Cyprus a paper published in the proceedings of SEEP2010 Conference Proceedings, June 29th– July 2nd 2010, Bari, Italy

characterised by high content of solids (almost dry) and it is collected, left to dry and then used as soil improver (Solid storage and dry lot).

Manure management is responsible for methane and nitrous oxide emissions. Methane is produced during the anaerobic decomposition of manure, while nitrous oxide is produced during the storage and treatment of manure before its use as fertilizer.

Emissions from manure management in 2014 accounted for 2.5% of the total national emissions without LULUCF. CH_4 and N_2O from manure management in 2014 accounted for 36.4% and 37.7% of GHG emissions from Agriculture respectively. Total emissions in 2014 increased by 12% compared to 1990 levels. CH_4 and N_2O emissions from manure management for the period 1990 – 2014 are presented in Table 5.10 and Figure 5.3.

Table 5.10. CH_4 and N_2O emissions from manure management for 1990 – 2014

	1990	1995	2000	2005	2010	2013	2014
CH4 (kt)	4.46	5.92	6.33	6.61	6.99	5.52	5.33
N2O (kt)	0.24	0.29	0.32	0.30	0.27	0.23	0.24
Total (CO2 eq)	183.95	233.07	252.40	253.72	256.73	207.01	206.10

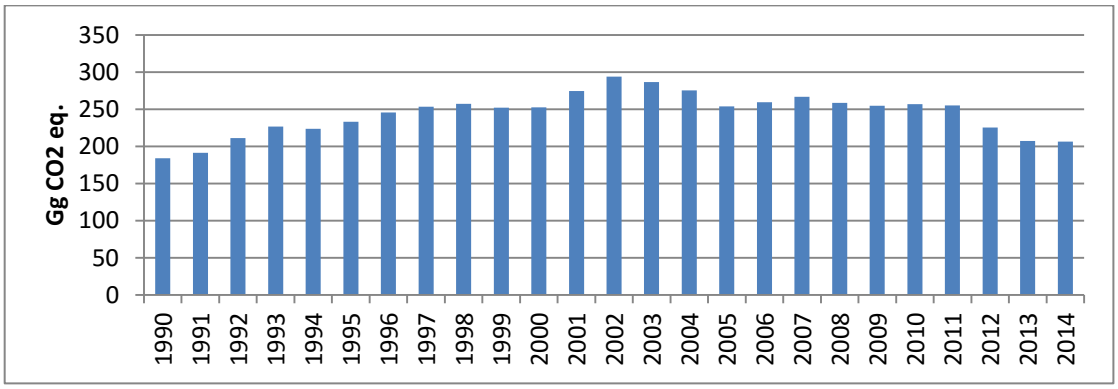

Figure 5.3. Emissions from manure management, 1990 – 2014

5.3.2. Methodological issues

The amount of methane emitted by a population of animals is calculated by multiplying the emission rate per animal by the number of animals. Tier 1 methodology is a simplified approach that relies on default emission factors drawn from previous studies. The Livestock population used has been already presented in Table 5.5.

3B1. CH_4 emissions

The EFs for manure management were chosen according to the manure management practices that are applied in Cyprus for the particular specie[20]. The following emission factors were used for the estimation or methane from manure management (Table 5.11):

[20]The choice for the EFs was based on discussions with Mr. Antis Athanasiades the responsible officer for manure management at the Department of Environment (aathanasiades@environment.moa.gov.cy, +35722408935).

- For sheep, goats, horses, mules and asses, laying chicken, broiler chicken, turkeys and other poultry, EFs for temperate developed countries were used (0.28, 0.2, 2.34, 1.1 and 0.03, 0.02, 0.09, 0.03 kg CH_4/head/yr respectively), as indicated in Table 10.15 of the IPCC2006 guidelines volume 4 (pg.10.40).
- For dairy and non-dairy cattle, Tier 2 methodology was applied using the following parameters:MCF: Solid 4% (IPCC 2006 Guidelines, Table 10.17), anaerobic digesters 2% (Common loss from anaerobic digesters (eg. Germany and Austria)); Volatile substance excretion (VS): Dairy cattle 4.5 kg/head/day, Non-dairy cattle 2.7 kg/head/day (IPCC 2006 Guidelines, Tables 10A-4 and 10A-5, Eastern Europe); B0: Dairy cattle 0.24, Non-dairy cattle 0.17(IPCC 2006 Guidelines, Tables 10A-4 and 10A-5, Eastern Europe).
- For swine, EF for temperate Western Europe were used (13 kg CH_4/head/yr), as indicated in Table 10.14 of the IPCC2006 guidelines volume 4 (pg. 10.38).

Table 5.11. Emission factors used for the estimation of methane emissions from manure management

Animal	kg CH_4/head/yr	Source
Sheep	0.28	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate
Goats	0.20	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4– developed countries, temperate
Swine	13	Table 10.14, pg.10.38, IPCC 2006 guidelines, volume 4 – western Europe, temperate*
Horses	2.34	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate
Mules and asses	1.10	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate
Laying chicken	0.03	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate/dry
Broiler chicken	0.02	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate
Turkeys	0.09	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate
Other Poultry	0.03	Table 10.15, pg.10.40, IPCC 2006 guidelines, volume 4 – developed countries, temperate/ducks

* Manure management practices for swine used in Cyprus are more appropriate to be categorised under Western Europe.

3B2. Direct N_2O emissions

To estimate the direct N_2Oemissions from manure management three steps were applied, according to the Tier 1 methodology: (a) estimation of annual nitrogen excretion per animal type (kg Nex/year), (b) allocation of waste to waste management system used, (c) estimation of annual nitrogen excretion per waste management system (kg N ex/year), and (d) estimation of N2O emissions using kgN2O-N/kg Nex factors per technology. These steps are summarised in the equation below:

$$N_2O_{D(mm)} = [\Sigma_s[\Sigma_T(N_{(T)} * N_{ex(T)} * MS_{(T,S)})] * EF_{3(S)}] * 44/28$$

where $N_2O_{D(mm)}$ is direct N2O emissions, $N_{(T)}$ is the number of head of livestock species, Nex_T the annual average N excretion per head of species, $MS_{(T,S)}$ the fraction of total annual excretion for each livestock species that is managed in system S, $EF_{3(S)}$ is the N_2O emission factor for system S (equation 10.25, pg.10.54, volume 4, IPCC guidelines).

(a) Estimation of annual nitrogen excretion rates $N_{ex(T)}$ (kg N ex/year)

The annual nitrogen excretion rate per animal type using the nitrogen excretion rates (kg N ex/animal/year) is shown in Table 5.12. These are the defaults proposed by the IPCC methodologies. The Nitrogen excretion rate has been determined by the IPPC 2006 Guidelines equation 10.30, pg. 10.57.The animal population used is presented in Table 5.5. It should be noted that Cyprus has used Western Europe default values for N excretion and Eastern Europe default values for CH4 for manure management. The reason of different approach is that manure management practises for cattle waste used in Cyprus are more appropriate to be categorised under Eastern Europe. However for the calculation of the N2O emissions from manure management, the factor has been changed to Western Europe, due to the high milk production, based on the comment received by the UNFCCC review team in 2013.

Table 5.12. Default values for Nitrogen excretion rate (IPCC 2006 guidelines, volume 4, table 10.19, pg. 10.59)

Animal	Default values for Nitrogen excretion rate (kg N /animal/day)
Dairy Cattle	0.48
Non-Dairy Cattle	0.33
Market swine	0.51
Breading swine	0.42
Sheep	0.85
Poultry	0.83
Goats	1.28
Horses	0.26
Mules and asses	0.26

Table 5.13. Waste management per technology contribution

Animal	1990-2000	2001	2002	2003	2004	2005	2006
Dairy Cattle							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%
Anaerobic digestion	0%	0%	0%	0%	0%	0%	0%
Non-Dairy Cattle							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%
Anaerobic digestion	0%	0%	0%	0%	0%	0%	0%
Sheep							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%
Goats							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%
Horses							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%
Mules and asses							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%
Market Swine							
Aerobic treatment	100%	97%	94%	91%	88%	85%	82%
Anaerobic digestion	0%	3%	6%	9%	12%	15%	18%
Breading Swine							
Aerobic treatment	100%	97%	94%	91%	88%	85%	82%
Anaerobic digestion	0%	3%	6%	9%	12%	15%	18%
Poultry							
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	98%
Anaerobic digestion	0%	0%	0%	0%	0%	0%	2%

Animal	2007	2008	2009	2010	2011	2012	2013	2014
Dairy Cattle								
Solid storage and dry lot	100%	99%	99%	99%	99%	97%	97%	95%
Anaerobic digestion	0%	1%	1%	1%	1%	3%	3%	5%
Non-Dairy Cattle								
Solid storage and dry lot	100%	99%	99%	99%	99%	97%	97%	95%
Anaerobic digestion	0%	1%	1%	1%	1%	3%	3%	5%
Sheep								
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%	100%
Goats								
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%	100%
Horses								
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%	100%
Mules and asses								
Solid storage and dry lot	100%	100%	100%	100%	100%	100%	100%	100%
Market Swine								
Aerobic treatment	79%	76%	73%	70%	70%	60%	60%	70%
Anaerobic digestion	21%	24%	27%	30%	30%	40%	40%	30%
Breading Swine								
Aerobic treatment	79%	76%	73%	70%	70%	60%	60%	70%
Anaerobic digestion	21%	24%	27%	30%	30%	40%	40%	30%
Poultry								
Solid storage and dry lot	96%	94%	92%	90%	90%	90%	90%	90%
Anaerobic digestion	4%	6%	8%	10%	10%	10%	10%	10%

(b) Allocation of waste to waste management system used

The distribution of waste to the waste management systems has been estimated based on the information presented in Table 5.13.

(c) Estimation of annual nitrogen excretion per waste management system (kg N ex/year)

The annual nitrogen excretion per waste management system is estimated by multiplying the % of waste allocated to a particular system by the annual nitrogen excretion per animal type estimated in step (a).

(d) Estimation of N_2O emissions using kgN_2O-N/kg Nex factors per technology.

The total annual nitrogen excretion per waste management system (regardless animal type) is then multiplied by the kgN2O-N/kg N ex coefficient, to estimate the N_2O emissions. The kgN2O-N/kg N ex coefficients used are presented in Table 5.14.

Table 5.14. kgN_2O-N/kg N ex coefficients per technology used

Animal	kgN_2O-N/kg N ex	Source
Solid storage and dry lot	0.005	2006 IPCC Guidelines, volume 4, pg. 10.62, table 10.21
Aerobic treatment (forced aeration)	0.005	
Anaerobic digestion	0.000	

3B2.5. Indirect N_2O emissions from Manure Management

I. Indirect N_2O emissions from volatilisation of N from Manure Management

To estimate the indirect N2O emissions from manure management four steps were applied, according to Tier 1 methodology: (a) Estimation of annual nitrogen excretion per animal type

(kg N ex/year), (b) Allocation of waste to waste management system used, (c) Estimation of amount of manure nitrogen that is lost due to volatilisation (d) Estimation of N2O emissions using the totals volatilisation N-losses (kg N/yr). The indirect N2O emissions were estimated using the following equation (eqn. 10.27, pg. 10.56, volume 4 IPCC guidelines):

$$N_2O_{G(mm)} = (N_{volatilisation-MMS} * EF_4) * 44/28$$

where $N_2O_{G(mm)}$ is indirect N2O emissions, $N_{volatilisation-MMS}$ is the amount of manure nitrogen that is lost due to volatilisation and EF_4 is the N2O emission factor for system S.

Estimation of annual nitrogen excretion per animal type (kg N ex/year)

The annual nitrogen excretion per animal type using the nitrogen excretion rates (kg N ex/animal/year) is shown in Table 5.12. These are the defaults proposed by the IPCC methodologies. The animal population used is presented in Table 5.5.

Allocation of waste to waste management system used

The distribution of waste to the waste management systems has been estimated based on the information presented in Table 5.13.

Estimation of amount of manure nitrogen that is lost due to volatilization

The annual amount of manure nitrogen that is lost due to volatilisation ($N_{volatilisation-MMS}$) is estimated by multiplying the % of waste allocated to a particular waste management system by the annual nitrogen excretion per animal estimated in step (a) and by multiplying the % of managed manure nitrogen for livestock category T in the manure system S ($Frac_{GASMS}$ (%)). The per cent of managed manure nitrogen for livestock is presented in Table 5.15.

Estimation of N2O emissions using the totals volatilisation N-losses (kg N/yr)

The total annual amount of manure nitrogen that is lost due to volatilisation ($N_{vol.atilization-MMS}$) is multiplied by the emission factor for N2O emissions from atmospheric deposition of nitrogen on soils and water surfaces (EF_4) to estimate the N2O emissions. The emission factor used is 0.01 kg N2O-N (default value). The equation used to estimate the indirect N2O emissions from volatilisation summarised in the equation below:

$$N_2O_{G(mm)} = (N_{volatilisation-MMS} * EF_4) * 44/28$$

Table 5.15. Default values for volatilisation N losses.

Animal	Manure management system	N volatilisation losses
Dairy cattle	Solid storage	38%*
	Anaerobic digestion	0%
Non-dairy cattle	Solid storage	38%*
	Anaerobic digestion	0%
Market swine	Anaerobic digestion	0%
	Aerobic treatment	0%
Breeding swine	Anaerobic digestion	0%
	Aerobic treatment	0%
Sheep	Solid storage	12%**
Goats	Solid storage	12%**
Horses	Solid storage	12%**
Mules and Asses	Solid storage	12%**

Poultry	Solid storage	12%**
	Anaerobic digestion	0%

* The average of 30% and 45% was used as default value due to the fact in Cyprus dairy and non-dairy cattle are in same farm; ** No default available for this animal - use other. IPCC guidelines, volume 4, pg. 10.65, table 10.22

II. Indirect N_2O emissions from leaching and runoff of nitrogen from manure management

Indirect N2O emissions from leaching and runoff of nitrogen from manure management have been estimated using eqns. 10.28 and 10.29 (pg. 10.56 - 10.57, vol.4) of the IPCC 2006 guidelines.

The annual nitrogen excretion per animal type using the nitrogen excretion rates (kg N ex/animal/year) is shown in Table 5.12. These are the defaults proposed by the IPCC methodologies. The animal population used is presented in Table 5.5.

Per cent of managed manure nitrogen losses for livestock category T due to runoff and leaching during solid and liquid storage of manure (Frac(leachMS)) used is 10%, since the typical range proposed by the guidelines is 1-20% (pg. 10.56, vol.4).

The default emission factor for N2O emissions from nitrogen leaching and runoff, kg N2O-N/kg N leached and runoff (EF5) proposed by the IPCC guidelines is used, 0.0075 kg N2O-N (kg N leaching/runoff)-1 (Chapter 11, Table 11.3).

5.3.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

5.3.4. Source-specific QA/QC and verification

QA/QC and verification activities are presented in Section 1.6.

5.3.5. Source-specific recalculations

The changes in the emissions' estimates compared to the previous submission are the following:

(a) T2 methodology has been applied for the estimation of CH4 emissions from dairy and other cattle. In previous submissions T1 was used.
(b) Revised calculations have been made for N2O emissions from sheep, swine and goats for the whole time series of emissions due to the fact that the sum of manure excretion over the different manure management systems did not match the total N excreted by the animals.
(c) Revised calculations have been made for N2O emissions per technology and N2O emissions per animal, due to the mistake identified to the conversion of (N2O-N) emissions to N2O emissions (44/26 change into 44/28).
(d) Indirect N2O emissions from leaching and runoff of nitrogen from manure management have been estimated for the first time.

5.3.6. Source-specific planned improvements

The possibility of applying Tier 2 methodology for the estimation of methane emissions from the manure management for more animals is under examination. Moreover the collection of information regarding the manure management systems and livestock breeding practices in Cyprus is planned.

5.4. Rice cultivation (CRF source category 3C)

Not occurring.

5.5. Agricultural soils (CRF source category 3D)

5.5.1. Source category description

Agricultural soils constitute the largest anthropogenic source of nitrous oxide emissions. N_2O is produced naturally in soils through the microbial processes of nitrification and denitrification. Agricultural activities add nitrogen to soils, increasing the amount of N_2O released in the atmosphere. Anthropogenic N_2O emissions from agriculture are produced either directly from nitrogen inputs to soils or indirectly, after the removal of nitrogen from soils. The N_2O emissions sources examined are the following:

- Direct N_2O emissions
- Indirect N_2O emissions

Total emissions from agricultural soils in 2014 contributed 21.9% to the emissions from agriculture and 1.6% to the total emissions of the country (excluding LULUCF). The total emissions from soils in 2014 reduced by 19.9% compared to 1990. Emissions from agricultural soils for the period 1990 – 2014 are presented in Table 5.16 and Figure 5.4.

Table 5.16. N_2O emissions from agricultural soils for 1990 – 2014

	1990	1995	2000	2005	2010	2013	2014
N_2O (kt)	0.50	0.71	0.52	0.48	0.49	0.41	0.40

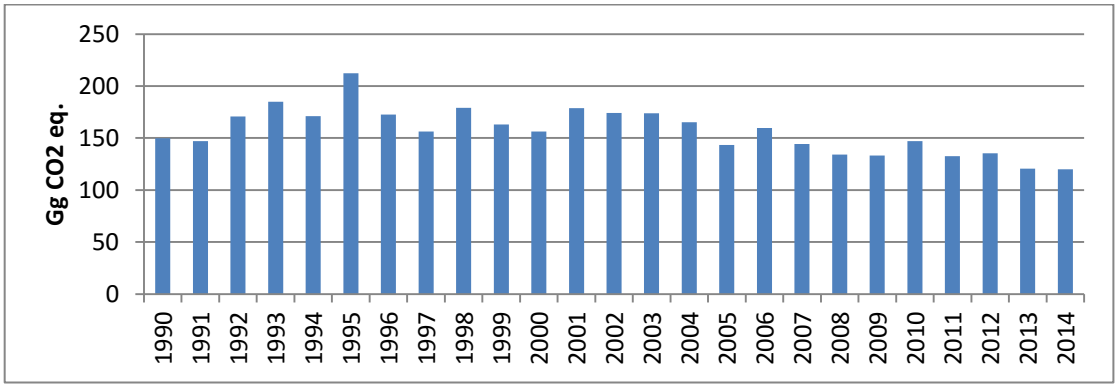

Figure 5.4. N2O emissions from agricultural soils, 1990 – 2014

5.5.2. Methodological issues

Direct N2O Emissions from managed soils (CRF source category 3D1)

Direct N_2O emissions from agricultural soils derive from: the use of inorganic N fertilisers – F_{SN} (CRF source category 3D1.1), use of organic N fertilisers (animal manure applied to soils and sewage sludge applied to soils – CRF source category 3D1.2a and 3D1.2b respectively) and crop residues - F_{CR} (CRF source category 3D1.4).

Use of Inorganic fertilisers (3D1.1)

N_2O emissions from the use of inorganic N fertilisers were estimated using Tier 1 methodology suggested by the IPCC Guidelines. Emission factor (EF1 (kg N2O-N/kg N)) is assumed 0.01, as proposed by the IPCC 2006 guidelines (Table 11.1, pg.11.11, volume 4, 2006 IPCC guidelines).

Table 5.17. N input from application of inorganic fertilisers for the period (in kt) 1990-2014

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
Inorganic fertilisers (kt N)	12.4	12.2	14.8	16.2	14.3	20.5	13.6	11.1	14.6

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
Inorganic fertilisers (kt N)	11.6	10.5	12.4	10.6	11.2	10.7	8.6	11.3	8.2

Year	2008	2009	2010	2011	2012	2013	2014
Inorganic fertilisers (kt N)	7.5	7.7	9.4	7.1	8.3	7.1	6.7

Use of organic N fertilisers (3D1.2)

Animal manure used as fertilisers (3D1.2a)

N_2O emissions from animal manure used as fertilisers were estimated using Tier 1a methodology suggested by the IPCC Good Practice Guidance. It was used the method proposed by IPCC1996 guidelines, since is not clear how to apply the IPCC 2006 method. The data used is the animal population as shown in Table 5.5. Using nitrogen excretion factors as listed in Table 5.12, total nitrogen excretion by livestock was calculated from livestock numbers. No manure is used as fuel in Cyprus therefore the percentage of the manure-N used as fuel ($Frac_{FUEL}$) is assumed 0. It is also assumed that no animals are grazing (Pasture range and Paddock) therefore fraction of livestock nitrogen excreted and deposited onto soil during grazing ($Frac_{GRAZ}$) is also assumed 0. Fraction of total nitrogen excretion that is emitted as NOx or NH_3 (kg N/kg N) is assumed 0.2 as proposed by the IPCC guidelines as default. The fraction of N input converted to N_2O (EF1) is assumed 0.0125 kg N_2O-N/kg nitrogen input, as proposed by the IPCC guidelines. The total nitrogen excretion by animals in country (Nex) and the manure nitrogen used as fertiliser in Cyprus, corrected for NH_3 and NOx emissions and excluding manure produced during grazing (F_{AW}) are presented in Table 5.18.

No changes have been made to previously submitted data, methodologies or emission factors.

Table 5.18. Total nitrogen excretion by animals in country (Gg N) and manure nitrogen used as fertiliser, corrected for NH_3 and NOx emissions and excluding manure produced during grazing (Gg N/yr) 1990-2014

Year	1990	1991	1992	1993	1994	1995	1996
Total nitrogen excretion by animals in country (Nex), Gg N	18.02	18.12	18.91	19.99	19.96	20.66	21.53
Manure nitrogen used as fertiliser*(F_{AW}), Gg N/yr	14.4	14.5	15.1	16.0	16.0	16.5	17.2

Year	1997	1998	1999	2000	2001	2002	2003
Total nitrogen excretion by animals in country (Nex), Gg N	22.48	22.57	22.58	23.40	25.46	26.89	25.51
Manure nitrogen used as fertiliser*(F_{AW}), Gg N/yr	18.0	18.1	18.1	18.7	20.4	21.5	20.4

Year	2004	2005	2006	2007	2008	2009	2010
Total nitrogen excretion by animals in country (Nex), Gg N	24.50	22.75	22.67	23.61	22.18	21.66	22.54
Manure nitrogen used as fertiliser*(F_{AW}), Gg N/yr	19.6	18.2	18.1	18.9	17.7	17.3	18.0

Year	2011	2012	2013	2014
Total nitrogen excretion by animals in country (Nex), Gg N	22.23	21.08	19.46	20.0
Manure nitrogen used as fertiliser*(F_{AW}), Gg N/yr	17.8	16.9	15.6	16.0

* corrected for NH_3 and NOx emissions and excluding manure produced during grazing

Sewage sludge applied to soils (3D1.2b)

N_2O emissions from sewage sludge on land were estimated using Tier 1a methodology suggested by the IPCC Good Practice Guidance. The treated sewage sludge applied to land data was obtained from the national statistics and the relevant reports from the Department of Environment[21]. Data was available for all wastewater treatment plants for the years 2004 and 2005. Data for the public waste water treatment plants was available for 2004-2012. All data was available in tonnes of dry matter. The sewage sludge used in agriculture during 1990-2003 and 2006-2014, was estimated using (a) the ratio of the public treatment plants compared to all treatment plants for 2004 and 2005 and (b) the percentage of the population served by a sewer system data for 1997 to 2004. The resulting data is presented in Table 5.18. Nitrogen content per kg dry sludge was assumed 3% for all years and was obtained from S. Perikenti[22]. The resulting nitrogen in sewage sludge applied on land is presented in Table 5.19. The fraction of N input converted to N_2O (EF6) is assumed 0.01 kg N_2O-N/kg sewage-N produced, as proposed by the IPCC guidelines.

Table 5.19. Dry sludge applied to soils and nitrogen in sewage sludge in t

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Dry sludge (t)	97	97	97	97	492	887	1281	2082	2082
Nitrogen in sewage sludge (t)	2.9	2.9	2.9	2.9	14.8	26.6	38.4	62.5	62.5

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Dry sludge (t)	2242	2563	2883	3684	4485	6372	5459	6074	6339
Nitrogen in sewage sludge (t)	67.3	76.9	86.5	110.5	134.5	191.2	163.8	182.2	190.2

	2008	2009	2010	2011	2012	2013	2014
Dry sludge (t)	6303	7003	5778	5620	5454	5454	5454
Nitrogen in sewage sludge (t)	189.1	210.1	173.3	168.6	163.6	163.6	163.6

[21]Perikenti, S. 2011&2013. Questionnaire according to Commission Decision 94/741/EC for the report of the Member States on the transposition and implementation of Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture, amended by Directive 91/692/EEC. Department of Environment

[22]Environment Officer responsible for sewage treatment plants, email dated 18/10/2013

Crop residues (3D1.4)

N_2O emissions from crop residues were estimated using Tier 1 methodology suggested by the IPCC Guidelines. Emission factor (EF1 (kgN2O-N/kg N)) is assumed 0.01, as proposed by the IPCC 2006 guidelines (Table 11.1, pg.11.11, volume 4, 2006 IPCC guidelines).Changes in N2O emissions have occurred due to changes (a) in crop production data by crop and (b) in cultivated area data by crop both taken by Eurostat.

Table 5.20. N input from application of crop residues for the period (in kt) 1990-2014

Year	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Crop residues (kt)	9.3	6.2	14.7	16.5	13.0	12.7	12.6	4.6	6.5

Year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Crop residues (kt)	11.3	5.0	11.1	12.6	14.2	10.2	7.3	6.8	6.9

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Crop residues (kt)	6.5	6.1	6.6	7.4	7.2	5.7	5.0

Indirect Soil Emissions (CRF source category 3D2)

Indirect N_2O emissions from agricultural soils are caused by:

- Atmospheric deposition: Volatilisation of nitrogen included in synthetic fertilisers, animal manure (used as fertilizer) and sewage sludge (used also as fertilizer) as NOx and NH3, followed by atmospheric deposition as NOx, NO3 and NH_4+ on soils and surface waters and subsequent N2O formation.
- Leaching: leaching and runoff of nitrogen contained in applied fertilisers (synthetic, animal manure and sewage sludge).

For both sources, the Tier 1 methodology suggested by IPCC Guidelines was applied.

Atmospheric deposition

Emissions from atmospheric deposition were estimated using data for synthetic fertiliser N applied to soils. The Fraction of Synthetic Fertiliser N Applied that Volatilises ($Frac_{GASF}$) is the default value according to the IPCC guidelines (0.1 kgN/kgN, table 11.3, pg.11.24, vol.4, IPCC2006). The resulting total N volatilised is presented in Table 5.21. It was used the default emission factor proposed by the IPCC guidelines.

Table 5.21. Total Nitrogen volatilised (Gg N/year)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Total Nitrogen volatilised (Gg N/year)	1.2	1.2	1.5	1.6	1.4	2.1	1.4	1.1	1.1

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Total Nitrogen volatilised (Gg N/year)	1.2	1.1	1.2	1.1	1.1	1.1	0.9	1.1	0.8

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Total Nitrogen volatilised (Gg N/year)	0.7	087	0.9	0.7	0.8	0.7	0.7

Nitrogen Leaching and runoff

Emissions from atmospheric deposition were estimated using data for synthetic fertiliser N applied to soils. The Fraction of nitrogen leached and runoff (Fr_{LEACH}) used is 0.3 and the default value according to the IPCC guidelines (table 11.3, pg.11.24, vol.4, IPCC2006). The resulting total N leached is presented in Table 5.22.

Table 5.22. Total Nitrogen leached and runoff (Gg N/year)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Total Nitrogen leached and runoff (Gg N/year)	4.0	3.8	4.9	5.4	4.7	6.5	4.5	3.5	4.6

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Total Nitrogen leached and runoff (Gg N/year)	3.8	3.3	4.0	3.6	3.8	3.5	2.8	3.6	2.7

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Total Nitrogen leached and runoff (Gg N/year)	2.4	2.5	3.0	2.4	2.7	2.3	2.2

5.5.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

5.5.4. Source-specific QA/QC and verification

QA/QC and verification activities are presented in Section 1.6.

5.5.5. Source-specific recalculations

The changes in this submission compared to previous submissions concern changes caused by changes in crop production data by crop and in cultivated area data by crop both taken by Eurostat, (b) changes that have been caused by changes in data source (Department of Agriculture[23]) regarding the annual amount of synthetic fertiliser N applies to soils.

5.5.6. Source-specific planned improvements

There are no planned improvements for this source.

5.6. Prescribed burning of savannahs (CRF source category 3E)

Not occurring.

5.7. Field burning of agricultural residues (CRF source category 3F)

5.7.1. Source category description

The generation of crop residues is a result of the farming practices used. Disposal practices for residues include ploughing them back into the ground, composting, landfilling and

[23] Mr. George Theophanous, T. +357 22464028, gtheophanous@da.moa.gov.cy

burning on-site. Burning of agricultural residues is responsible for emissions of CH_4, N_2O, CO and NOx.

CH_4 and N_2O emissions from field burning of agricultural residues in 2014 accounted for 0.04% of total GHG emissions from Agriculture and for 0.003% of total national emissions (without LULUCF). Total emissions from field burning of agricultural residues for the period 1990-2014 are presented in Table 5.23.

The emissions have been calculated based on the 2006 IPCC guidelines.

Table 5.23. Total emissions from Field burning of agricultural residues (3F) 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CH_4 (kt)	0.0138	0.0079	0.0111	0.0071	0.0082	0.0075	0.0066
N_2O (kt)	0.00036	0.0002	0.00029	0.00018	0.00021	0.00019	0.00017
Total (CO_2 eq)	0.45	0.26	0.36	0.23	0.27	0.24	0.22

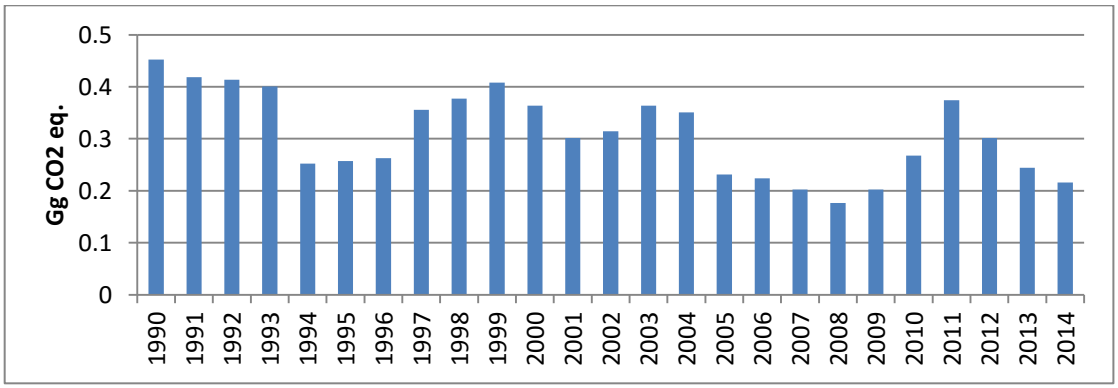

Figure 5.5. Emissions from Field burning of agricultural residues (3F) 1990-2014

5.7.2. Methodological issues

Emissions were estimated only for wheat because there is no carbon fraction available for the other crops in the IPCC 2006 guidelines. Carbon fraction for wheat is assumed 0.9 (table 2.6, pg.2.49, vol.4, IPCC2006) and dry matter 0.89 (table 11.2, pg.11.17, vol.4, IPCC2006).

Crop production and cultivated area are presented in Table 5.24. Any changes to the activity data are indicated with red. The fraction of crop residue that is burned (FracBURN) used (Table 5.25) is the default proposed by the IPCC guidelines as follows: the fraction used was the 0.25 which is proposed for the developing countries in 1990 and linearly decreased to 0.1 in 2008 which the value proposed for the developed countries. After 2008 it was maintained constant at 0.1. There are no supporting documents to support this choice, only the fact that in 1990 it was a widespread practice to burn crop residues, which was banned by law in 2003.

Fraction oxidised is assumed 0.9 as proposed by the IPCC guidelines.

Table 5.24. Crop production (t) and cultivated area (ha) for wheat 1990-2014

	1990	1991	1992	1993	1994	1995	1996
Crop production (t)	10400	5600	10500	11700	8000	12297	13000
Cultivated area (ha)	98000	59500	171000	193000	154000	133818	128000

	1997	1998	1999	2000	2001	2002	2003

Crop production (t)	11500	11500	14000	10000	10500	12900	14280
Cultivated area (ha)	5250	5800	6600	6150	5400	5900	7225

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Crop production (t)	9930	9249	7520	10712	24720	14690	18890
Cultivated area (ha)	7450	5264	5389	5287	4990	5761	7560

	2011	**2012**	**2013**	**2014**
Crop production (t)	23740	22923	15180	14440
Cultivated area (ha)	10590	8550	6920	6140

Table 5.25. Crop residue that is burned (FracBURN)

Year	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
FracBURN	0.25	0.24	0.23	0.23	0.22	0.21	0.20	0.19	0.18

Year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
FracBURN	0.18	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.11

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
FracBURN	0.10	0.10	0.10	0.10	0.10	0.10	0.10

5.7.3. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

5.7.4. Source-specific QA/QC and verification

QA/QC and verification activities are presented in Section 1.6.

5.7.5. Source-specific recalculations

The changes have been caused by changes (a) in crop production data by crop and (b) in cultivated area data by crop both taken by Eurostat.

5.7.6. Source-specific planned improvements

There are no planned improvements for this source.

5.8. Liming (CRF source category 3G)

Not occurring.

5.9. Urea Application (CRF source category 3H)

5.9.1. Source category description

Adding urea to soils during fertilisation leads to a loss of CO2 that was fixed in the industrial production process. This source category is included because the CO2 removal from the atmosphere during urea manufacturing is estimated in the Industrial Process Sector. It has been assumed that CO2 emissions form urea fertilisation caused by sales. Emissions from urea fertilisation for the period 1990 – 2014 are presented in Table 5.26.

Table 5.26. Emissions from urea fertilisation for the period 1990 – 2014

Year	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**
CO_2 (kt)	1.82	1.54	1.67	0.97	0.74	0.91	0.55	0.79	0.41

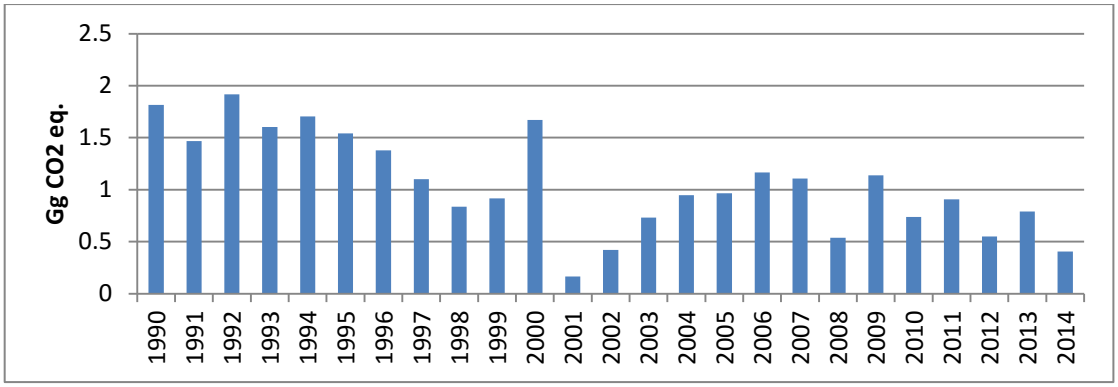

Figure 5.6. Emissions from urea fertilisation for the period 1990 – 2014

5.9.2. Methodological issues

CO_2 emissions from Urea fertilisation were estimated using T1, methodology suggested by the 2006 IPCC Guidelines. Emission factor (EF (tC/t urea)) is assumed 0.2, as proposed by the 2006 IPCC Guidelines (page 11.34, volume 4). Urea fertilisation data is presented in Table 5.27. Activity data has been revised according to the data provided by the Department of Labour Inspection Revised (data is indicated with red).

Table 5.27. Urea Fertilisation data (1990-2014)

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Urea applied to soils (t)	2475	2000	2615	2185	2323	2101	1879	1502	1140

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Urea applied to soils (t)	1250	2280	227	572	997	1291	1318	1590	1508

	2009	2010	2011	2012	2013	2014
Urea applied to soils (t)	732	1553	1006	1239	748	1078

5.9.3. Source-specific recalculations

Recalculations have been made due to revised activity data provided by the Department of Labour Inspection.

5.10. Other Carbon – containing Fertilizers (CRF source category 3I)

Not occurring.

Chapter 6: Land use, land-use change and forestry (CRF sector 4)

6.1. Overview of sector

The LULUCF sector differs from the other sectors in that it contains both sources and sinks of carbon dioxide. Removals are reported as negative figures and emissions are reported as positive figures according to the guidelines. CO_2 is the main greenhouse gas emitted and removed to/ from the atmosphere following carbon stocks changes in different carbon pools.Non-CO_2 greenhouse gases (CH_4 and N_2O) and indirect GHG (NO_X and CO) are released in relatively small quantities when biomass is burnt.

LULUCF sector is the most incomplete sector of the national GHG inventory of Cyprus.The system for the collection of data is not yet fully completed to collect the necessary activity data for the complete reporting of emissions. Therefore, the only emissions reported for LULUCF by Cyprus are the removals from Forest Land remaining Forest including biomass burning from wildfire. Emissions/ removals from the Forest Land category are the result of the balance mainly in biomass increment from forest growth and biomass loss due to felling and wildfires.

The system for the estimation of emissions from LULUCF has been in development since the summer of 2013. Between July 2013 and January 2014, two meetings have taken place with all the involved governmental Departments and several meetings with specific Departments such as the Department of Forests. In January 2014 a meeting has also taken place in Ispra with experts from the JRC to assist Cyprus in the preparation of the GHG inventory for the LULUCF sector. Two more bilateral meetings with JRC experts took place at Arona in May 2014 and May 2015.

During this period several data sets have been collected, assessed and compared regarding land uses in Cyprus. The proposal of the LULUCF inventory expert which was agreed by all the involved Departments was to use the available information from the CORINE Land Cover Maps that are prepared from the nature protection sector of the Department of the Environment. CORINE Land Cover (CLC) is a map of the European environmental landscape based on interpretation of satellite images. It provides comparable digital maps of land cover for each country for much of Europe. CORINE stands for Coordination of Information on the Environment.

Currently, there are three such maps available for Cyprus for the years 2000, 2006, and 2012. The CORINE categories were correlated to the LULUCF IPCC categories to get to land remaining in the same land category for years 2000, 2006, and 2012. Then, it was assumed that land change was linear over time and the land areas were extrapolated back to 1990 and forward to 2014.

The final results for **Land remaining in the Same Land Category** are presented below (Table 6.1) and the areas are shown in percentages in order to get a more complete picture of land use in Cyprus.

It should be noted that **the information presented for LULUCF is for the whole of the country and not only the areas under the effective control of the Republic of Cyprus.**

Table 6.1. Land remaining in the Same Land Category

LULUCF Category	1990	1995	2000	2005	2010	2013	2014
Forest	17.33%	17.11%	16.90%	16.68%	16.70%	16.75%	16.77%
Cropland	48.79%	48.58%	48.36%	48.15%	47.96%	47.85%	47.81%
Grassland	26.89%	26.48%	26.07%	25.66%	25.48%	25.41%	25.39%
Wetland	0.35%	0.39%	0.43%	0.48%	0.50%	0.50%	0.50%
Settlements	5.51%	6.46%	7.40%	8.35%	8.71%	8.84%	8.88%
Other land	1.14%	0.98%	0.83%	0.68%	0.65%	0.65%	0.65%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

6.2. Emission trends

The emissions from LULUCF changed from -613 Gg CO2 eq. in 1990 to -651 Gg CO2 in 2014. Overall the trend is one of increased removals from the LULUCF sector, with the exception of peaks in emissions in years with increased wildfires. The emissions from LULUCF are presented in Table 6.2 and Figure 6.1.

Table 6.2 Total GHG removals/ emissions (in Gg CO2 eq) from LULUCF for the period 1990 – 2014

	1990	1995	2000	2005	2010	2013	2014
CO_2 (Gg)	-613.54	-617.03	-568.48	-647.69	-641.30	-652.44	-651.88
CH_4 (Gg)	0.04	0.33	5.71	0.15	0.74	0.22	0.24
N_2O (Gg)	0.03	0.22	3.76	0.10	0.49	0.15	0.16
Total (Gg CO_2 eq.)	**-613.47**	**-616.49**	**-559.01**	**-647.43**	**-640.07**	**-652.07**	**-651.47**

A. Forest land	-613.47	-616.49	-559.01	-647.43	-640.07	-652.07	-651.47

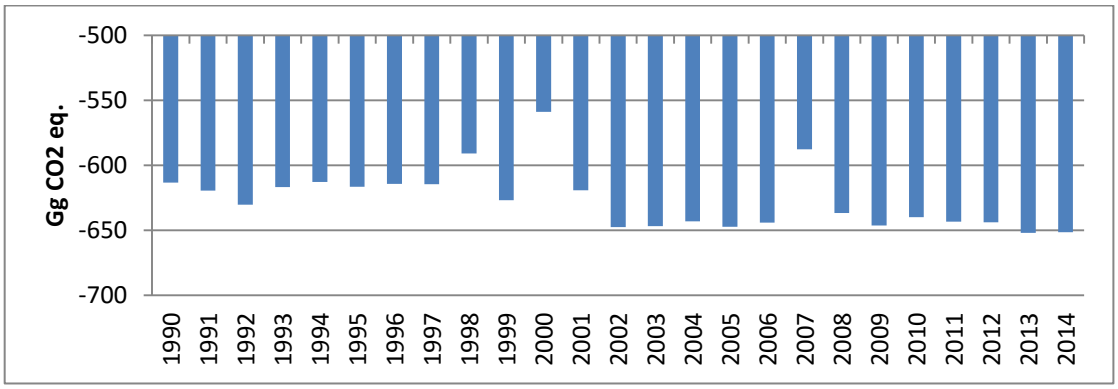

Figure 6.1. LULUCF emissions 1990-2014

6.2.1. Methodology

Emissions were estimated using the methodologies proposed by the IPCC guidelines. For the emission factors the Tier 1 Biomass Gain-Loss method was used and the activity data was calculated using Approach 1 to determine the land categories (using CORINE 2000, 2006 and

2012). For forest wildfires, emissions were calculated using the official activity data for state and private forests burnt that was provided by the Forest Department.

For the calculations it was preferred to use country-specific emission factors, but for the most part, default values were used. Cyprus is classified in the sub-tropical climate domain, warm temperate dry climate region, and the subtropical dry forest ecological zone, code SCs.

Table 6.2. Summary of methodologies

	Method	**Calculating Steps/ equations**
Activity data (LULUCF categories)	Approach 1	Use of CORINE country data
Forest Land remaining Forest Land	Tier 1 Method: Biomass Gain-Loss method (pg.4.11, vol.4, IPCC2006)	1. Annual change in carbon stocks in biomass in land remaining in a particular land-use category (gain-loss method) $\Delta CB = \Delta CG - \Delta CL$ $\Delta CG = A*GTOTAL*CF$ $GTOTAL = GW*(1+R)$ $\Delta CL = L_{wood\text{-}removals} + L_{fuelwood} + L_{disturbance}$ 2. Annual carbon in biomass transfer to dead organic matter Tier 1 method assumes that the net carbon stock changes in DOM pools are zero because the simple input and output equations used in Tier 1 methods are not suitable to capture the DOM pool dynamics.Therefore, $DOM_{in} = 0$ 3. Soil carbon <u>Mineral soils</u> It is assumed in the Tier 1 method that forest mineral soil C stocks do not change with management.(Tier 1, pg.4.23) Therefore, $SOC_{Mineral} = 0$ <u>Organic soils</u> Since Cyprus does not have organic soils, $SOC_{Organic} = 0$ 4. Non-CO2 greenhouse gas emissions from biomass burning $L_{fire} = A * MB * Cf * Gef * 0{,}001$

6.2.2. Completeness

Emissions/removals have been estimated only for Forest Land remaining Forest Land and for Forest Wildfires. The emissions/removals from Harvested Wood Products, Cropland remaining Cropland and Grassland remaining Grassland are in preparation. Since Cyprus was not required to report LULUCF for the first commitment period, there has not been any previous expertise, which led to delays.So far, emphasis has been given on the collection of the activity data.

6.2.3. Methodological issues

Approach 1 was used for the determination of land areas for the six (6) categories of LULUCF utilizing data from CORINE for years 2000, 2006 and 2012 alongside with data of

CORINE Land Use Change between 2000-2006 and 2006-2012.The trends found were extrapolated backward to 1990 and forward to 2014.

6.2.3.1. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

The data used to arrive to LULUCF categories was taken from the CORINE Land Area Maps of 2000, 2006 and 2012.Also correlations were drawn from the CORINE Land Change Maps of 2000-2006 and 2006-2012.It was assumed that the land changed linearly between 2000 and 2006 and this was extrapolated back to 1990.Similarly, it was assumed that land changed linearly between 2006 and 2012 and this was extrapolated to 2014.The overall raw data for 2000, 2006 and 2012 is shown in Table 6.3, together with the correspondence to LULUCF categories.

Table 6.3. CORINE RAW DATA and Correlation of CLC to IPCC categories

CLC codes	Level 3	LULUCF Categories	Sum of AREA for 2000 (ha)	Sum of AREA for 2006 (ha)	Sum of AREA for 2012 (ha)
111	Continuous urban fabric	SL	567	568	568
112	Discontinuous urban fabric	SL	41439	47770	49564
121	Industrial or commercial units	SL	13022	14300	14773
122	Road and rail networks and associated land	SL	324	615	682
123	Port areas	SL	432	430	430
124	Airports	SL	2507	2531	2614
131	Mineral extraction sites	SL	2824	2654	2554
132	Dump sides	SL	320	311	311
133	Construction sites	SL	1181	2280	1375
141	Green urban areas	SL	1081	982	997
142	Sport and leisure facilities	SL	4712	6443	7389
211	Non-irrigated arable land	Annual CL	240522	229330	228433
212	Permanently irrigated land	Annual CL	19223	25466	25457
221	Vineyards	Woody CL	14136	14032	13999
222	Fruit trees and berry plantations	Woody CL	16566	17093	16983
223	Olive groves	Woody CL	6504	7125	7125
231	Pastures	Grass GL	1163	885	885
241	Annual crops associated with permanent crops	Annual CL	33205	32274	32186
242	Complex cultivation	Woody CL	74112	72258	71584
243	Land principally occupied by agriculture, with significant areas of natural vegetation	Woody CL	40983	46950	46745
311	Broad leaved forest	Broadleaved Forest	763	608	608
312	Coniferous forest	Coniferous Forest	153449	152752	153319
313	Mixed forest	Coniferous Forest	357	346	346
321	Natural grassland	Grass GL	29689	26080	26025
323	Sclerophyllous vegetation	Woody GL	159738	156170	154501
324	Transitional woodland/shrub	Woody GL	29797	40641	39766

CLC codes	Level 3	LULUCF Categories	Sum of AREA for 2000 (ha)	Sum of AREA for 2006 (ha)	Sum of AREA for 2012 (ha)
331	Beaches, dunes and sand plains	OL	5161	4653	4653
332	Bare rock	OL	2549	1386	1378
333	Scarcely vegetated areas	Grass GL	12101	12521	12214
334	Burnt areas	See point 3 below	11698	184	2071
411	Inland marshes	WL	520	497	497
421	Salt marshes	WL	1955	1965	1965
511	Water courses	WL	0	26	26
512	Water bodies	WL	1543	2018	2122
	***Total land area*=**		**924145**	**924145**	**924145**

The assumptions and corrections used are the following:

1. The total land area for 2000 and 2006 was corrected to the area that was found for 2012.
2. All CORINE Land Categories were categorized into IPCC LULUCF categories, as shown above, as Forest Land (Broadleaved and Coniferous), Cropland (Annual and Woody), Grassland (Grass and Woody), Wetland, Settlements Land and Other Land.
3. Mixed forest category was allocated to Coniferous forest which is the most abundant in Cyprus.
4. Burnt areas category was appropriated accordingly using the CORINE Land Change 2000-2006 and the CORINE Land Change 2006-2012 data.At first, for the years 2006 and 2012 the burnt areas were allocated according to what these areas used to be in 2000 and 2006 respectively by getting the percentages from the CLC Change tables and multiplying with the actual burnt area recorded. Then these areas were added to their specific categories as annual cropland, coniferous forest and woody grassland.
5. For 2000, since there is no previous data available, it was checked to see what the burnt areas turned into by 2006.It was found that 14.83% became “land principally occupied by agriculture with significant areas of natural vegetation”, CLC Code 243 (woody cropland) and 85.17% was turned into “transitional woodland/shrub”, CLC Code 324 (woody grassland). We assume, though, that part of the land that was burnt was also annual cropland and coniferous forest (categories that were also found for burnt land in 2006 and 2012). Therefore, to compensate for our lack of more specific data, the area burnt for 2000 was allocated as follows: 50% of the area burnt was allocated according to what the area was found to be in 2006 and the other 50% was allocated according to the average of the % for 2006 and 2012 burnt areas Finally, the burnt areas were distributed (added) to the LULUCF categories.

Table 6.4. Burnt areas of 2006 and 2012 categorized for LULUCF according to 2000 and 2006 status respectively

	2006	2012	Average	Level 3	LULUCF Category
CLC Code 211	28,04%	0,00%	14,02%	Non-irrigated arable land	Annual CL
CLC Code 312	35,86%	18,27%	27,06%	Coniferous forest	Coniferous F
CLC Code 323	15,20%	77,27%	46,23%	Sclerophyllous vegetation	Woody GL
CLC Code 324	20,90%	4,46%	12,68%	Transitional woodland/shrub	Woody GL

	2006	2012
CLC Code 211	515408,94	0,00
CLC Code 312	659019,17	3784294,64
CLC Code 323	279262,54	16003440,70
CLC Code 324	384167,49	924381,30
Total land area in m2:	**1837858,14**	**20712116,64**

Table 6.5 Burnt areas of 2000 categorized for LULUCF according to 2006 status taking into account also the categories found for burnt areas in 2006 and 2012

	2000		
Total burnt area in m^2	116984953		
50% of the burnt area in m^2	58492476.4		
Half of the area allocated as:	%	Area in m^2	LULUCF Category
CLC 243	14.83%	8674293.22	Woody CL
CLC 324	85.17%	49818183.2	Woody GL
The rest half of the area was allocated as:			
CLC 211	14.02%	8201815.04	Annual CL
CLC 312	27.06%	15830673.42	Coniferous Forest
CLC 323	46.23%	27041387.82	Woody GL
CLC 324	12.68%	7418600.117	Woody GL

Table 6.6. Burnt areas of 2000, 2006 and 2012categorized for LULUCF

End of Year	**2000**	**2006**	**2012**
Coniferous forest	1583.07	65.90	378.43
Annual cropland	820.18	51.54	0.00
Woody cropland	867.43	0.00	0.00
Woody grassland	8427.82	66.34	1692.78
Total	11698.50	183.79	2071.21

6. Having established the LULUCF categories for 2000, 2006 and 2012, (**Error! Reference ource not found.**), it was assumed that land change per year was linear and data was computed for land area in hectares for the years 2000-2006 and 2007-2012 and then extrapolated back to 1990 and forward to 2014. The result is presented in Table 6.7.

Table 6.7. LULUCF Categories for years 2000, 2006 and 2012

End of Year	**2000**	**2006**	**2012**

Broadleaved Forest	763	608	608
Coniferous Forest	155389	153164	154044
Annual Cropland	293771	287121	286076
Woody Cropland	153168	157458	156436
Grass Grassland	42953	39486	39124
Woody Grassland	197963	196878	195959
Wetland	4019	4506	4610
Settlements Land	68408	78886	81257
Other Land	7710	6039	6031
Total Land Area (ha)	**924145**	**924145**	**924145**

The LULUCF areas in Cyprus (hectares), for the period 1990 – 2014 as these have been estimated through the methodology above are presented in Table 6.8.

Table 6.8. LULUCF areas remaining in the same land category for the period 1990-2014 (ha)

End of Year	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Broadleaved Forest	1021	996	970	944	918	892	866
Coniferous Forest	159099	158728	158357	157986	157615	157244	156873
Annual Cropland	304854	303746	302637	301529	300421	299313	298204
Woody Cropland	146019	146734	147449	148163	148878	149593	150308
Grass Grassland	48732	48154	47576	46998	46420	45842	45264
Woody Grassland	199771	199591	199410	199229	199048	198867	198686
Wetland	3208	3289	3370	3451	3532	3613	3695
Settlements Land	50945	52692	54438	56184	57930	59677	61423
Other Land	10495	10217	9938	9660	9381	9103	8824
Total Land Area	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**

End of Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Broadleaved Forest	840	815	789	763	737	711	685
Coniferous Forest	156502	156131	155760	155389	155019	154648	154277
Annual Cropland	297096	295988	294879	293771	292663	291554	290446
Woody Cropland	151023	151738	152453	153168	153883	154598	155313
Grass Grassland	44687	44109	43531	42953	42375	41797	41219
Woody Grassland	198505	198325	198144	197963	197782	197601	197420
Wetland	3776	3857	3938	4019	4100	4181	4262
Settlements Land	63169	64916	66662	68408	70154	71901	73647
Other Land	8546	8267	7989	7710	7432	7153	6875
Total Land Area	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**

End of Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Broadleaved Forest	659	633	608	608	608	608	608
Coniferous Forest	153906	153535	153164	153310	153457	153604	153750
Annual Cropland	289338	288229	287121	286947	286773	286598	286424
Woody Cropland	156028	156743	157458	157288	157117	156947	156777
Grass Grassland	40641	40064	39486	39425	39365	39305	39244
Woody Grassland	197239	197058	196878	196724	196571	196418	196265
Wetland	4343	4425	4506	4523	4540	4558	4575
Settlements Land	75393	77140	78886	79281	79676	80072	80467
Other Land	6596	6318	6039	6038	6037	6035	6034
Total Land Area	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**

End of Year	**2011**	**2012**	**2013**	**2014**

End of Year	2011	2012	2013	2014
Broadleaved Forest	608	608	608	608
Coniferous Forest	153897	154044	154190	154337
Annual Cropland	286250	286076	285902	285727
Woody Cropland	156606	156436	156266	156095
Grass Grassland	39184	39124	39063	39003
Woody Grassland	196112	195959	195806	195653
Wetland	4593	4610	4627	4645
Settlements Land	80862	81257	81653	82048
Other Land	6033	6031	6030	6029
Total Land Area	**924145**	**924145**	**924145**	**924145**

6.2.4. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

6.2.5. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

6.2.6. Source-specific recalculations

No recalculations

6.3. Forest Land (CRF source 4A)

The relevant carbon pools and non-CO_2 gases are biomass (above-ground and below-ground), dead organic matter (dead wood and litter), soil organic matter and the following non-CO_2 gases (CH_4, CO, N_2O, NO_X).The IPCC Guidelines provide methods for the estimation and reporting of sources and sinks of greenhouse gases only from managed forests. National definitions should cover all forests subject to human intervention, including the full range of management practices from protecting forests, raising plantations, promoting natural regeneration, commercial timber production, non-commercial fuel-wood extraction and abandonment of managed land. In Cyprus, all forests are considered (state and private) as subject to human intervention, and consequently, all land that may be considered forest by the national definition of forest, is thus considered as managed. Therefore, all forested land is accounted for under Forest Land remaining Forest Land.

6.3.1. Source category description

Emissions have been estimated for Forest Land remaining Forest Land.Land converted to Forest Land was included in the category Forest Land remaining Forest Land. Firstly, the carbon stock change emissions were calculated (Table 6.9) for all managed forests.As illustrated in Figure 6.2, there is an increasing trend of net removals by forests

Table 6.9. Forest Land Remaining Forest Land/Carbon stock change emissions 1990-2014

	1990	1995	2000	2005	2010	2013	2014
Net emissions/ removalsCO2 (Gg)	-614.09	-621.39	-644.66	-649.74	-651.23	-655.41	-655.12

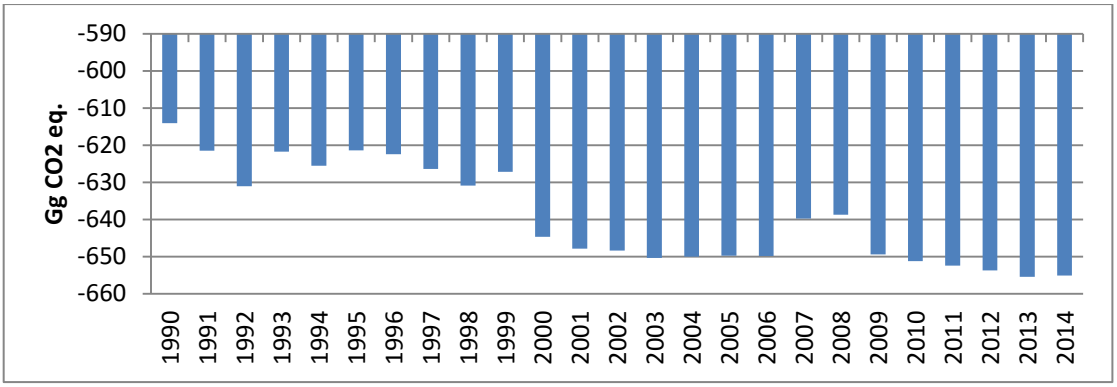

Figure 6.2. Forest Land Remaining Forest Land/Carbon stock change emissions 1990-2014

On the other hand, emissions from Wildfires (Table 6.10) vary greatly from year to year as the land burnt may be as little as close to 6 ha in 1999 and as high as 2141 ha in 2000.

Table 6.10. Forest Land Remaining Forest Land- Biomass Burning/Wildfires emissions 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CO2 (t)	557.5	4359.6	76187.3	2049.7	9921.1	2974.9	3245.3
CH4 (t)	1.7	13.1	228.2	6.1	29.7	8.9	9.7
N2O (t)	0.1	0.7	12.6	0.3	1.6	0.5	0.5
Total (Gg CO2 eq.)	626.8	4901.4	85655.1	2304.4	11154.0	3344.6	3648.6

Table 6.11 shows the great variations of burnt forest area from year to year.The figures were provided by the Forest Department and show total forest area burnt (stare and private) since 2000.The data between1990-1999 did not include private forests and this was adjusted by multiplying with the ratio of state to private forests, which is 1.76.

Table 6.11. Forest area burnt (ha)

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Forest area burnt (ha)	15.7	47.9	15.3	121.8	313.5	122.5	204.4	293.4	997.0
	1999	2000	2001	2002	2003	2004	2005	2006	2007
Forest area burnt (ha)	6.0	2141.0	713.6	20.6	89.1	171.6	57.6	140.3	1302.8
	2008	2009	2010	2011	2012	2013	2014		
Forest area burnt (ha)	45.5	73.4	278.8	226.8	246.6	83.6	91.2		

As illustrated in Figure 6.3 emissions in wildfires can have a significant effect on total LULUCF emissions/removals. Thus, forest protection measures against fires are of utmost importance for Cyprus.

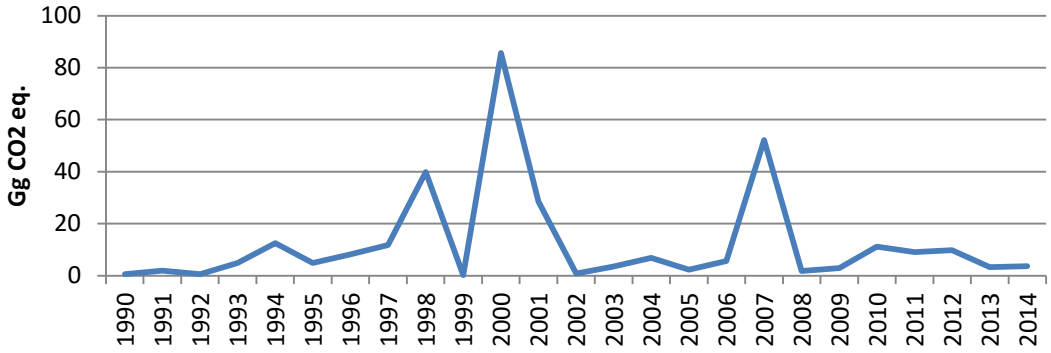

Figure 6.3. Forest Land Remaining Forest Land/Carbon stock change emissions 1990-2014

6.4. Sector-specific planned improvements

1.4.1 Planned steps for 2016

The main issues that need to be addressed in 2016 are the following:

(a) Determination of Land Change in Other Land Categories
(b) Complete Land Matrices for years 1990 to 2015
(c) Calculation of Emissions forCropland remaining Cropland, Grassland remaining Grassland and Harvested Wood Products
(d) Collection of the necessary information to apply the IPCC 2006 and GPG for completion of KP LULUCF tables and reporting of Forest Management, Cropland Management and Grassland Management
(e) Revision/ completion of CRF tables

Chapter 7: Waste (CRF sector 5)

7.1. Overview of sector

Disposal and treatment of industrial and municipal wastes can produce emissions of GHG. Solid wastes can be disposed of through landfilling, recycling, incineration or waste-to-energy. Incineration and waste-to-energy technologies are not implemented for the management of municipal solid waste in Cyprus. This chapter will deal with CH_4 and N_2O emissions resulting from solid waste disposal, biological treatment of solid waste and wastewater treatment and discharge. The most important gas produced in this source category is methane (CH4). Emissions from incineration and open burning of waste are reported as NO as no incineration takes place in Cyprus.

7.1.1. Emissions trends

Emissions from the Waste Sector in 2014 contributed 6% of the total emissions without LULUCF. In 2014, 91% of the emissions is from solid waste disposal, 2% from biological treatment of solid waste and 7% from waste water treatment and discharge.55% of the total methane emissions and 6% of the nitrous oxide emissions of the country are from the sector of waste. The emissions from waste have changed considerably between 1990 and 2014 due to changes that are taking place in the waste and wastewater management practices of the country. Recycling and composting have been reducing the amount of waste disposal on land since 2010. The emissions from industrial wastewater have increased since there is an increase in the amount of waste treated by anaerobic digestion.

Table 7.1. Total GHG emissions (in Gg CO2 eq) from waste for the period 1990-2014

	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2014**
CH4 (Gg)	13.69	15.15	16.56	17.76	18.29	19.04	19.18
N2O (Gg)	0.04	0.05	0.05	0.05	0.06	0.07	0.07
Total (Gg CO2 eq.)	354.55	392.92	428.40	458.40	475.54	495.96	500.36
Gg CO2 eq.							
5A. Solid Waste Disposal	251.16	278.68	314.83	356.24	404.54	445.04	455.59
5B. Biological Treatment of Solid Waste	NO	NO	NO	NO	4.51	8.47	11.12
5D. Wastewater Treatment and Discharge	103.39	114.24	113.57	102.17	66.49	42.45	33.64

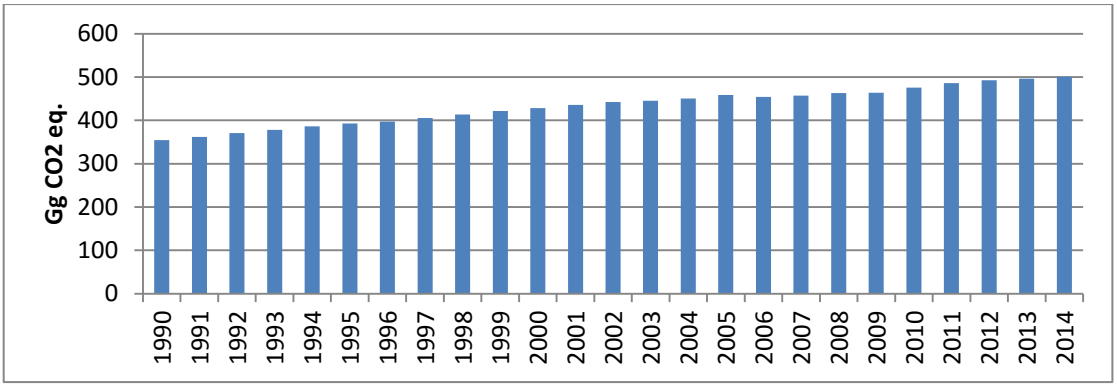

Figure 7.1. GHG emissions from waste for the period 1990-2014

7.1.2. Methodology

The calculation of GHG emissions from Waste is based on the methodologies and emission factors suggested by the IPCC Guidelines. Data used for the estimation of the emissions was obtained from the National Statistical Service. Tier 1 method with default IPCC 2006 emission factors are used for all calculations. The methodologies and emission factors used are summarised in Table 7.2.

Table 7.2. Waste– methodologies and emission factors applied

	CO_2		CH_4		N_2O	
	Method	**EF**	**Method**	**EF**	**Method**	**EF**
5A. Managed Waste Disposal Sites	NA	NA	T1	D		
5B. Biological Treatment of Solid Waste			T1	D	T1	D
5D. Wastewater Treatment and Discharge			T1	D	T1, OTH	D, OTH

T1: IPCC methodology Tier 1; D: IPCC default methodology and emission factor; OTH: other methodology – EMEP/CORINAIR 2007

Key categories

The results of the key categories assessment are presented in Section 1.5.

Uncertainty

The uncertainty analysis is presented in Section 1.7.

7.1.3. Completeness

Table 7.3 gives an overview of the IPCC source categories included in this chapter and presents the status of emissions estimates from all sub-sources in the sector of waste.

Table 7.3. Waste – completeness

	CO_2	CH4	N2O
5A. Solid Waste Disposal	NE	✓	NE
5B. Biological Treatment of Solid Waste		✓	✓
5D. Wastewater Treatment and Discharge		✓	✓

NE: Not estimated (method not available)

7.2. Managed Waste Disposal Sites (CRF 5A)

Solid waste disposal on land is responsible for methane emissions. Methane is emitted during the anaerobic decomposition of organic waste disposed solid waste disposal sites. The main characteristic of this process is that organic waste decomposes at a diminishing rate over time and takes many years to decompose completely. Other factors that affect the decomposition rate are the type of waste disposed, the characteristics of the disposal sites and the climate conditions. Methane emissions were calculated using the Tier 1 method proposed by the IPCC 2006 guidelines.

Carbon dioxide emissions occur during the flaring of biogas released from the decomposition of waste. These emissions should not be included in the total GHG emissions of this source as they are of biogenic origin. However, recovery and flaring of biogas does not occur in Cyprus and is therefore reported as NO.

CH_4 emissions from solid waste disposal on land in 2014 accounted for 94.3% of total GHG emissions from Waste, 5.4% of total national emissions without LULUCF and 51% of the total CH4 emissions without LULUCF. All solid waste disposal on land emissions is considered managed in 2014, compared to 87% in 1990. All unmanaged waste disposal is considered shallow. The emissions between 1990 and 2014 increased by 81%.Emissions from Managed Waste Disposal Sites are presented in Table 7.4 and Figure .

Table 7.4. Total GHG emissions (in Gg CO_2 eq) from solid waste disposal sites for the period 1990 – 2014

Year	1990	1995	2000	2005	2010	2013	2014
5A1. Managed waste disposal sites (Gg CH_4)	10.05	11.15	12.59	14.25	16.18	17.80	18.2
Total (Gg CO_2 eq.)	251.25	278.75	314.75	356.25	404.5	445.04	455.59

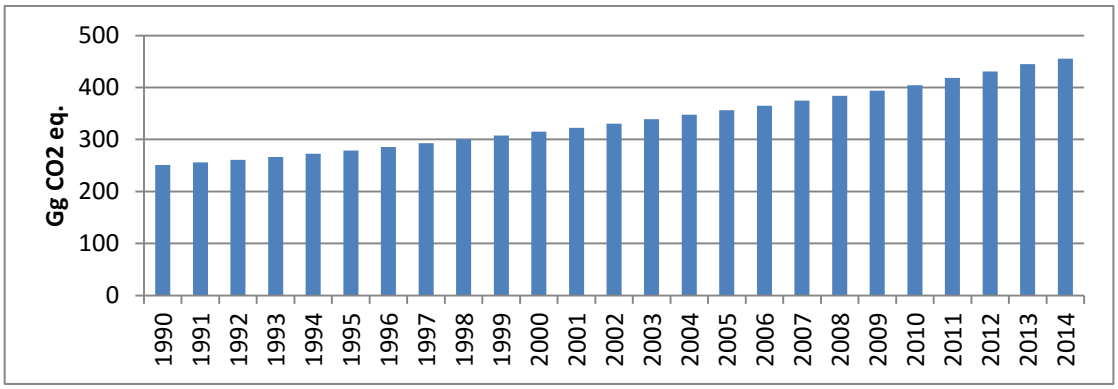

Figure 7.2. Total GHG emissions from solid waste disposal sites for the period 1990 – 2014

7.2.1. Methodological issues

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines) outlines three methods to estimate CH_4 emissions from solid waste disposal sites: (a) the Tier 1 method based on the IPCC First Order Decay method (FOD), (b) the Tier 2 method using the IPCC FOD method, some default parameters and good quality country specific activity data and (c) the Tier 3 method using good quality country specific activity data and either the

FOD IPCC FOD method with country specific key parameters or measurement derived county-specific parameters. According to the 2006 IPCC Guidelines, is a *good practice* to use the FOD method in order to account for time dependence of the emissions. Due to in unavailability of the necessary data to implement the Tier 2 or Tier 3 methodologies, the Tier 1 methodology was implemented for the estimation of emissions from land disposal of solid waste.

The default method is based on the following equation (2006 IPCC guidelines, volume 5, pg. 3.8, equation 3.1):

$$CH_4 \text{ emissions (Gg/yr)} = [\Sigma\ CH_4 \text{ generated}_{x,T}) - R_T] * (1 - OX_T)$$

Where $R_{T,}$ is the recovered CH4 (Gg/yr) and OX_T is the oxidation factor (fraction).

The IPCCWasteModel excel spreadsheet has been used for the estimation of emissions. The parameters are set to Southern Europe region, the DOC is calculated based on waste by composition and the methane generation constant is the default for dry temperate.

Total municipal solid waste (MSW_T)

Data on total MSW production and annual per capita production are available for the period 1996-2013 from the National Statistical Service. The data for the period 1990-1995 was obtained using the linear trend equation of 1996-2008 that was obtained from plotting the annual per capita production against time as shown in Figure 7.3. The years 2009 to 2014 were excluded from the trend, because during those years there are considerable changes in (a) the economy of the country and (b) the waste management practices of the country, which resulted in a decrease of the waste production. The total municipal solid waste production (MSW_T) was then estimated by multiplying the annual per capita production by the total population at the end of the year.

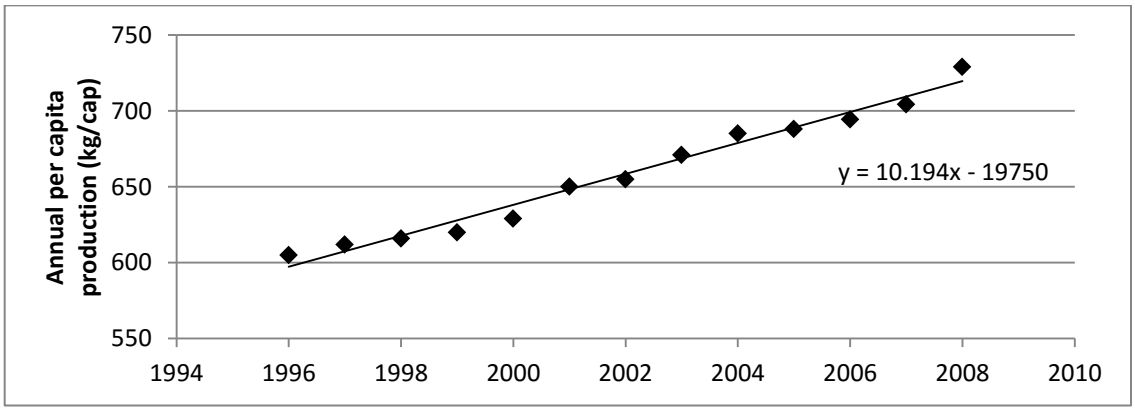

Figure 7.3. Plot used to estimate the annual per capita production for 1990-1995 (kg/cap)

The total population used, the annual per capita production and the resulting total municipal solid waste production for the whole reporting period, are presented in Table 7.5. Total MSW of 2013 was revised according to revised data provided by the Statistical Service.

Table 7.5. Total population, annual per capita production (kg/cap), total MSW production (1000t)

	Total population	Annual per capita production (kg/cap)	Total MSW production (1000t)
1990	587100	536.1	314.7
1991	603100	546.3	329.4
1992	619200	556.4	344.6
1993	632900	566.6	358.6
1994	645400	576.8	372.3
1995	656300	587.0	385.3
1996	666300	605.0	400.1
1997	675200	612.0	410.5
1998	682900	616.0	418.2
1999	690500	620.0	425.8
2000	697500	629.0	436.1
2001	705500	650.0	456.1
2002	713700	655.0	464.6
2003	722900	671.0	481.4
2004	733000	685.0	498.1
2005	744000	688.0	507.9
2006	757900	694.4	521.0
2007	776400	704.3	539.8
2008	796900	728.9	572.7
2009	819100	729.9	589.1
2010	839800	698.0	577.4
2011	862000	684.0	581.1
2012	865900	670.0	578.7
2013	858000	629.0	542.0
2014	847000	626.0	533.9

Determining Historical Waste per Capita Data

The IPCC Waste Model requires MSW activity data to be reported annually going back to the year 1950. However, MSW activity data in Cyprus were only recorded between the years of 1996-2014, while the previously reported period of 1990-1995 was linearly extrapolated from the trend observable in years 1996-2009.

In an attempt to determine the historical waste per capita data going back to the year 1950, as recommended during the TERT review, a linear extrapolation from the small sample size of recorded data would not have sufficed, or otherwise been applicable. Therefore, a more pertinent indicator of waste activity was required, and, as such, the national GDP was used to correlate the annual waste activity against the corresponding years.

The methodology used to determine the historical waste per capita data was applied as follows:

(a) The 1960-2014 GDP data[24] was extrapolated backwards, to expand the range to the year 1950.

[24] Maria Matsi, Economic Officer, Directorate of Economic Research and EU Affairs, Ministry of Finance. Tel. no.: +357 22 60 1231. Email: mmatsi@mof.gov.cy

(b) Waste activity data from 1996-2009 was fitted exponentially to the respective GDP value of each year to provide for a correlation between waste per capita and GDP.
(c) Hence, a hind cast of the annual waste activity was calculated going back to 1950 using the derived relation of waste per capita to GDP.

GDP data alongside the calculated waste activity derived from the methodology of the model is summarized annually in Table 7.6. The aforementioned methodology is described analytically below in conjunction with the relevant data.

Table 7.6. Data used for fitting and extrapolating GDP and waste activity is tabulated by year. Figures in bold are calculated by the models illustrated in Figures 7.4 and 7.5

	GDP (€m)	Waste (kg/capita)
1950	**1052.3**	**457.96**
1951	**1103**	**458.65**
1952	**1156.2**	**459.37**
1953	**1211.9**	**460.13**
1954	**1270.2**	**460.92**
1955	**1331.4**	**461.76**
1956	**1395.6**	**462.64**
1957	**1462.8**	**463.56**
1958	**1533.3**	**464.52**
1959	**1607.1**	**465.54**
1960	1468.8528	**463.64**
1961	1631.9978	**465.88**
1962	1778.7189	**467.91**
1963	1888.7596	**469.44**
1964	1709.1906	**466.95**
1965	2090.2273	**472.24**
1966	2217.787	**474.03**
1967	2519.4411	**478.28**
1968	2635.504	**479.92**
1969	2880.769	**483.42**
1970	2970.0061	**484.69**
1971	3349.9479	**490.17**
1972	3571.1244	**493.39**
1973	3606.7097	**493.91**
1974	2997.3794	**485.09**
1975	2428.0142	**476.98**
1976	2870.3672	**483.27**
1977	3323.122	**489.78**
1978	3577.1465	**493.48**
1979	3930.2624	**498.66**
1980	4162.9357	**502.11**
1981	4289.948	**504**

	GDP (€m)	Waste (kg/capita)
1983	4802.3767	**511.7**
1984	5227.7582	**518.18**
1985	5478.4979	**522.03**
1986	5675.5858	**525.09**
1987	6078.5212	**531.38**
1988	6583.8328	**539.39**
1989	7117.0653	**547.96**
1990	7650.2977	**556.68**
1991	7703.9494	**557.56**
1992	8428.2477	**569.64**
1993	8487.3741	**570.64**
1994	8987.7585	**579.15**
1995	10190.74	**600.13**
1996	10355.25	605
1997	10602.94	612
1998	11138.88	616
1999	11662.88	620
2000	12330.36	629
2001	12772.74	650
2002	13185.748	655
2003	13556.11	671
2004	14179.977	685
2005	14730.58	688
2006	15396.7	694.38
2007	16156.38	704.31
2008	16746.54	728.88
2009	16406.76	729.86
2010	16630.61	698
2011	16697.85	684
2012	16289.047	670
2013	15321.63	629
2014	14939.02	626

(a) Reliable national GDP data is available, courtesy of the Statistical Service of Cyprus (CYSTAT), starting from 1960 – marked by the establishment of the Republic of Cyprus, and using constant market prices of 2005.

GDP data between the years of 1950-59 was extrapolated exponentially to allow for the waste activity to be fitted to that period as well, as shown in Figure; not much growth was to be expected during those years due to the British rule and Cyprus Emergency, and the

fitted model is shown to be in accord. The GDP data appear to effectively gauge the socio-political economics of the time period, as they factor in any fluctuations in the market that may economically influence waste activity, as well as by modelling the situation in the aftermath of a war, such as the Turkish invasion of 1974.

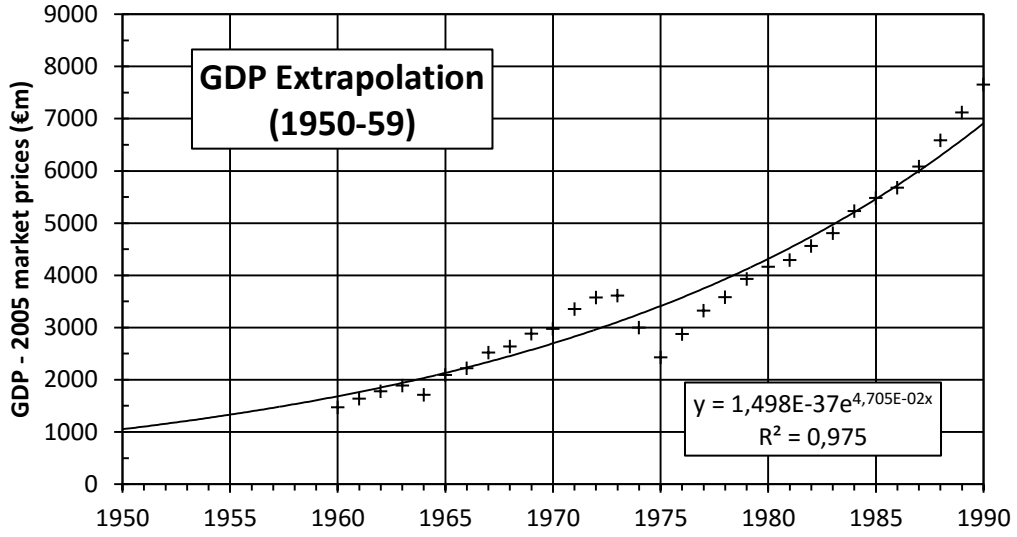

Figure 7.4. GDP data 1960-2014 (CYSTAT) extrapolated for the years of 1950-59.

(b) As illustrated in Figure, the waste activity data showing a linear trend between the years 1996-2009 was used to fit waste per capita to GDP exponentially, and, by association, correlate waste activity with each corresponding year.

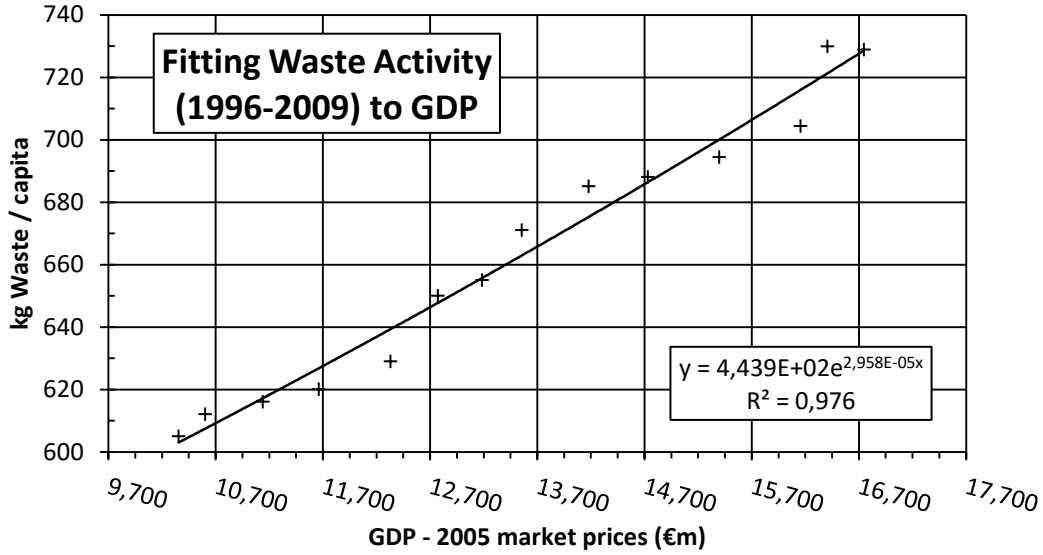

Figure 7.5. Plotting the linear period of waste activity data from 1996-2009 against their corresponding annual GDP, and fitting to an exponential model.

(c) The GDP data from 1950-2014 could now be normalized to waste activity data by relation to the exponential fit determined from plotting waste activity to GDP for 1996-2009 in Figure. Hence, the waste activity data can be hind cast for each year going back to 1950 through a correlation to the annual GDP, as in Figure 7.6.

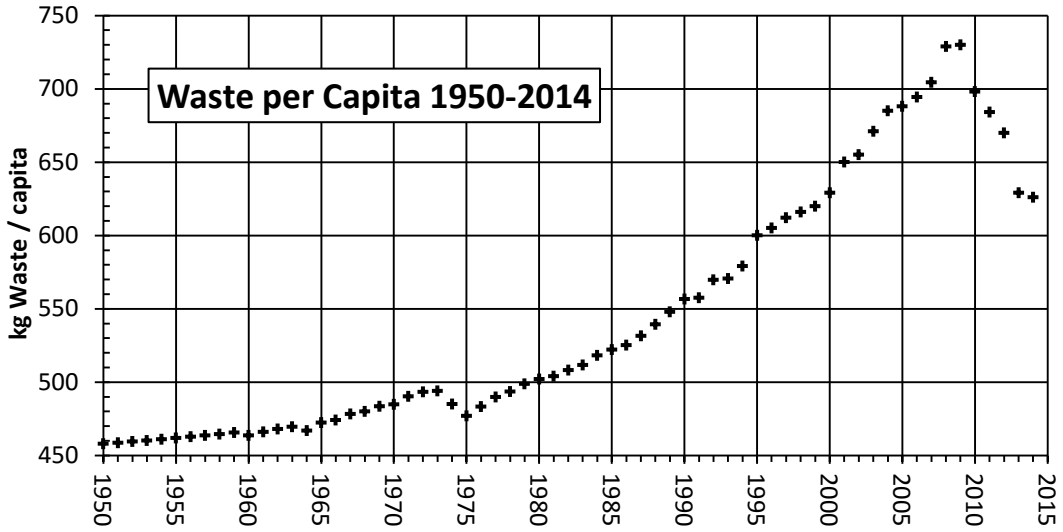

Figure 7.6. Waste per capita derived from annual GDP data and hind casts.

Fraction of MSW disposed at SWDS (MSW_F)

Data on MSW disposed at SWDS is available for the period 1996-2012 from the National Statistical Service. For the period 1990-1995 it was assumed that the fraction of waste disposed to SWDS is the same as 1996. The MSW_F and the corresponding mass of MSW disposed to disposal sites are presented in Table 7.7. In Table 7.7 data on other waste management practices are also presented for years that data is available. Amount of waste recycled in 2013 has been revised according to revised data provided by the Statistical Service. MSW to disposal sites for 1950-1989 is assumed 100%.

Table 7.7. Fraction of MSW disposed at SWDS (MSW_F), mass of MSW disposed to disposal sites (1000t) and other practices

	Composting (1000t)	Recycling (1000t)	MSW to disposal sites (1000t)	MSW to disposal sites
1990			305.97	97.2%
1991			320.29	97.2%
1992			334.98	97.2%
1993			348.66	97.2%
1994			361.94	97.2%
1995			387.00	97.2%
1996		11.12	389.00	97.2%
1997		12.54	398.00	96.9%
1998		12.17	406.00	97.1%
1999		12.76	413.00	97.0%
2000		13.11	423.00	97.0%
2001		14.10	442.00	96.9%
2002		14.61	450.00	96.9%
2003		14.73	466.63	96.9%
2004		16.48	481.59	96.7%
2005		18.61	489.30	96.3%
2006		21.50	499.49	95.9%
2007		27.59	512.19	94.9%

	Composting (1000t)	Recycling (1000t)	MSW to disposal sites (1000t)	MSW to disposal sites
2008		42.09	530.59	92.7%
2009		49.39	539.67	91.6%
2010	26.31	61.09	489.97	84.9%
2011	47.92	72.22	460.96	79.3%
2012	57.77	69.65	451.28	78.0%
2013	49.40	69.78	422.82	78.0%
2014	64.86	71.17	397.85	74.5%

Composition of MSW disposed at SWDS

Data on the composition of waste to disposal sites is available for the period 1996 to 2014. For the period 1990-1995 it is assumed that the composition is the same as 1996. The breakdown on the organic matter to food waste and non-food/garden waste has been provided from the Statistical service and is assumed constant for all the years: 86% of organic matter is food waste and the remaining 14% is non-food/garden waste. The resulting composition of MSW disposed at SWDS is presented in Table 7.8. Composition of waste for 2013 has been revised according to new date from the statistical service. Composition of waste for 1950-1989 is assumed the same as 1990.

Table 7.8. Composition of MSW disposed at SWDS

	Paper	Textiles	Wood	Food waste	Garden	Plastics, other inert
1990	28%	6%	2%	39%	6 %	19%
1991	28%	6%	2%	39%	6 %	19%
1992	28%	6%	2%	39%	6 %	19%
1993	28%	6%	2%	39%	6 %	19%
1994	28%	6%	2%	39%	6 %	19%
1995	28%	6%	2%	39%	6 %	19%
1996	28%	6%	2%	39%	6 %	19%
1997	28%	6%	2%	39%	6 %	19%
1998	27%	6%	2%	39%	6 %	19%
1999	27%	6%	2%	39%	6 %	19%
2000	27%	6%	2%	39%	6 %	19%
2001	27%	6%	2%	39%	6 %	19%
2002	27%	6%	2%	39%	6 %	19%
2003	27%	6%	2%	38%	6 %	20%
2004	27%	6%	2%	38%	6 %	20%
2005	27%	6%	2%	38%	6 %	20%
2006	26%	6%	2%	38%	6 %	21%
2007	24%	7%	2%	39%	6 %	21%
2008	23%	7%	2%	41%	7%	20%
2009	23%	7%	2%	42%	7%	19%
2010	27%	8%	3%	44%	7%	12%
2011	28%	9%	3%	45%	7%	7%
2012	28%	10%	3%	45%	7%	6%
2013	26%	10%	3%	47%	8%	7%
2014	27%	11%	3%	49%	8%	2%

Degradable organic carbon (DOC)

Degradable organic carbon is the organic carbon that is accessible to biochemical decomposition, and should be expressed as Gg C per Gg waste. It is based on the composition of waste and can be calculated from a weighted average of the carbon content of various components of the waste stream. The following equation, as presented in the IPCC Guidelines, estimates DOC using default carbon content values (equation 3.7, volume 5, pg. 3.13):

$$DOC = \Sigma_i (DOC_i * W_i)$$

where$DOC_i$is the fraction of degradable organic carbon in waste type and W_i is the fraction of waste type *i* by waste category.

The defaults used by the IPCC waste model for DOC are presented in Table 7.9.

Table 7.9. DOCi used for the calculation of DOC (weight fraction, wet basis)

Waste stream	Range	Default
Food waste	0.08-0.20	0.15
Garden	0.18-0.22	0.2
Paper	0.36-0.45	0.4
Wood and straw	0.39-0.46	0.43
Textiles	0.20-0.40	0.24

Fraction of degradable organic carbon which decomposes (DOC_F)

DOC_F is an estimate of the fraction of carbon that is ultimately degraded and released from SWDS, and reflects the fact that some organic carbon does not degrade, or degrades very slowly, when deposited in SWDS. The IPCC Guidelines (pg. 3.13, volume 5) provide a default value of 0.5 for DOC_F.

Estimation of CH_4 from waste disposal on land

Landfill gas consists mainly of CH_4 and carbon dioxide (CO_2). The CH_4 fraction F value used is according to the default proposed by the IPCC guidelines, i.e. 0.5. The oxidation factor (OX) reflects the amount of CH_4 from SWDS that is oxidised in the soil or other material covering the waste. The oxidation factor used is according to the defaults proposed by the IPCC guidelines; i.e. 0.1. This means that no $CH_4$is oxidised. No methane is recovered from SWDS in Cyprus therefore recovery (R) is assumed 0.

The value for the methane correction factor for managed solid disposal sites - anaerobic is assumed to be 1, managed solid disposal sites semi-anaerobic is 0.5, according to the IPCC2006 guidelines (pg. 3.14, volume 5). The amount of waste disposed at managed disposal sites is presented in Table 7.7.

The defaults used by the IPCC waste model for Methane generation rate constant (k) are presented in Table 7.10 and are according to dry temperate climate.

Table 7.10. Methane generation rate constant (k)

Waste stream (per year)	Range	Default
Food waste	0.05–0.08	0.06
Garden	0.04–0.06	0.05
Paper	0.03–0.05	0.04
Wood and straw	0.01–0.03	0.02
Textiles	0.03–0.05	0.04

Data is available on the depth of the unmanaged disposal sites. According to the consultations with the Ministry of Interior, and according to the 2006 IPCC Guidelines, all SWDS not meeting the criteria of managed SWDS and which have depth smaller than 5m classified as unmanaged disposal sites, and therefore be assumed shallow. The value for the methane correction factor for shallow unmanaged disposal sites is assumed to be 0.4, and is according to the default IPCC2006 guidelines (pg. 3.14, volume 5). Moreover, all SWDS not meeting the criteria of managed SWDS and which have depth greater than or equal to 5m classified as unmanaged disposal sites, and assumed deep. The value for the methane conversion factor for deep unmanaged disposal sites is assumed to be 0.8, and is according to the default IPCC2006 guidelines (pg. 3.14, volume 5).The amount of waste disposed at managed and unmanaged disposal sites is presented in Table 7.11.

Table 7.11. Waste disposed at (a) managed, (b) deep unmanaged and (c) swallow unmanaged disposal sites

	% of waste to managed disposal sites	% of waste to deep unmanaged disposal sites	% of waste to shallow unmanaged disposal sites
1990	0.0%	66.5%	33.5%
1991	0.0%	67.1%	32.9%
1992	0.0%	67.7%	32.3%
1993	0.0%	67.8%	32.2%
1994	0.0%	67.9%	32.1%
1995	0.0%	68.1%	31.9%
1996	0.0%	68.2%	31.8%
1997	0.0%	68.4%	31.6%
1998	0.0%	68.5%	31.5%
1999	0.0%	68.7%	31.3%
2000	0.0%	68.8%	31.2%
2001	0.0%	69.0%	31.0%
2002	0.0%	69.1%	30.9%
2003	0.0%	68.7%	31.3%
2004	0.0%	68.5%	31.5%
2005	0.0%	68.3%	31.7%
2006	10.1%	61.1%	28.8%
2007	10.1%	60.9%	29.0%
2008	10.2%	60.7%	29.1%
2009	10.3%	60.4%	29.2%
2010	32.9%	50.2%	16.9%
2011	33.0%	49.9%	17.0%
2012	33.2%	66.8%	0.0%
2013	33.2%	66.8%	0.0%
2014	33.2%	66.8%	0.0%

Other parameters used for the calculation of methane emissions by the IPCC waste model are presented in Table 7.12.

Table 7.12. Other parameters used for methane calculation

Delay time (months)	6
Fraction of methane (F) in developed gas	0.5
Conversion factor, C to CH4	1.33
Oxidation factor (OX)	0.1

All the emissions estimated for Solid waste disposal (5A) as these have been estimated by the IPCC waste model spreadsheet are reported under 5A3, Uncategorised waste disposal sites.

7.2.2. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

7.2.3. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

7.2.4. Source-specific recalculations

The emissions from this source have been recalculated due to the following changes: a) change in the solid waste production data for the year 2013, b) change of the methane generation rate constant, c) change on the time series on waste disposal data and d) change of methane oxidation factor.

(a) Waste generation

Total municipal solid waste production, the amount of municipal solid waste to disposal sites and the composition of municipal solid waste have been revised for 2013.

(b) Methane generation rate constant

A different methane generation rate value was chosen for this submission in order to be more applicable for Cyprus. Dry temperature constant was chosen in this submission according to the IPCC Guidelines, volume 5, pg. 3.18, Table 3.3. The Technical Expert Review Team (TERT) during the Emission Review procedure has also identified the methane generation rate that was used (wet temperature) in NIR2014 incorrect.

(c) Time series of waste disposal data

In NIR2015 data on waste disposal had been taken into consideration from 1990 onwards. Methane generation and emissions were therefore underestimated. The Technical Expert Review Team (TERT) during the Emission Review procedure has identified this issue. In this submission Cyprus uses data on waste disposal data for the last 50 years according to the IPCC guidelines (volume 5, pg. 3.6, Section 3.2.1).

(d) Oxidation factor

In NIR2015 the default value for oxidation factor was zero for all landfills. In NIR2016 the oxidation factor was changed to 0.1 for covered, well-managed landfills, according to IPCC guidelines (volume 5, pg. 3.15, table 3.2).

7.2.5. Source-specific planned improvement

There are no planned improvements for managed waste disposal sites.

7.3. Biological Treatment of solid waste (CRF 5B)

7.3.1. Composting - Municipal solid waste (5B1a)

Composting is an aerobic process and a large fraction of the degradable organic carbon (DOC) in the waste material is converted into carbon dioxide (CO2). CH4 is formed in anaerobic Sections of the compost, but it is oxidised to a large extent in the aerobic Sections of the compost. Composting can also produce emissions of N_2O.

CH_4 emissions from biological treatment of solid waste in 2014 accounted for 1.3% of total GHG emissions from Waste, 0.7% of total national emissions without LULUCF. The emissions from composting are presented in Table 7.13 and Figure 7.7.

Table 7.13. Emissions from Composting 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CH_4 (t)	NO	NO	NO	NO	105.2	197.6	259.4
N_2O (t)	NO	NO	NO	NO	6.3	11.9	15.6
Total (Gg CO2 eq.)	NO	NO	NO	NO	4.51	8.47	11.12

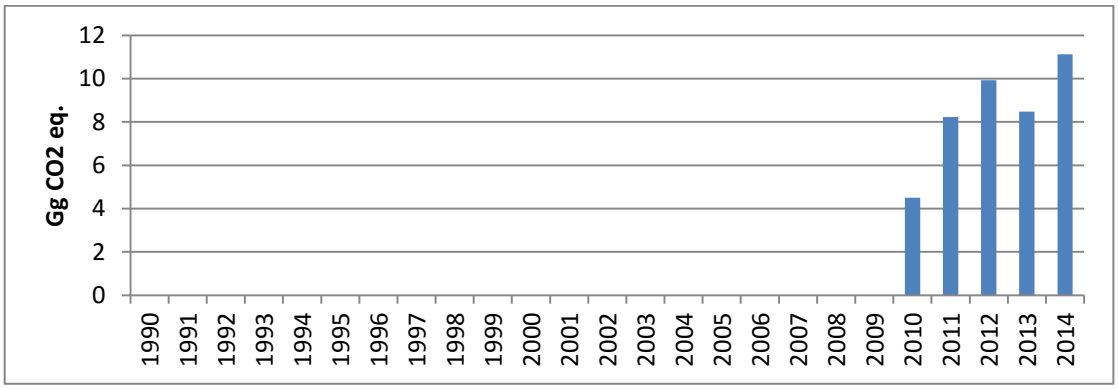

Figure 7.7. Emissions from Composting 1990-2014

7.3.1.1. Methodological issues

The CH_4 and N_2O emissions of the biological treatment have been estimated using the default method in equation 4.1 and 4.2 of 2006 IPCC guidelines, volume 5, page 4.5:

$$CH_4 \text{ Emissions} = \Sigma (M*EF)*10^{-3} - R$$

$$N_2O \text{ Emissions} = \Sigma (M*EF)*10^{-3}$$

The activity data used is presented in Table 7.14.The emission factor for N2O emissions is assumed 0.24 g/kg as proposed in the corrigendum of the 2006 guidelines dated July 2015, compared to 0.3 g/kg in previous submissions.

Table 7.14. Amount of municipal solid waste composted (M), 1000 t wet waste

	1990	1995	2000	2005	2010	2013	2014
M composted, 1000 t wet waste	NO	NO	NO	NO	26.31	49.40	64.86

7.3.2. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

7.3.3. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

7.3.4. Source-specific recalculations

(a)revised data for the year 2012.

(b) The emission factor for N2O emissions is assumed 0.24 g/kg as proposed in the corrigendum of the 2006 guidelines dated July 2015, compared to 0.3 g/kg in previous submissions.

7.4. Incineration and Open Burning of Waste (CRF 5C)

Not occurring.

7.5. Wastewater treatment and discharge (CRF 5D)

Handling of domestic and industrial wastewater under anaerobic conditions produces CH_4. The issues concerning emissions from wastewater handling systems are considered separately because the types of activity data and emission factors needed for each are different.

Emissions from Wastewater treatment and discharge accounted for 6.7% of the of total GHG emissions from Waste and 0.4% of total national emissions without LULUCF. The emissions between 1990 and 2014 decreased by 67%. The emissions from these sources are presented in Table 7.15 and Figure 7.8.

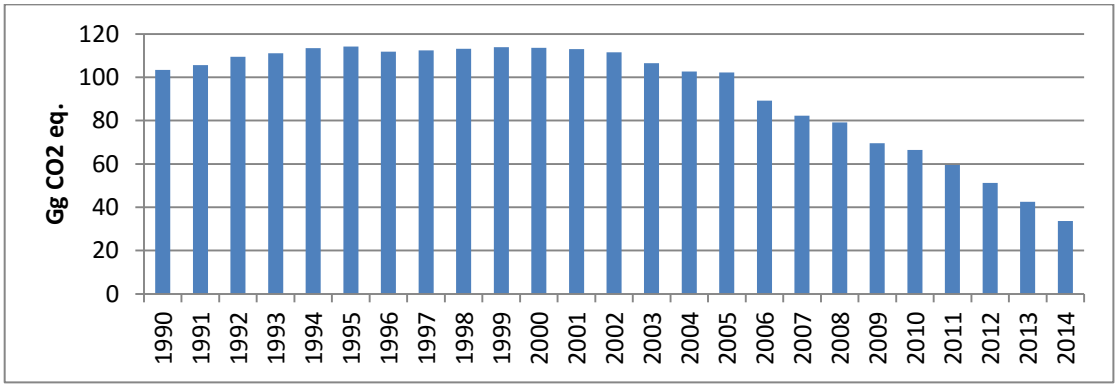

Figure 7.8. Total emissions from Wastewater treatment and discharge (5D) 1990-2014

Table 7.15. Emissions from Wastewater treatment and discharge (5D) 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CH4 (kt)	3.64	4.00	3.96	3.52	2.00	1.04	0.69

N2O (kt)	0.041	0.048	0.049	0.048	0.055	0.055	0.055
Total (Gg CO2 eq.)	103.4	114.2	113.6	102.2	66.5	42.5	33.6

7.5.1. Domestic Wastewater (5D1)

In Cyprus during 2014 approximately 89.4% of the population was served by a sewer and aerobic treatment systems, the majority of which apply tertiary or advance treatment, since most of the treated water is reused in agriculture. The wastewater produced by the remaining population is collected in septic tanks where anaerobic conditions are dominant. 10% of this wastewater is collected by authorised wastewater collectors and transported to aerobic wastewater treatment plants. Some industrial wastewater may be discharged into municipal sewer lines where it combines with domestic wastewater provided that the organic load of the wastewater is reduced to the limits set in the wastewater disposal permit issued by the Department of Environment. The CH4 emissions and N2O emissions from this source are presented in Table 7.16 and Figure 7.9.

Table 7.16. Total emissions from Domestic wastewater 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CH4 (Gg)	3.61	3.96	3.93	3.43	1.90	0.93	0.59
N2O (Gg)	0.040	0.047	0.048	0.047	0.054	0.054	0.054
Total (Gg CO2 eq.)	102.21	113.06	112.39	99.74	63.60	39.55	30.74

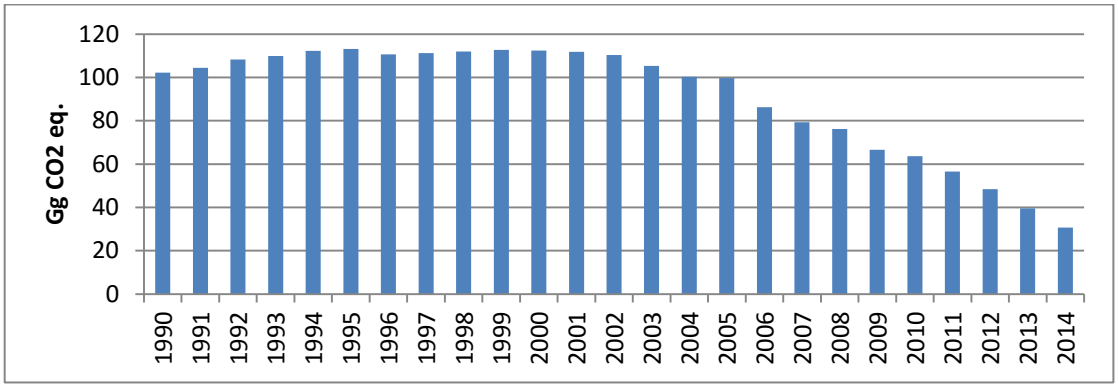

Figure 7.9. Total emissions from Domestic wastewater (5D1) 1990-2014

7.5.1.1. Methodological issues

Methane Emissions from Domestic wastewater

The IPCC Guidelines describe a single method for calculating CH4 emissions from domestic wastewater handling. Emissions are a function of the amount of waste generated and an emission factor that characterises the extent to which this waste generates CH4. The general equation is as follows (equation 6.1, pg. 6.11, volume5, 2006 IPCC).

$$CH4\ Emissions = [\Sigma(U_i * T_{i,j} * EF_j)](TOW\text{-}S) - R$$

Where $U_i$is the fraction of population in income group i in inventory year, $T_{i,j}$is the degree of utilisation of treatment/discharge pathway or system for each income group fraction i in inventory year, *EF* is the emission factor, *TOW* is the total organics in wastewater, *S* is the organic component removed as sludge , *R* is the amount of CH4 recovered.

No CH4 is recovered and flared or used for energy therefore methane recovery is assumed 0.

Total organic waste (TOW)

The activity data for this source category is the amount of organic waste in a country. Total Organic Waste (TOW) is a function of human population and waste generation per person, and is expressed in terms of biochemical oxygen demand (equation 6.3):

$$TOW = P * BOD*0.001*I*365$$

where TOW is the total organic waste (kg BOD/yr), P is the country population (person) and BOD is the country specific per capita BOD in the inventory year (g/person/day), 0.001 is the conversion from grams BOD to kg BOD and I is the correction factor for additional industrial BOD discharged into sewers (for collected the default is 1.25, for uncollected the default is 1.00). Wastewater disposed in septic tanks is considered as uncollected and 1 is used as a correction factor (compared to 1.25 in previous submissions).

The population used and the estimated TOW are presented in Table 7.17.

Table 7.17. Human population and total organic waste

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Human population (1000s)	587.1	603.1	619.2	632.9	645.4	656.3	666.3	675.2	682.9
TOW (Gg BOD/yr)	12.86	13.21	13.56	13.86	14.13	14.37	14.59	14.79	14.96

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Human population (1000s)	690.5	697.5	705.5	713.7	722.9	733	744	757.9	776.4
TOW (Gg BOD/yr)	15.12	15.28	15.45	15.63	15.83	16.05	16.29	16.60	17.00

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Human population (1000s)	796.9	819.1	839.8	862.0	865.9	858.0	847.0
TOW (Gg BOD/yr)	17.45	17.94	18.39	18.88	18.96	18.79	18.55

Emission factor

The emission factor for each waste type is a function of the maximum methane producing potential of each waste type (B_o) and the weighted average of the methane conversion factors (MCFs) for the different wastewater treatment systems used in the country, as shown in the equation below (equation 6.2, pg. 6.12, volume 5, IPCC guidelines). The MCF indicates the extent to which the methane producing potential (B_o) is realised in each type of treatment method.

$$Emission\ Factor = Bo \bullet MCF_j$$

where Bo is the maximum methane producing capacity (kg CH4/kg BOD) and MCF_j is the methane conversion factor (fraction).

The value used for the maximum methane producing capacity (B_o) is the value proposed as default by the IPCC guidelines, i.e. 0.6 kg CH4/kg BOD (table 6.2, pg. 6.12, volume 5). The values used for the methane correction factor (MCF_j) are the values proposed as default by the IPCC guidelines, i.e. 0 for centralised, aerobic treatment plant and 0.5 for septic system (table 6.3, pg. 6.13, volume 5).

Amount of waste treated aerobically

All the sewage treatment plants in Cyprus are using aerobic treatment. The wastewater Information on the percentage of national population connected to wastewater collection and treatment systems is available for 1992-2005, 2007 and 2009. For the years 1990 and 1991, it has been assumed that value is the same as 1992, since not many changes have taken place regarding wastewater treatment during 1990 and 1992. The percentage of national population connected to wastewater collection and treatment systems for the years 2006, 2008 and 2010-2012, were estimated using the linear trend that is created between 2001 and 2009, which has the equation y=0.0595x-0.5937 (see Figure 7.10).

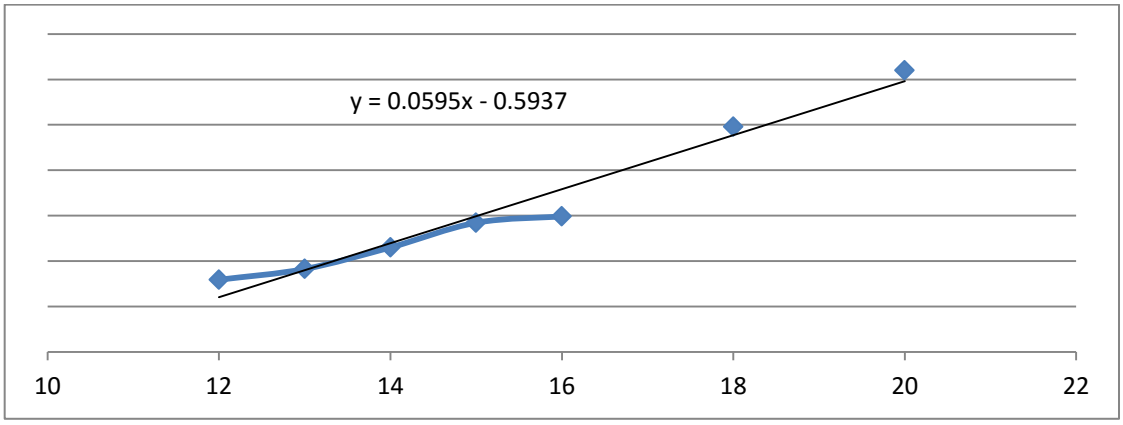

Figure 7.10. Linear trend that is created between percentage of national population connected to wastewater collection and treatment systems for the years 2001 and 2009 and time (where 1990=1)

Amount of waste treated anaerobically

The amount of waste treated anaerobically is the remaining when the amount of waste treated aerobically is subtracted from 100%. The percentage of national population served by anaerobic treatment is presented in Table 7.18.

Table 7.18. Percentages of national population served by aerobic and anaerobic treatment

	Percentage of national population connected to wastewater collection and treatment systems	Percentage of population served by septic tanks
1990	6.4%	93.6%
1991	6.4%	93.6%
1992	6.4%	93.6%

	Percentage of national population connected to wastewater collection and treatment systems	Percentage of population served by septic tanks
1993	6.8%	93.2%
1994	6.7%	93.3%
1995	8.1%	91.9%
1996	11.2%	88.8%
1997	12.0%	88.0%
1998	12.8%	87.2%
1999	13.3%	86.7%
2000	14.3%	85.7%
2001	15.9%	84.1%
2002	18.3%	81.7%
2003	23.0%	77.0%
2004	28.5%	71.5%
2005	29.8%	70.2%
2006	41.8%	58.2%
2007	49.6%	50.4%
2008	53.7%	46.3%
2009	62.0%	38.0%
2010	65.6%	34.4%
2011	71.5%	28.5%
2012	77.5%	22.5%
2013	83.4%	16.6%
2014	89.4%	10.6%

% BOD reduction

BOD reduction coefficient is assumed 50%.

For category waste water treatment and discharge for domestic waste water and the gas CH4, the TERT noted during the NIR2015 review that the IEF for CH4 emissions from domestic wastewater was very low in comparison to other Member States. The TERT identified a large amount of sludge (90% of total TOW), which was assumed to be removed from the waste water. As a result the fraction of TOW that was assumed to be converted to CH4 after waste water treatment was low and this resulted in low CH4 emissions. The TERT considered the amounts of sludge removed as not realistic and too high. Also for wastewater treatment in septic tanks Cyprus assumed that 90% of the organic material is removed as sludge. In the IPCC Guidelines (Table 6.3) an MCF for septic tanks is given as 0.5 and a remark is added, that 50% of the organic material settles in the tank as sludge. This seems to imply that sludge removal is already accounted for in the MCF. So this MCF should be applied to total TOW, treated in septic tanks and not to TOW subtracted by organic material removed in sludge.

Sludge

The IPCC Guidelines propose a separate calculation for wastewater and for sludge removed from the wastewater. The distinction however is inappropriate for Cyprus, because sludge is not collected separately. Nevertheless, the total organic product of sludge is 0 for all years, since according to the revised IPCC1996 guidelines (workbook, pg. 6.21) the fraction of degradable organic component remove in sludge is 0.

Nitrous oxide Emissions from domestic wastewater

The emissions of N_2O from wastewater effluent according to the IPCC2006 guidelines (volume 5, pg. 6.25) are calculated using the following equation:

$$N_2O \text{ emissions} = N_{EFFLUENT} * EF_{EFFLUENT} * 44/28$$

where $N_2O_{(s)}$ is the N_2O emissions from wastewater effluent in kg N_2O -N/yr, $N_{EFFLUENT}$ is the nitrogen in the effluent discharged to aquatic environments, $EF_{EFFLUENT}$ is the emissions factor for N2O emissions from discharged to wastewater (default 0.005 kg N_2O-N/kg, page 6.25, volume 5). The factor 44/28 is the conversion of kg N2O-N into kg N2O.

The $N_{EFFLUENT}$ is estimated using the following equation (equation 6.8, pg. 6.25, volume 5):

$$N_{EFFLUENT} = (P * Protein * F_{NPR} * F_{NON-CON} * F_{IND-COM}) - N_{SLUDGE}$$

Where P is the human population, Protein is the annual per capita protein consumption in kg/person/yr, F_{NPR} is the fraction on nitrogen in protein (default value = 0.16 in kg N/kg protein), $F_{NON-CON}$ is the factor for non-consumed protein added to the wastewater, $F_{IND-COM}$ is factor for industrial and commercial co-discharged protein into the sewer system and N_{SLUDGE} is the nitrogen removed with sludge (default = zero) in kg N/yr.

The population and the annual protein intake per capita used are presented in Table 7.19.

The protein supply quantity (g/capita/day) is according to FAO information[25]. For 2012-2014, the protein intake was assumed that same as 2011.

Table 7.19. Human population and annual protein intake per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Human population (1000s)	587.1	603.1	619.2	632.9	645.4	656.3	666.3	675.2	682.9
Protein intake (kg/person/yr)	31.1	29.7	32.4	31.6	31.4	32.4	30.9	30.8	31.6

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Human population (1000s)	690.5	697.5	705.5	713.7	722.9	733	744	757.9	776.4
Protein intake (kg/person/yr)	31.8	31.1	31.1	30.9	29.3	29.4	28.7	27.8	29.5

	2008	2009	2010	2011	2012	2013	2014
Human population (1000s)	796.9	819.1	839.8	862.0	865.9	858.0	847.0
Protein intake (kg/person/yr)	29.8	28.9	29.3	28.8	28.8	28.8	28.8

7.5.1.2. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

7.5.1.3. Source-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

[25] http://faostat3.fao.org/download/FB/FBS/E

7.5.1.4. Source-specific recalculations

The emissions from this source have been recalculated due to the change of (a) the protein supply quantity,(b) the %BOD reduction following the TERT's recommendation in trial review and (c) Wastewater disposed in septic tanks is considered as uncollected and 1 is used as a correction factor (compared to 1.25 in previous submissions).

7.5.1.5. Source-specific planned improvement

No source specific improvements are planned.

7.5.2. Industrial wastewater (5D2)

The principal factor that determines methane generation potential of wastewater is the amount of organic material in the wastewater stream. For industrial wastewater, this is indicated by the Chemical Oxygen Demand (COD). COD indicates the total amount of carbon, biodegradable and non-biodegradable, that is available for oxidation. According to IPCC guidelines, industrial production should be grouped according to their methane production potential. The main groups are paper and pulp manufacture, slaughterhouses, alcohol, beer, starch, organic chemicals and others (vegetable oil production, textiles, rubber, petroleum refineries, fruits and vegetables). The industrial activities taking place in Cyprus are predominately food and drink industries.

Even though the actual industrial production has decreased considerably during 1990-2014, emissions from industrial wastewater increased by 140% during the same period (Table 7.20, Figure 7.11). This increase has been caused by the increase in the amount of waste treated by anaerobic digestion and therefore the methane produced. Emission estimates from this source have been revised due to availability of new data for 2013.

Table 7.20. Total emissions from industrial wastewater 1990-2014

	1990	1995	2000	2005	2010	2013	2014
CH4 (t)	35.21	35.21	35.21	85.01	103.86	103.86	103.86
N2O (t)	1.04	1.24	1.18	0.96	0.93	0.87	0.87
Total (Gg CO2 eq.)	1.19	1.25	1.23	2.41	2.87	2.86	2.86

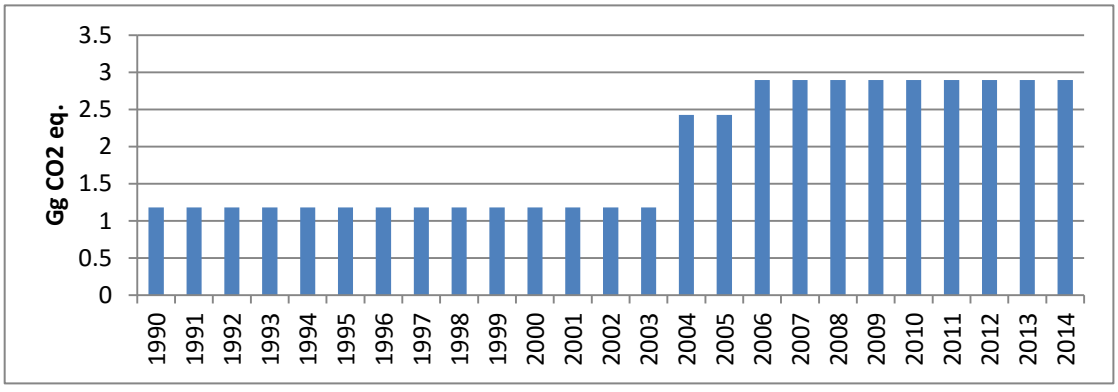

Figure 7.11. Emissions from industrial wastewater 1990-2014

7.5.2.1. Methodological issues

Methane emissions

According to the IPCC guidelines, to estimate total emissions from wastewater, the selected emissions factors are multiplied by the associated organic wastewater production and summed. The amount of CH_4 recovered and thus not emitted into the atmosphere for each handling method should be subtracted: no methane recovery takes place in Cyprus therefore recovery is assumed 0. The sum of the emissions for each handling method provides the total CH_4 emissions from industrial wastewater. In equation form, the estimate of total CH4 emissions from wastewater handling is as follows (equation 6.4, 2006 IPCC guidelines, volume 5 pg. 6.20):

$$CH4\ Emissions=\Sigma[(TOW_i-S_i)*EF_i-R_i]$$

where CH4 emissions is the total methane emissions from wastewater in kg CH4, TOWi is the total organically degradable material in wastewater from industry i in kg COD/yr, Si is the organic component removed as sludge in inventory year, kg COD/yr, EFi is the emission factor for industry i in kg CH4/kg COD and Ri is the total amount of methane recovered in kg CH4/yr.

To estimate total organic wastewater (TOW) for a particular industry the following equation should be used (equation 6.6, IPCC2006 guidelines, volume 5, pg. 6.22):

$$TOWi = Pi\ x\ Wi\ x\ COD$$

where TOW is the total industrial organically material in wastewater for industry in kg COD/yr, P is the total industrial product for industrial sector W is the wastewater generated in m3/tonne of product, COD is the chemical oxygen demand (industrial degradable organic component in kg COD/m3 wastewater.

To estimate the emission factor for industrial wastewater, the following equation is proposed by the IPCC guidelines (Equation 6.5, IPCC1996 guidelines, volume 5,pg. 6.21):

$$EF_j = B_o\ x\ MCF_j$$

whereEF_j is the emission factor (kg CH4 /kg DC) for each treatment (e.g. aerobic treatment, anaerobic digester for sludge, etc.), Bo is the maximum methane producing capacity (kg CH4/kg DC), MCF_j is the methane conversion factor. Since no country specific data is available, Bo is considered 0.25 (2006IPCC guidelines, volume 5, pg. 6.21).

In words, the methodology applied for the estimation of methane emissions from industrial wastewater is the following:

(a) Collection of data for industrial production (Table 7.21).
(b) Total industrial organic wastewater was estimated by multiplying the industrial production by the wastewater generation coefficients and by COD in Table 7.22(2006 IPCC guidelines, volume 5, pg. 6.22, Table 6.8).
(c) Organically Degradable material (TOW) in Gg is the sum of the TOW of each industrial product divided by 1,000,000 (Table 7.23).
(d) The wastewater generated was categorised to anaerobic and aerobic treatment according to the assumptions of Table 7.24.
(e) Methane conversion factor was assumed 0 for aerobic treatment and 0.8 for anaerobic treatment, according to the 2006 IPCC guidelines (pg. 6.21, volume 5). Maximum producing capacity was assumed 0.25 kg CH4 / kg according to the 2006 IPCC guidelines

(pg. 6.21, volume 5). The resulting methane emission factor estimated according to waste stream is presented in Table 7.25.

(f) The emission factor for each waste streams was multiplied by the TOW (kg COD/ year) of the respective waste stream to estimate the annual emissions of methane per waste stream. The total CH4 emissions are the sum of the CH4 emitted per waste stream.

Data for industrial production

Detailed statistics on industrial production in Cyprus do not exist. Therefore data on industrial consumption is used instead. Another issue associated with the national statistics on industrial activity, is that the sales of industrial products for the year x-2 (which in this case is 2014) are completed and published in the summer after the inventory has to be submitted (which in this case is summer 2015). Therefore, the 2014 “production" is assumed to be equal to the 2013 “production”. The industrial production data used is presented in Table 7.21.

Table 7.21. Industrial production 1990-2014

Gg product	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Alcohol	1.0	1.0	1.0	1.0	1.0	1.1	0.9
Beer	33.1	34.8	36.6	36.1	35.6	35.2	33.1
Soft drinks	46.6	50.5	54.7	55.4	56.2	56.9	57.5
Dairy products	60.7	64.6	68.8	71.2	73.9	76.7	81.1
Meat & poultry	64.4	63.1	67.7	76.0	80.9	81.0	88.0
Refinery	635.3	763.2	727.1	781.2	896.8	827.9	760.0
Soaps & detergents	12.1	12.9	13.8	10.9	9.8	9.5	9.0
Vegetable oils	21.7	24.9	28.6	27.5	26.5	25.7	28.1
Vegetables, fruits & juices	47.9	34.9	34.0	38.0	52.1	56.3	53.0
Wine	49.4	52.8	56.5	56.3	56.0	55.8	54.3

Gg product	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Alcohol	1.0	1.0	2.1	2.6	3.9	3.8	2.5
Beer	33.3	36.5	40.5	40.9	40.4	38.3	36.7
Soft drinks	58.3	59.3	60.0	60.9	62.7	62.3	62.1
Dairy products	81.4	86.3	84.1	83.3	89.5	92.4	93.2
Meat & poultry	97.0	93.7	69.5	80.5	87.8	90.0	92.4
Refinery	1042.7	1082.6	1140.4	1134.8	1115.1	1045.5	931.9
Soaps & detergents	7.1	7.2	7.2	7.0	7.8	8.1	6.2
Vegetable oils	26.3	22.7	23.2	21.8	20.1	21.3	19.4
Vegetables, fruits & juices	52.5	48.0	49.0	49.9	51.6	48.7	44.2
Wine	42.0	30.9	43.2	37.4	34.5	37.5	35.5

Gg product	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Alcohol	1.9	1.3	1.2	1.0	0.9	0.7	0.7
Beer	37.1	37.7	37.4	39.8	42.7	35.7	34.3
Soft drinks	60.5	66.6	58.3	62.5	62.9	59.4	57.9
Dairy products	93.9	96.3	99.5	97.8	112.1	104.1	106.0
Meat & poultry	93.4	95.5	94.0	94.5	102.1	99.1	105.6
Refinery	269.2	0.0	0.0	0.0	0.0	0.0	0.0
Soaps & detergents	7.4	6.1	6.2	6.3	6.8	6.9	7.1
Vegetable oils	19.6	19.3	19.1	18.1	18.2	16.3	16.9
Vegetables, fruits & juices	42.1	37.6	34.4	35.4	40.6	40.4	45.5
Wine	31.7	29.8	26.5	20.2	15.9	12.4	11.1

Gg product	**2011**	**2012**	**2013**	**2014**
Alcohol	0.6	0.7	0.7	0.7
Beer	32.2	33.0	32.9	32.9

Soft drinks	54.6	35.6	26.0	26.0
Dairy products	109.3	106.2	100.9	100.9
Meat & poultry	103.6	96.0	83.6	83.6
Refinery	0.0	0.0	0.0	0.0
Soaps & detergents	6.7	7.1	6.5	6.5
Vegetable oils	15.7	14.3	12.2	12.2
Vegetables, fruits & juices	56.5	48.0	54.5	54.5
Wine	14.2	10.9	11.5	11.5

Industrial organic wastewater

Wastewater production was estimated by multiplying the industrial production by the wastewater generation coefficients in Table 7.22 (volume 5, pg. 6.22, Table 6.8).

Table 7.22. Wastewater generation coefficient (m^3 /t product) and COD concentration (kg COD/m3) according to industrial product

	Wastewater generation (m^3/t)	**COD (kg/m^3)**
Alcohol	24	11
Beer	6.3	2.9
Soft drinks	2 [a]	2 [a]
Dairy products	7	2.7
Meat& poultry	13	4.1
Refinery	0.6	1.0
Soaps& detergents	3.0 [a]	0.9 [a]
Vegetable oils	3.1	0.9 [a]
Vegetables, fruits & juices	20.0	5.0
Wine	23.0	1.5

[a]IPCC Good Practice Guide 2000,pg. 5.22

Total organic wastewater

Total organically degradable material in wastewater in kg COD/year per industrial product was then estimated by multiplying the industrial production by the wastewater generated and by the COD coefficient of each industrial product in Table (2006 IPCC guidelines, p.6.22). The sum of the TOW of each industrial product divided by 10^6 is presented in Table 7.23.

Table 7.23. Total organically degradable material (Gg), 1990-2014

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Gg DC	12.61	11.55	11.96	12.85	14.64	15.07	15.04	15.22	14.40	13.98

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Gg DC	14.58	15.49	15.38	14.53	13.72	13.08	12.53	12.42	13.51	12.86

	2010	**2011**	**2012**	**2013**	**2014**
Gg DC	13.68	14.75	13.28	13.14	13.14

Categorisation of wastewater treatment to aerobic and anaerobic

The wastewater generated was categorised to anaerobic and aerobic treatment according to the assumptions of Table 7.24. The assumptions were prepared in collaboration with the Pollution Prevention Unit of the Department of Environment.

Table 7.24. Treatment of waste by anaerobic treatment according to industrial production, 1990-2014

	1990	1991	1992	1993	1994	1995	1996
alcohol	2.0%	2.1%	2.1%	2.0%	1.9%	1.9%	2.2%
beer	20%	19%	18%	18%	19%	19%	20%
soft drinks	1.00%	0.92%	0.85%	0.84%	0.83%	0.82%	0.81%
dairy products	0	0	0	0	0	0	0
meat & poultry	0	0	0	0	0	0	0
refinery	0	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0	0
vegetable oils	0	0	0	0	0	0	0
veg., fruits & juices	1.0%	1.4%	1.4%	1.3%	0.9%	0.9%	0.9%
wine	0	0	0	0	0	0	0

	1997	1998	1999	2000	2001	2002	2003
alcohol	2.1%	2.0%	1.0%	0.8%	0.5%	0.5%	0.8%
beer	20%	18%	16%	16%	16%	17%	18%
soft drinks	0.80%	0.79%	0.78%	0.76%	0.74%	0.75%	0.75%
dairy products	0	0	0	0	0	0	0
meat & poultry	0	0	0	0	0	0	0
refinery	0	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0	0
vegetable oils	0	0	0	0	0	0	0
veg., fruits & juices	0.9%	1.0%	1.0%	1.0%	0.9%	1.0%	1.1%
wine	0	0	0	0	0	0	0

	2004	2005	2006	2007	2008	2009	2010
alcohol	1.1%	1.5%	1.8%	2.1%	2.3%	2.8%	2.8%
beer	18%	18%	18%	17%	15%	19%	19%
soft drinks	0.77%	0.70%	0.80%	0.75%	0.74%	0.78%	0.80%
dairy products	0	0	5.00%	5.09%	4.44%	4.78%	4.69%
meat & poultry	5.00%	4.89%	4.97%	4.95%	4.57%	4.71%	4.42%
refinery	0	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0	0
vegetable oils	0	0	0.5%	0.5%	0.5%	0.6%	0.5%
veg., fruits & juices	1.1%	1.3%	1.4%	1.4%	1.2%	1.2%	1.1%
wine	0	0	0	0	0	0	0

	2011	2012	2013	2014
alcohol	3.5%	3.1%	3.1%	3.1%
beer	21%	20%	20%	20%
soft drinks	0.85%	1.31%	1.79%	1.79%
dairy products	4.55%	4.69%	4.93%	4.93%
meat & poultry	4.51%	4.86%	5.59%	5.59%
refinery	0	0	0	0
soaps & detergents	0	0	0	0
vegetable oils	0.6%	0.6%	0.7%	0.7%
veg., fruits & juices	0.8%	1.0%	0.9%	0.9%
wine	0	0	0	0

Methane emission factor

Methane conversion factor was assumed 0 for aerobic treatment and 0.8 for anaerobic treatment, according to the 2006 IPCC guidelines (volume 5, pg. 6.21, Table 6.7). Maximum producing capacity was assumed 0.25 kg CH4 / kg COD according to the 2006 IPCC

guidelines (pg. 6.21, volume 5). The resulting methane emission factor estimated according to waste stream is presented in Table 7.25.

The aggregate MCF for all waste streams was multiplied by the total annual organic wastewater generation (kg COD/ year) to estimate the annual emissions of methane.

Table 7.25. Methane emission factor estimated according to waste stream (kg CH4/kg COD), 1990-2014

	1990	1991	1992	1993	1994	1995	1996
alcohol	0.004	0.004	0.004	0.004	0.004	0.004	0.004
beer	0.040	0.038	0.035	0.037	0.037	0.038	0.040
soft drinks	0.002	0.002	0.002	0.002	0.002	0.002	0.002
dairy products	0	0	0	0	0	0	0
meat & poultry	0	0	0	0	0	0	0
refinery	0	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0	0
vegetable oils	0	0	0	0	0	0	0
veg., fruits & juices	0.002	0.003	0.003	0.003	0.002	0.002	0.002
wine	0	0	0	0	0	0	0

	1997	1998	1999	2000	2001	2002	2003
alcohol	0.004	0.004	0.002	0.002	0.001	0.001	0.002
beer	0.040	0.036	0.033	0.032	0.033	0.035	0.036
soft drinks	0.002	0.002	0.002	0.002	0.001	0.001	0.002
dairy products	0	0	0	0	0	0	0
meat & poultry	0	0	0	0	0	0	0
refinery	0	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0	0
vegetable oils	0	0	0	0	0	0	0
veg., fruits & juices	0.002	0.002	0.002	0.002	0.002	0.002	0.002
wine	0	0	0	0	0	0	0

	2004	2005	2006	2007	2008	2009	2010
alcohol	0.002	0.003	0.004	0.004	0.005	0.006	0.006
beer	0.036	0.035	0.035	0.033	0.031	0.037	0.039
soft drinks	0.002	0.001	0.002	0.001	0.001	0.002	0.002
dairy products	0	0	0.010	0.010	0.009	0.010	0.009
meat & poultry	0.010	0.010	0.010	0.010	0.009	0.009	0.009
refinery	0	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0	0
vegetable oils	0.00	0.00	0.001	0.001	0.001	0.001	0.001
veg., fruits & juices	0.002	0.003	0.003	0.003	0.002	0.002	0.002
wine	0	0	0	0	0	0	0

	2011	2012	2013	2014
alcohol	0.007	0.006	0.006	0.006
beer	0.041	0.040	0.040	0.040
soft drinks	0.002	0.003	0.004	0.004
dairy products	0.009	0.009	0.010	0.010
meat & poultry	0.009	0.010	0.011	0.011

refinery	0	0	0	0
soaps & detergents	0	0	0	0
vegetable oils	0.001	0.001	0.001	0.001
veg., fruits & juices	0.002	0.002	0.002	0.002
wine	0	0	0	0

Estimation of N_2O emissions

The nitrous oxide emissions were estimated by multiplying the total annual industrial wastewater production (Table 7.26) by the default emission factor of 0.25 g N2O/m3 wastewater according to CORINAIR.

Table 7.26. Total industrial wastewater production (1000 m3/year), 1990-2014

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Alcohol	24	24	23	24	25	26	22
Beer	208	219	231	227	225	222	208
Soft drinks	93	101	109	111	112	114	115
Dairy products	425	452	481	499	517	537	568
Meat & poultry	837	820	880	987	1052	1052	1145
Refinery	381	458	436	469	538	497	456
Soaps &detergents	36	39	41	33	29	29	27
Vegetable oils	67	77	89	85	82	80	87
Veg., fruits & juices	959	698	680	759	1041	1127	1060
Wine	1136	1215	1300	1295	1289	1283	1250

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Alcohol	23	24	50	61	94	92	59
Beer	210	230	255	257	255	242	231
Soft drinks	117	119	120	122	125	125	124
Dairy products	570	604	589	583	626	647	652
Meat & poultry	1261	1218	903	1047	1142	1170	1202
Refinery	626	650	684	681	669	627	559
Soaps &detergents	21	22	22	21	23	24	19
Vegetable oils	82	70	72	68	62	66	60
Veg., fruits & juices	1050	961	980	999	1031	974	884
Wine	965	711	993	860	793	863	817

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Alcohol	46	32	28	24	21	17	18
Beer	234	238	236	251	269	225	216
Soft drinks	121	133	117	125	126	119	116
Dairy products	657	674	696	684	785	729	742
Meat & poultry	1214	1242	1222	1228	1327	1289	1373
Refinery	161	0	0	0	0	0	0
Soaps &detergents	22	18	19	19	21	21	21
Vegetable oils	61	60	59	56	56	50	52
Veg., fruits & juices	842	751	687	708	812	808	911
Wine	730	685	609	465	366	285	254

	2011	2012	2013	2014
Alcohol	14	16	16	16
Beer	203	208	207	207
Soft drinks	109	71	52	52
Dairy products	765	743	706	706
Meat & poultry	1347	1248	1086	1086
Refinery	0	0	0	0
Soaps &detergents	20	21	20	20
Vegetable oils	49	44	38	38
Veg., fruits & juices	1129	960	1090	1090
Wine	327	250	265	265

7.5.2.2. Uncertainties and time-series consistency

Uncertainty analysis is presented in Section 1.7.

7.5.2.3. Sector-specific QA / QC and verification

QA/QC and verification activities are presented in Section 1.6.

7.5.2.4. Sector-specific recalculations

Emissions estimates from this source have been revised due to availability of new data on industrial production for 2013.

Detailed statistics on industrial production in Cyprus do not exist. Therefore data on industrial consumption is used instead. Another issue associated with the national statistics on industrial activity, is that the sales of industrial products for the year x-2 (which in this case is 2014) are completed and published in the summer after the inventory has to be submitted (which in this case is summer 2016). Therefore, the 2014 “production" is assumed to be equal to the 2013 “production”. This assumption was applied for the preparation of the NIR 2015. Since “industrial production” data is now available for 2013, the emissions are re-estimated using the data.

7.5.2.5. Sector-specific planned improvement

Improvement of activity data for wastewater production and management – the inventory team is in communication with the statistical service and other involved authorities to improve the industrial production and management data for the whole time series. The necessary resources and methods are investigated by the statistical service to collect the necessary data and information.

Chapter 8: Other (CRF source category sector 6)

Not occurring.

Chapter 9: KP-LULUCF

9.1. General information

Accounting of LULUCF activities under the Kyoto Protocol states that unlike the Convention, which includes all emissions and removals from LULUCF in a Party's total emissions, the accounting of the LULUCF sector is restricted to emissions and removals from specific activities that are defined under Article 3, paragraphs 3 and 4, of the Protocol. Article 3, paragraph 3, covers direct, human-induced, afforestation, reforestation and deforestation activities. Accounting of these is mandatory: each Annex I Party must account for emissions and removals in the commitment period on lands on which these activities have occurred. Article 3, paragraph 4, activities are restricted to forest land management, cropland management, grazing land management and/or revegetation. In the second commitment period article 3, paragraph 4, activities include also wetland drainage and rewetting. Accounting of these activities differs between the first and the second commitment period. For activities that are elective each Party must choose whether to account for emissions and removals from each such activity during the commitment period.

Cyprus did not have any obligations during the first commitment period regarding KP-LULUCF and the inventory section on LULUCF and the KP-LULUCF is still under development. The calculations of emissions and removals for afforestation/reforestation, deforestation and forest management are still under way.

9.1.1. Definition of forest and any other criteria

The forest definition adopted by Cyprus is in line with the Forest National Law of 2012 (25 (I)/2012) and in accordance with the definitions of the Food and Agriculture Organization of the United Nations for its Global Forest Resource assessment (FAO FRA 2015). This definition is consistent with the definition given in Decision 16/CMP.1.

For Cyprus, forest comprises of land covered by forest trees which covers at least 0.3 hectares, where the tree crown cover is at least 10 per cent and the minimum tree height is of 5 meters (at maturity). It includes forest roads, cleared tracts, firebreaks and other small open areas within the forest as well as reforested areas or burnt areas or other areas that temporarily have low plant cover due to human intervention or natural causes, but does not include municipal parks and gardens.

9.1.2. Elected activities under Article 3, paragraph 4, of the Kyoto Protocol

Cyprus has not elected any additional activities under Article 3, paragraph 4 of the Kyoto Protocol. As of the Decision 2/CMP.7, forest management (FM) is a mandatory activity to be reported under Article 3.4.

9.1.3. Description of how the definitions of each activity under Article 3.3 and each elected activity under Article 3.4 have been implemented and applied consistently over time

Non-applicable.

9.1.4. Description of precedence conditions and/or hierarchy among Article 3.4 activities, and how they have been consistently applied in determining how land was classified.

Non-applicable.

9.2. Land-related information

As mentioned in Chapter 6, the proposal of the LULUCF inventory expert was to use the available land cover and land change information from the CORINE Land Cover Maps that are prepared from the nature protection sector of the Department of the Environment, in order to categorise the land into the LULUCF categories.

Preliminary analysis of land change data from the CORINE datasets show land change from one category to the other as illustrated in the Table 9.1 below.

Table 9.1. Land change 1990-2014

Year	1990	1995	2000	2005	2010	2013	2014
Forest-Forest	159719	157735	155751	153767	154352	154792	154939
Annual CL-Annual CL	303616	298074	292533	286991	286212	285689	285515
Woody CL-Woody CL	145156	148730	152305	155880	156574	156063	155893
Grass GL-Grass GL	48154	45264	42375	39486	39174	38993	38933
Woody GL-Woody GL	199118	198214	197310	196405	196010	195551	195398
Wetland-Wetland	3208	3613	4019	4425	4575	4627	4645
Settlements-Settlements	50909	59640	68372	77103	80388	81574	81969
Other land to Other land	9342	7950	6557	5165	5969	5965	5964
L to Forest	5	5	5	5	153	153	153
L to Annual CL	130	130	130	130	38	38	38
L to Woody CL	1578	1578	1578	1578	32	32	32
L to Grass GL	0	0	0	0	10	10	10
L to Woody GL	472	472	472	472	102	102	102
L to Wetland	81	81	81	81	17	17	17
L to Settlements	1043	1043	1043	1043	474	474	474
L to Other Land	1614	1614	1614	1614	64	64	64
Total Area in ha	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**	**924145**

9.2.1. Spatial assessment unit used for determining the area of the units of land under Article 3.3

The minimum mapping unit (MMU) for CORINE land cover is 25 hectares, the minimum width of linear elements is 100 meters and the MMU for Land Cover Changes is 5 hectares.

9.2.2. Methodology used to develop the land transition matrix

As mentioned in Chapter 6 the CORINE Land Cover maps and CORINE Land Change data was utilized to categorize land into the 6 LULUCF categories for years 2000, 2006 and 2012. Then it was assumed that land change was linear and it was extrapolated back to 1990 and forward to 2014, thus establishing land transition matrices.

Table 9.2. Land transition matrices - Areas and changes in areas in 1990-1991 and in 2013-2014 (ha)

	Ha	Forest	Annual CL	Woody CL	Grass GL	Woody GL	Wetland	Settlements	Other Land	**Total end 1990**
FROM	Forest	159719		39		225		9	129	160120
	Annual CL	5	303616	159		116	4	552	401	304854
	Woody CL			145156		123		740		146019
	Grass GL		130	7	48154	8		140	293	48732
	Woody GL			277		199118		325	51	199771
	Wetland						3208			3208
	Settlements			36				50909		50945
	Other Land			1059			77	17	9342	10495
	Total end 1991	159724	303745	146734	48154	199591	3289	52692	10217	**924145**
		TO								

	Ha	Forest	Annual CL	Woody CL	Grass GL	Woody GL	Wetland	Settlements	Other Land	**Total end 2013**
FROM	Forest	154792					6			154798
	Annual CL		285689	29				184		285902
	Woody CL		14	156063				163	26	156266
	Grass GL				38993	45		26		39063
	Woody GL	150		3		195551		101		195806
	Wetland						4627			4627
	Settlements		1			31	9	81574	38	81653
	Other Land	2	23		10	26	3		5965	6030
	Total end 2014	154945	285727	156095	39003	195653	4645	82048	6029	**924145**
		TO								

9.2.3. Maps and/or database to identify the geographical locations, and the system of identification codes for the geographical locations

CORINE Land Use Maps covering the whole of Cyprus were used. The maps were obtained for years 2000, 2006 and 2012.

9.3. Activity-specific information

The development of this sector is not complete yet.

9.3.1. Methods for carbon stock change and GHG emission and removal estimates

Not reported. The methodology used for LULUCF is the 2006 IPCC Guidelines for National Greenhouse Inventories.

9.3.1.1. Description of the methodologies and the underlying assumptions used

Tier 1 methodologies will be applied.

9.3.1.2. Justification when omitting any carbon pool or GHG emissions/removals from activities under Article 3.3 and elected activities under Article 3.4

Non-applicable.

9.3.1.3. Information on whether or not indirect and natural GHG emissions and removals have been factored out

Non-applicable.

9.3.1.4. Changes in data and methods since the previous submission (recalculations)

Non-applicable.

9.3.1.5. Uncertainty estimates

Non-applicable.

9.3.1.6. Information on other methodological issues

Non-applicable.

9.3.1.7. The year of the onset of an activity, if after 2008

Non-applicable.

9.4. Article 3.3

Calculations of these activities are not as yet complete.

9.4.1. Information that demonstrates that activities under Article 3.3 began on or after 1 January 1990 and before 31 December 2012 and are direct human-induced

In Cyprus all land use categories are to be considered managed and consequently activities under Article 3.3 are directly human induced.

9.4.2. Information on how harvesting or forest disturbance that is followed by the re-establishment of forest is distinguished from deforestation

This information is not yet available. The Forest Department is conducting a full inventory of forested areas which should be complete by 2020. This should give us the additional information needed to distinguish between forest disturbance and deforestation. Harvesting is not taking place extensively in Cyprus and no areas are clear-cut of forest as the common practice is the thinning of trees.

9.4.3. Information on the size and geographical location of forest areas that have lost forest cover but which are not yet classified as deforested

Not reported.

9.5. Article 3.4

Not reported.

9.5.1. Information that demonstrates that activities under Article 3.4 have occurred since 1 January 1990 and are human-induced

In Cyprus all land use categories are to be considered managed and consequently activities under Article 3.4 are directly human induced.

9.5.2. Information relating to Cropland Management, Grazing Land Management and Revegetation, if elected, for the base year

Cyprus has not elected Cropland Management, Grazing Land Management and Revegetation for the current commitment period.

9.5.3. Information relating to Forest Management

All forested areas that are not reported as Afforestation/Reforestation or Deforestation are to be considered as Forest Management.

9.5.4. Information related to the natural disturbances provision under article 3.4

Cyprus intends to apply the provisions under article 3.4 to exclude emissions from natural disturbances for the accounting for forest management (FM) during the second commitment period in accordance with decision 2/CMP.7.

9.6. Other information

9.6.1. Key category analysis for Article 3.3 activities and any elected activities under Article 3.4

Not reported.

9.6.2. KP-LULUCF accounting

Cyprus will account for Article 3.3 and 3.4 LULUCF activities at the end of the commitment period.

9.7. Information relating to Article 6

Cyprus has not elected any activities under Article 6.

Chapter 10: Recalculations and improvements

The recalculations and improvements that have been performed have been presented in detail in the appropriate chapter.

Several of the improvements and recalculations have been implemented because of comments received for the submission of 2015 by the TERT. Cyprus has not undergone a detailed review by the UNFCCC for the NIR2015 submission.

The comments made and mistakes identified with the resulting changes that have taken place are presented in the Table 10.1.

Table 10.1. Reporting on implementation of recommendations and adjustments

CRF category / issue	Review recommendation	Review report / paragraph	MS response / status of implementation	Chapter/section in the NIR
Public Electricity and Heat Production CH4, CO2, N2O emissions, biomass Activity data	Cyprus cross check the biomass activity data and CO2 emissions reported as memo items in the reporting tables	When comparing the CRF sectoral approach with the sectoral approach calculated on basis of Eurostat energy balance data, the TERT noted that the CRF does not include activity data for biomass for the category 1A1a whereas the Eurostat energy balance includes 118 TJ for this specific category. Cyprus responded that necessary changes will be made in the 2016 submission. The TERT recommends that when making these changes that Cyprus cross check the biomass activity data and CO_2 emissions reported as memo items in the reporting tables. This item is linked with item CY-1A2g-2015-0002.	All biogas consumed by Main activity producer CHP plants and Autoproducer CHP plants has been allocated to agriculture since the biogas is produced and consumed the CHP generators installed at the anaerobic digesters treating animal waste.	section 3.2.2
1A2g Other CH4, CO2, N2O emissions, Activity data	Cyprus checks whether biomass consumption exists in this category and reports emissions in its next submission, if relevant	For the category 1A2g Other and CH4, CO2, N2O emissions from biomass for the year 2013, step 1 of the review identified a notable difference between CRF and Eurostat energy balance data. Cyprus responded that CH4 and N2O emissions from biomass were not estimated because biomass consumption is not indicated in the national energy balance. However, Eurostat energy data includes biomass consumption. In its reply to the TERT Bulgaria indicated that the national energy balance may have been updated and that it will check in the next inventory submission whether biomass consumption is available from national sources or Eurostat data and complete the estimation. The TERT recommends that Cyprus checks whether biomass consumption exists in this category and reports emissions in its next submission, if relevant. This item is linked with item CY-1A1a-2015-0002.	Biomass consumption exists in this category and emissions have been estimated and reported.	section 3.2.6
2A1 Mineral industry - Cement Production CO2 emissions, Activity data	Cyprus investigates whether there is no CKD exported from the process for the period before 2005 and to check whether the same production technologies and CKD recycling were used in that period and to clearly document this in its NIR	For CO2 emissions from category 2A1 and the years before 2005, the TERT noted that it is not clear whether and how cement kiln dust (CKD) was included in the calculation of emissions from cement production. In response to the review Cyprus explained that from 2005 onwards emissions reported under the EU ETS are used in the inventory. Based on information received from the cement company all the CKD is bound and recycled into the production process and that therefore emissions from CKD are not included in the EU ETS reports since no CKD is being exported from the system. Cyprus used the implied emission factor from the two operating installations from 2005 onwards also for the period 1990-2004. The TERT recommends that Cyprus investigates whether there is no CKD exported from the process for the period before 2005 and to check whether the same production technologies and CKD recycling were used in that period and to clearly document this in its NIR.	Confirmed with the ETS inspectors that there is no CKD exported from the process for the period before 2005 and the same production technologies and CKD recycling were used during 1990-2004. This is clearly documented in the NIR.	Section 4.2.1
2D Non-Energy Products from Fuels and Solvent Use	Cyprus recommended to report these emissions in its next submission	The TERT notes that this issue is outside the agreed scope for the 2015 ESD trial review. For CO2 emissions from non-energy use of fuels, the TERT noted that Cyprus stated in its NIR that these emissions are calculated according to the methodology proposed by the IPCC 2006 guidelines. In the NIR in Table 3.38 only the consumption of feedstocks and the carbon stored is reported (also for lubricants). However, in the CRF in Table 2(I).A-Hs2 lubricant emissions	The emissions have been estimated and reported.	section 4.3

CRF category / issue	Review recommendation	Review report / paragraph	MS response / status of implementation	Chapter/section in the NIR
CO2 Emission	and document the estimates transparently	are reported as 'NO'. In response to a question raised during the review Cyprus acknowledges that emissions from lubricants do exist in Cyprus. However, due to problems encountered while applying the IPCC 2006 guidelines, the emissions have not been estimated and therefore the respective cells in the CRF reporter have been left blank. Cyprus stated during the review that these problems have not yet been resolved and cannot provide estimates. However, Cyprus aims to correct this problem in the 2016 inventory submission. The TERT welcomes this effort and recommends Cyprus to report these emissions in its next submission and document the estimates transparently.		
2D Non-Energy Products from Fuels and Solvent Use CO2 Emission	Cyprus considers the method provided in the 2006 IPCC Guidelines and provides estimates or provides a justification in the NIR why the method cannot be implemented.	The TERT noted that Cyprus does not report CO2 emissions from urea-based catalytic converters. These emissions should be reported under category 2D3 according to footnote 6 in CRF table 2(I).A-Hs2. It is unlikely that these emissions do not occur in view of compliance with European emission standards. Upon a question raised during the review, Cyprus stated that no data is available to report CO2 emissions from this source. The TERT recommends that Cyprus considers the method provided in the 2006 IPCC Guidelines (Chapter 3 of Volume 2) and provides estimates or provides a justification in the NIR why the method cannot be implemented.	The emissions have been estimated and reported.	section 3.2.5
2F4 Product Uses as Substitutes for Ozone Depleting Substances – Aerosols HFCs emissions, Activity data	Cyprus include MDI emission estimates in its next submission.	For category Aerosols/Metered dose inhalers and HFCs the TERT noted that no information was provided for emissions in the CRF tables although some data was included in the draft NIR. In addition, emissions from MDI were presented in the NIR 2014. In response to the questions raised during the review, Cyprus explained that the emissions have not been estimated by mistake. Cyprus notified the TERT that it plans to estimate emissions from MDI based on population data (applying average of MDI emissions per capita based on the submissions by Malta and Greece) for the 2016 submission. The TERT noted that the issue is below the threshold of significance for technical correction. The TERT recommends that Cyprus include MDI emission estimates in its next submission.	The emissions have been estimated and reported.	section 4.4
2F1 Product Uses as Substitutes for Ozone Depleting Substances - Refrigeration and Air Conditioning HFCs	Cyprus (a) improves its F-gas reporting and reports emissions from newly filled/ manufactured products and from stocks separately (and accounts for the entire stock in	For the category 2F1 Refrigeration and air conditioning and HFCs for years 2000-2013 the TERT noted that the product life factors reported for CRF 2F1 subcategories show unexpectedly high values (between 41-1.050% in 2013). In the NIR (page 83) a formula is provided for calculating the emissions from 2.F.1. However, it was not very clear from the NIR which values were used in the formula and which activity data were available. The TERT asked Cyprus to explain the calculation method in more detail and to provide an explanation for the high IEFs reported in the CRF tables. In response to the review, Cyprus provided an Excel file with 2F1 emission calculations. Based on the file and the information received during review week, the TERT believes that the method is not in line with the 2006 IPCC Guidelines. The TERT recommends that Cyprus improves its F-gas reporting and reports emissions from newly	The methodology for the estimation of emissions from 2F1 has been revised and clearly reported in the NIR.	section 4.4

CRF category / issue	Review recommendation	Review report / paragraph	MS response / status of implementation	Chapter/section in the NIR
emissions, Activity data, Emission factor	2000-2013) (b) to include a more detailed description of the methods and activity data used in its NIR to increase the transparency of the inventory	filled/manufactured products and from stocks separately (and accounts for the entire stock in 2000-2013). Furthermore, the TERT recommends Cyprus to include a more detailed description of the methods and activity data used in its NIR to increase the transparency of the inventory.		
3A Enteric Fermentation CH4 emissions, Emission factor	Cyprus include revised estimates in its next submission.	For category 3A1 Dairy Cattle Enteric Fermentation for CH4 emissions for the entire time series, the TERT noted that the EF used by Cyprus was identified as an outlier. The TERT identified that the EF was too high due to the assumed daily weight gain used and the fat content of milk used in the estimation. In response to a question and solutions suggested by the TERT during the review, Cyprus explained that 'We shall discuss your comments with the Department of Agriculture that have provided the data that we used and revise the methodology/estimates accordingly'. The TERT partly agreed with the explanation provided by Cyprus. However, the TERT decided to calculate a technical correction because the issue had already been identified in step 1 as a significant issue and the trial review was meant to simulate a regular review year. The TERT recommends that Cyprus include revised estimates in its next submission.	The daily weight gain has been revised to 0 (from 1.15) according to the IPCC2006 guidelines (pg.10.12, vol. 4) and the percentage of fat in milk to 3.5% (from 0.4%) according to the recommendation of the TERT expert (3-4%). Revised estimates on the animal weight are expected from the Department of Agriculture, to further improve the EF.	section 5.2.2
3B Manure Management CH4, N2O emissions, Activity data	Cyprus to (a) include in the NIR information about the source of the manure management systems, as well as an explanation of the lack of ‘pasture’ in the country. (b) gather statistical information about the use of the different manure management systems.	For category 3B manure management for CH4 and N2O emissions, the TERT noted that Cyprus has not provided in the NIR information about the source of the manure management systems used. In addition, the TERT pointed out that “pasture” system is reported as “NO” for all animal species. In response to a question raised during the review, Cyprus explained that 'No other written references are available for Cyprus. The source for the information is oral discussion s with Mr. Andreas Athanasiades, an officer at the Department of Environment who is an expert on animal waste management. Pasture is not practiced in Cyprus even for sheep and goats'. The TERT partly agreed with the explanation of Cyprus. Even though, the TERT considered that the information should be strengthen based on statistical studies. The TERT recommends Cyprus to include in the NIR information about the source of the manure management systems, as well as an explanation of the lack of ‘pasture’ in the country. Additionally, the TERT encourages Cyprus to gather statistical information about the use of the different manure management systems.	Work in progress in collaboration with the pollution prevention control Unit of the Department of Environment.	section 5.3.6
3B Manure Management N2O	recommends reporting the notation key “NE”	For category 3B5 Indirect N2O emissions due to leaching and run-off for the whole period the TERT noted that Cyprus has neither estimated this activity nor reported a notation key. In response to a question raised during the review, Cyprus explained that 'The emissions have	Information for FracLEACHMS is not available. "NE" reportedincluding a comment	section 5.3.2

CRF category / issue	Review recommendation	Review report / paragraph	MS response / status of implementation	Chapter/section in the NIR
Emissions	and including a comment about the lack of a Tier 1 methodology in the 2006 IPCC Guidelines	not been estimated by error. Emissions' estimates will be provided in next submission'. The TERT agreed with the commitment of Cyprus. The TERT also acknowledged the lack of a default value for FracLEACHMS in the 2006 IPCC Guidelines. Additionally, the TERT recognize the lack of a Tier 1 methodology in the 2006 IPCC Guidelines. Nevertheless, the TERT also points out that for every cell a value or notation key should be reported. The TERT recommends estimating this activity, if information for parameter FracLEACHMS is available. If this is not the case, the TERT recommends reporting the notation key “NE” and including a comment about the lack of a Tier 1 methodology in the 2006 IPCC Guidelines.	about the lack of a Tier 1 methodology in the 2006 IPCC Guidelines	
3B Manure Management N2O emissions, Activity data	include the explanation provided in the agriculture sector of NIR	For category 3B manure management for cattle for CH4 and N2O emissions and for the whole time series of emissions, the TERT noted that Cyprus has used a Western Europe default value for N excretion and an Eastern Europe value for the CH4 emissions due to manure management. In response to a question raised during the review, Cyprus explained that 'Manure management practices for cattle waste used in Cyprus are more appropriate to be categorised under Eastern Europe. However, for the calculation of the N2O emissions from manure management, the factor has been changed to Western Europe, due to the high milk production, based on the comment received by the UNFCCC review team in 2013'. The TERT agreed with the explanation of Cyprus. The TERT recommends Cyprus to include the explanation provided in the agriculture sector of NIR.	The necessary explanation has been included in the report.	section 5.3.2
3B Manure Management, CH4, CO2 emissions	include the explanation provided in the agriculture sector of NIR	For category 3B manure management for CH4 and N2O emissions and for the whole time series of emissions, the TERT noted that Cyprus has not provided in the NIR information in energy sector about the inclusion of emissions from the use of CH4 captured in digesters. In response to a question raised during the review, Cyprus explained that 'The electrical energy used on and offsite has been taken into account in the energy sector according to the national energy balance'. The TERT agreed with the explanation of Cyprus. The TERT recommends Cyprus to include the explanation provided in the agriculture sector of NIR.	The necessary explanation has been included in the report.	section 5.3.1
3B Manure Management N2O emissions, Activity data	include the revised estimate in its next submission	For category 3B manure management for N2O emissions from sheep, swine and goats for the whole time series of emissions, the TERT noted that the sum of manure excretion over the different manure management systems did not match the total N excreted by the animals. In response to a question and solutions suggested by the TERT during the review, Cyprus explained that they found the mistake in the calculations. In addition, Cyprus committed to use the corrected calculations for the next submission. The TERT agreed with the commitment of Cyprus. The TERT recommends that Cyprus include the revised estimate in its next submission.	The mistake has been identified and the necessary correction has been made to the estimates.	section 5.3.5
Direct N2O from managed soils N2O emissions, Activity data	Cyprus estimates N2O emissions from source category 3.D.1.2 Organic N fertilizers in its next	For source category 3D1.2 Organic N fertilizers and N2O emissions Cyprus reported 'not estimated' (NE). However, N excretions of animal livestock are reported in CRF table 3.B(b) and N2O emissions were reported in previous submission. In addition, N2O emissions from sewage sludge spreading were reported in previous submission in this category. In its answer to a question raised within step 1 of the ESD trial Review 2015, Cyprus explained that it will try to provide emissions in the final inventory submission. However, the final submission still	The emissions have been estimated and reported.	section 5.5.2

CRF category / issue	Review recommendation	Review report / paragraph	MS response / status of implementation	Chapter/section in the NIR
	submission	includes the notation key NE and Cyprus explained in an answer to a question raised by the TERT during step 2 of the ESD review that emissions were not estimated. This causes significant underestimation of N2O emissions from agricultural soils and the TERT strongly recommends that Cyprus estimates N2O emissions from source category 3.D.1.2 Organic N fertilizers in its next submission.		
Direct N2O from managed soils N2O emissions, Activity data	Cyprus reports the notation key 'not occurring' (NO) also for source category 3D1.3.	Cyprus reports for source category 3D1.3 Urine and dung deposited by grazing animals and N2O emissions the notation key 'not estimated' (NE). For the source category 3B(b) N excretions from pasture, range, paddock Cyprus explained that grazing does not occur in the country. Assuming that the statement for 3.D.1.3 is correct, the TERT recommends that Cyprus reports the notation key 'not occurring' (NO) also for source category 3D1.3.	"NE" revised to "NO" as proposed	NA
Solid Waste Disposal CH4 emissions	Cyprus recalculate emissions in its next submission	The category solid waste disposal and the gas CH4 for year 2013 was identified in the first step as a potential significant issue. In response to questions raised during the review, Cyprus provided details on the calculation of methane emissions. The TERT identified two errors in the calculation: (i) in the IPCC-calculation sheet wet temperate conditions are chosen for the rate of biodegradation (k), where dry temperate seem to be more applicable and (ii) in the calculation for Cyprus only waste landfilled after 1990 is taken in consideration. Good practice according to the 2006 guidelines (volume 5, page 3.6) is to use data for 3 to 5 half-lives in order to achieve an acceptably accurate result. In addition, Cyprus assumes zero methane oxidation for all landfills, where the 2006 IPCC guidelines allow 10% methane oxidation for well-managed landfills. In a response to this recommendation, Cyprus indicated that recalculated emissions cannot be provided during this review. The TERT recommends that Cyprus will recalculate emissions in its next submission.	(i) in the IPCC-calculation sheet wet temperate conditions for the rate of biodegradation (k), were changed to dry temperate (ii) in the calculation waste landfilled since 1950 is taken in consideration (iii) in the IPCC-calculation sheet there is no differentiation of landfills therefore zero methane oxidation is maintained	section 7.2.1
Wastewater Treatment and Discharge CH4 emissions	take these recommendations into consideration in its next submission	For category waste water treatment and discharge for domestic waste water and the gas CH4 for year 2013, the TERT noted that the IEF for CH4 emissions from domestic wastewater was very low in comparison to other Member States. In response to the review, Cyprus provided details on the way emissions are calculated. The TERT identified a large amount of sludge (90% of total TOW), which was assumed to be removed from the waste water. As a result the fraction of TOW that is assumed to be converted to CH4 after waste water treatment is low which results in low CH4 emissions. The TERT considered the amounts of sludge removed as not realistic and too high. Also for wastewater treatment in septic tanks Cyprus assumed that 90% of the organic material is removed as sludge. In the IPCC Guidelines (Table 6.3) an MCF for septic tanks is given as 0.5 and a remark is added, that 50% of the organic material settles in the tank as sludge. This seems to imply that sludge removal is already accounted for in the MCF. So this MCF should be applied to total TOW, treated in septic tanks and not to the TOW subtracted by organic material removed in sludge. In a response to this recommendation, Cyprus indicated that they internally will discuss this recommendation. The TERT recommends that Cyprus will take these recommendations into consideration in its next submission.	MCF was applied to total TOW, treated in septic tanks and not to the TOW subtracted by organic material removed in sludge	section 7.5.1

Additional recalculations that have been performed during the EU QA/QC procedures for the 2016 submission are presented in the Tables that follow.

(a) The differences between NIR2016 v.1.1 submitted on 16th of March 2016 and NIR2016 v.1.0 are presented in the Table below.

Sector	Comment	Change	TERT ref. number	Change in report	Change in CRF
1 Energy	Verified emissions: reported in Annex V: 1,528 kt CO2eq, reported in EUTL: 4,469 kt CO2eq.	Corrected - The emissions from 1A1a. Public electricity and heat production were not entered.		Template MMR-IRArticle10 revised & resubmitted	
1A3a Fuel Combustion Activities - Transport - Civil Aviation	Pick IEF value 1990	Correction of fuel consumption (from 230.991 to 272.31 TJ)	CY-1A3a-2016-0001	✓	✓
1A3a Fuel Combustion Activities - Transport - Civil Aviation	Trend of kerosene consumption	Data source changed from CYSTAT to EUROCONTROL for both international and domestic flights	CY-1A3a-2016-0002	✓	✓
1A3b Fuel Combustion Activities - Transport - Road transportation	IE notation key without explanation	Explanation included in the CRF.	CY-1A3b-2016-0001		
2F Product uses as substitutes for Ozone Depleting Substances	Recovery should be “amount remaining in products at decommissioning” minus “disposal emissions”.	NO changed to NE	CY-2F-2016-0004		
3.D.1.2.a Animal Manure Applied to Soils	Implied emission factor (IEF): Data has been identified as an outlier.	Change of EF1 from 0.0125 (IPCC1996) to 0.01 as proposed by the IPCC2006 guidelines	CY-3D1-2016-0004	✓	✓
3.D.1.2.c Other organic fertilizers applied to soil.	There is a notation key "NE" used in the category	NE has been replaced by NO.	CY-3D1-2016-0001		
3.D.1.5 Mineralization of soil organic matters	There is a notation key "NE" used in the category	NE has been replaced by NO.	CY-3D1-2016-0002		
3B Manure Management - 3.B.1.3 (Swine)	Allocation over all climate regions and MMS (Tier 2) sums up to 100). Years: 1999-2002	Corrected	CY-3B-2016-0005		✓
3B Manure Management - 3.B.1.4.6 (Mules and Asses)	Allocation over all climate regions and MMS (Tier 2) sums up to 100). Years: 1999	Corrected	CY-3B-2016-0006		✓
3B Manure Management - 3.B.2.1 (Cattle)	Sum of manure excreted over the MMS per animal type versus the N-excretion rate multiplied by the animal population (heads)). Years: 1996	Mistake during the transfer of data from the excel file to CRF reporter – corrected	CY-3B-2016-0008		✓
5B Biological Treatment of Solid Waste	Emission factors applied for calculating CH4 and N2O emissions from	Emissions corrected	CY-5B-2016-0001	✓	✓

Sector	Comment	Change	TERT ref. number	Change in report	Change in CRF
	composting are very low. Check if the right units are used				
5.C Incineration and Open Burning of Waste	No emissions are reported	The correct notation key (NO) has been used to complete the empty cells	CY-5C-2016-0001		
5.E Other	Blank cells	Blank cells have been completed	CY-5E-2016-0001		

(b) The differences between NIR2016 v.1.2 submitted on 7th of April 2016 and NIR2016 v.1.0 submitted on 16th of March 2016 are presented in the Table below.

Sector	Comment	Change	TERT ref. number	Change in report	Change in CRF
2D1 Lubricant Use, CO2, 1993	Mistake identified 23/3/16	CO2 emissions entered in CRFreporter	NA	x	✓
2G4 Other product use	NOx, SOx, NMVOCs not included by mistake	2G4 added		* Change in template for art.7	✓
2G4 Other product use	CO2 emissions estimated from NMVOCs	2G4 added	CY-2D-2016-0001	✓	✓
2D3	CO2 emissions estimated from NMVOCs	CO2 emissions entered in CRFreporter	CY-2D-2016-0002	✓	✓
1A1a	We have detected blank cells for the following fuels: biomass, gaseous fuels, other fossil fuels, peat and solid fuels.	Biomass, gaseous fuels, other fossil fuels, peat and solid fuels have been created and entered NO.	CY-1A1a-2016-0001	x	✓
1D1a	Mistake identified 31/3/16 from TERT comment CY-1A3a-2016-0002 (Numbers have considerably been revised for nearly the whole time-series (*only 1999 and 2000 for international consumption has not changed*)	Jet kerosene 1999-2000 revised – not correctly entered in CRFreporter	NA	x	✓
3.D.1.5 - Mineralization of soil organic matters	NE instead of NO	NO	CY-3D1-2016-0002	x	✓
3.B.1.3	Distribution of MMS over climates	Corrected to sum up to 100	CY-3B-2016-0004 CY-3B-2016-0005	x	✓
5A	Wrong oxidation factor in report	Corrected	CY-5A-2016-0002	✓	x
3.B.2.5	"NE" used in the category 3.B.2.5	Emissions estimated	CY-3B-2016-0001	✓	✓

(c) The differences between NIR2016 v.1.3 submitted on 13h of June 2016 (CYP_2016_12_Inventory) and NIR2016 v.1.2 (CYP_2016_5_Inventory) submitted on 7th of April 2016 are presented in the Table below.

Sector	Comment	Change	TERT ref. number	Change in report	Change in CRF
1A3b Fuel	Large differences in	The difference is due	CY-1A3b-	✓	✓

Sector	Comment	Change	TERT ref. number	Change in report	Change in CRF
Combustion Activities - Transport - Road transportation	Biomass fuel consumption between data in CRF and data reported to the Eurostat for road transportation. There seems to be a systematic difference of 27% lower consumption in CRF each year (2008-2014).	to the NCV used: in the CRF, 27 was used according to the IPCC2006 guidelines, whereas in the energy balance reported to EUROSTAT, 37 was used.	2016-0003		
1A3b Fuel Combustion Activities - Transport - Road transportation	CO2 from urea-based catalysts are reported under 1.A.3.b instead of 2.D.3 as in line with the UNFCCC	Relocation of emissions from urea-based catalyst	CY-1A3b-2016-0004	✓	✓
2D Non-Energy Products from Fuels and Solvent Use	Carbon content of NMVOCs not according to IPCC2006 guidelines	Revised from 85% to 60%	CY-2D-2016-0001	✓	✓
3A Enteric fermentation	Overestimation of emissions caused by 60% digestibility for dairy cattle.	Adopted 68% proposed by the TERT.	CY-3A-2016-0002	✓	✓
3A Enteric fermentation	Mistake identified during calculations in equation (constant milk production used and not varying by year)	Formula corrected	NA	✓	✓
3B Manure management	For estimating CH4 emission from Manure Management Systems (MMS) for cattle is assumed Eastern European conditions and using the default value for CH4 from MMS for Eastern Europe. Proposal to develop T2	Proposal adopted. T2 applied for cattle (dairy and other)	CY-3B-2016-0010	✓	✓
Biological Treatment of Solid Waste	Emissions of N2O from composting are calculated assuming an EF of 0.3 g/kg of waste and not 0.24 as indicated in corrigendum, dated July 2015.	EF revised from 0.3 to 0.24 g/kg	CY-5B-2016-0002	✓	✓
Wastewater Treatment and Discharge	I=1 should be used for septic tanks	Calculations revised to use I=1 for septic tanks	CY-5D-2016-0002	✓	✓

Annex I. Uncertainty analysis

This Annex contains the uncertainty analysis tables. The tables have also been submitted in excel format.

Reporting year:	1990												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	1761.4882	5	5	7.0711	4.8807	0.0000	0.3124	0.0000	2.2092	4.880654673	
1A2. Manufacturing industries and cons	CO2	512.1969	512.1969	5	5	7.0711	0.6424	0.0000	0.0908	0.0000	0.6424	0.412660078	
1A3. Transport	CO2	1180.5150	1180.5150	5	5	7.0711	1.4806	0.0000	0.2094	0.0000	1.4806	2.192106367	
1A4. Other sectors	CO2	430.4000	430.4000	2	2	2.8284	0.2159	0.0000	0.0763	0.0000	0.2159	0.046621164	
1A5. Other	CO2	10.9950	10.9950	5	5	7.0711	0.0138	0.0000	0.0020	0.0000	0.0138	0.000190156	
2A. Mineral industry	CO2	759.1845	759.1845	5	5	7.0711	0.9522	0.0000	0.1347	0.0000	0.9522	0.906594895	
2D. Non-energy products from fuels an	CO2	6.2377	6.2377	20	400	400.4997	0.4431	0.0000	0.0011	0.0000	0.0313	0.000979243	
2G. Other product manufacture and use	CO2	0.0584	0.0584	50	200	206.1553	0.0021	0.0000	0.0000	0.0000	0.0007	5.36101E-07	
3H. Urea application	CO2	1.8150	1.8150	50	200	206.1553	0.0664	0.0000	0.0003	0.0000	0.0228	0.00051817	
1A1. Energy industries	CH4	1.7055	1.7055	5	100	100.1249	0.0303	0.0000	0.0003	0.0000	0.0021	4.57533E-06	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8831	5	100	100.1249	0.0157	0.0000	0.0002	0.0000	0.0011	1.22656E-06	
1A3. Transport	CH4	5.3955	5.3955	5	50	50.2494	0.0481	0.0000	0.0010	0.0000	0.0068	4.57912E-05	
1A4. Other sectors	CH4	2.5278	2.5278	5	20	20.6155	0.0092	0.0000	0.0004	0.0000	0.0032	1.00505E-05	
1A5. Other	CH4	0.0370	0.0370	20	40	44.7214	0.0003	0.0000	0.0000	0.0000	0.0002	3.44542E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	30	100	104.4031	0.0000	0.0000	0.0000	0.0000	0.0000	2.19256E-13	
3A. Enteric fermentation	CH4	199.6575	199.6575	5	30	30.4138	1.0770	0.0000	0.0354	0.0000	0.2504	0.062703223	
3B. Manure management	CH4	111.4133	111.4133	5	50	50.2494	0.9930	0.0000	0.0198	0.0000	0.1397	0.019525056	
3F. Field burning of agricultural residue	CH4	0.3450	0.3450	50	200	206.1553	0.0126	0.0000	0.0001	0.0000	0.0043	1.87222E-05	
5A. Solid waste disposal	CH4	251.1627	251.1627	5	20	20.6155	0.9184	0.0000	0.0445	0.0000	0.3150	0.099226811	
5D. Waste water treatment and dischar	CH4	91.1100	91.1100	20	40	44.7214	0.7227	0.0000	0.0162	0.0000	0.4571	0.208915508	
1A1. Energy industries	N2O	3.9813	3.9813	5	300	300.0417	0.0449	0.0000	0.0007	0.0000	0.0050	2.49324E-05	
1A2. Manufacturing industries and cons	N2O	1.7230	1.7230	5	300	300.0417	0.0084	0.0000	0.0003	0.0000	0.0022	4.6699E-06	
1A3. Transport	N2O	27.8034	27.8034	5	300	300.0417	2.1893	0.0000	0.0049	0.0000	0.0349	0.001215946	
1A4. Other sectors	N2O	0.9804	0.9804	5	100	100.1249	0.0003	0.0000	0.0002	0.0000	0.0012	1.51197E-06	
1A5. Other	N2O	0.0265	0.0265	20	20	28.2843	0.0000	0.0000	0.0000	0.0000	0.0001	1.77032E-08	
2G. Other product manufacture and use	N2O	41.3028	41.3028	50	200	206.1553	2.2808	0.0000	0.0073	0.0000	0.5180	0.268335167	
3B. Manure management	N2O	72.5332	72.5332	5	100	100.1249	1.6592	0.0000	0.0129	0.0000	0.0910	0.008275463	
3D. Agricultural soils	N2O	149.9732	149.9732	20	100	101.9804	7.3588	0.0000	0.0266	0.0000	0.7524	0.566064542	
3F. Field burning of agricultural residue	N2O	0.1073	0.1073	20	20	28.2843	0.0000	0.0000	0.0000	0.0000	0.0005	2.89652E-07	
5D. Waste water treatment and dischar	N2O	12.2776	12.2776	5	10	11.1803	0.0006	0.0000	0.0022	0.0000	0.0154	0.000237108	
2F Product uses as ODS substitutes	HFCs	0.1456	0.1456	50	200	206.1553	0.0000	0.0000	0.0000	0.0000	0.0018	3.33522E-06	
2F Product uses as ODS substitutes	SF6	0.0258	0.0258	50	200	206.1553	0.0000	0.0000	0.0000	0.0000	0.0003	1.04433E-07	
END													
Total		5638.0082	5638.0082				26.0668					9.6749	
Total Uncertainties						Uncertainty in total inventory %:	5.105569909				Trend uncertainty %:	3.110456456	

Reporting year:	1991												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	1824.0439	5	5	7.0711	4.4195	0.0164	0.3235	0.0820	2.2877	5.240193836	
1A2. Manufacturing industries and cons	CO2	512.1969	938.3774	5	5	7.0711	1.0815	0.0675	0.1664	0.3376	1.1769	1.499040167	
1A3. Transport	CO2	1180.5150	1178.5630	5	5	7.0711	1.3583	0.0188	0.2090	0.0939	1.4781	2.193674121	
1A4. Other sectors	CO2	430.4000	470.3680	2	2	2.8284	0.2168	0.0004	0.0834	0.0007	0.2360	0.055682417	
1A5. Other	CO2	10.9950	12.2290	5	5	7.0711	0.0141	0.0000	0.0022	0.0002	0.0153	0.000235289	
2A. Mineral industry	CO2	759.1845	716.2085	5	5	7.0711	0.8255	0.0195	0.1270	0.0974	0.8983	0.816337908	
2D. Non-energy products from fuels an	CO2	6.2377	5.5092	20	400	400.4997	0.3596	0.0002	0.0010	0.0907	0.0276	0.008992962	
2G. Other product manufacture and use	CO2	0.0584	0.0584	50	200	206.1553	0.0020	0.0000	0.0000	0.0002	0.0007	5.69461E-07	
3H. Urea application	CO2	1.8150	1.4667	5	100	100.1249	0.0239	0.0001	0.0003	0.0090	0.0018	8.46875E-05	
1A1. Energy industries	CH4	1.7055	1.7575	5	100	100.1249	0.0287	0.0000	0.0003	0.0017	0.0022	7.90559E-06	
1A2. Manufacturing industries and cons	CH4	0.8831	1.2852	5	100	100.1249	0.0210	0.0001	0.0002	0.0058	0.0016	3.56673E-05	
1A3. Transport	CH4	5.3955	5.5560	5	50	50.2494	0.0455	0.0001	0.0010	0.0028	0.0070	5.63772E-05	
1A4. Other sectors	CH4	2.5278	2.4760	5	20	20.6155	0.0083	0.0000	0.0004	0.0010	0.0031	1.05926E-05	
1A5. Other	CH4	0.0370	0.0413	20	40	44.7214	0.0003	0.0000	0.0000	0.0000	0.0002	4.28729E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	30	100	104.4031	0.0000	0.0000	0.0000	0.0000	0.0000	3.30698E-13	
3A. Enteric fermentation	CH4	199.6575	198.5050	5	30	30.4138	0.9840	0.0033	0.0352	0.0998	0.2490	0.07194015	
3B. Manure management	CH4	111.4133	118.0630	5	50	50.2494	0.9670	0.0006	0.0209	0.0282	0.1481	0.022718484	
3F. Field burning of agricultural residue	CH4	0.3450	0.3200	50	200	206.1553	0.0108	0.0000	0.0001	0.0020	0.0040	1.99731E-05	
5A. Solid waste disposal	CH4	251.1627	255.8867	5	20	20.6155	0.8598	0.0031	0.0454	0.0618	0.3209	0.106812845	
5D. Waste water treatment and dischar	CH4	91.1100	93.5700	20	40	44.7214	0.6821	0.0010	0.0166	0.0395	0.4694	0.221913541	
1A1. Energy industries	N2O	3.9813	4.2852	5	300	300.0417	0.0439	0.0000	0.0008	0.0025	0.0054	3.51836E-05	
1A2. Manufacturing industries and cons	N2O	1.7230	2.6841	5	300	300.0417	0.0172	0.0001	0.0005	0.0431	0.0034	0.001864777	
1A3. Transport	N2O	27.8034	28.1908	5	300	300.0417	1.9007	0.0004	0.0050	0.1099	0.0354	0.013318881	
1A4. Other sectors	N2O	0.9804	1.0490	5	100	100.1249	0.0003	0.0000	0.0002	0.0003	0.0013	1.83187E-06	
1A5. Other	N2O	0.0265	0.0295	20	20	28.2843	0.0000	0.0000	0.0000	0.0000	0.0001	2.19101E-08	
2G. Other product manufacture and use	N2O	41.3028	42.4650	50	200	206.1553	2.0360	0.0004	0.0075	0.0880	0.5326	0.291390073	
3B. Manure management	N2O	72.5332	72.9802	5	100	100.1249	1.4185	0.0011	0.0129	0.1055	0.0915	0.019512374	
3D. Agricultural soils	N2O	149.9732	146.9664	20	100	101.9804	5.9677	0.0029	0.0261	0.2879	0.7373	0.626454671	
3F. Field burning of agricultural residue	N2O	0.1073	0.0983	20	20	28.2843	0.0000	0.0000	0.0000	0.0001	0.0005	2.47649E-07	
5D. Waste water treatment and dischar	N2O	12.2776	12.0303	5	10	11.1803	0.0005	0.0002	0.0021	0.0024	0.0151	0.000233216	
2F Product uses as ODS substitutes	HFCs	0.1456	0.1556	50	200	206.1553	0.0000	0.0000	0.0000	0.0001	0.0020	3.81847E-06	
2F Product uses as ODS substitutes	SF6	0.0258	0.0301	50	200	206.1553	0.0000	0.0000	0.0000	0.0001	0.0004	1.47681E-07	
END													
Total		5638.0082	6135.2492				23.2936					11.1906	
Total Uncertainties						Uncertainty in total inventory %:	4.826342227				Trend uncertainty %:	3.345231349	

Reporting year:	1992												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
						$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$		$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$				
		input data	input data	input data Note A	input data Note A			Note B		I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2120.7909	5	5	7.0711	5.2042	0.0118	0.3762	0.0592	2.6599	7.07830867	
1A2. Manufacturing industries and cons	CO2	512.1969	726.5667	5	5	7.0711	0.7815	0.0229	0.1289	0.1146	0.9112	0.84350508	
1A3. Transport	CO2	1180.5150	1324.5280	5	5	7.0711	1.4248	0.0092	0.2349	0.0459	1.6612	2.761676009	
1A4. Other sectors	CO2	430.4000	561.4490	2	2	2.8284	0.2416	0.0106	0.0996	0.0211	0.2817	0.079780632	
1A5. Other	CO2	10.9950	14.8100	5	5	7.0711	0.0159	0.0004	0.0026	0.0018	0.0186	0.000348123	
2A. Mineral industry	CO2	759.1845	767.5490	5	5	7.0711	0.8256	0.0208	0.1361	0.1042	0.9626	0.937534263	
2D. Non-energy products from fuels an	CO2	6.2377	5.9334	20	400	400.4997	0.3615	0.0002	0.0011	0.0950	0.0298	0.009916603	
2G. Other product manufacture and use	CO2	0.0584	0.0635	50	200	206.1553	0.0020	0.0000	0.0000	0.0002	0.0008	6.60435E-07	
3H. Urea application	CO2	1.8150	1.9177	5	100	100.1249	0.0292	0.0000	0.0003	0.0035	0.0024	1.81807E-05	
1A1. Energy industries	CH4	1.7055	2.0605	5	100	100.1249	0.0314	0.0000	0.0004	0.0013	0.0026	8.30766E-06	
1A2. Manufacturing industries and cons	CH4	0.8831	0.7868	5	100	100.1249	0.0120	0.0000	0.0001	0.0043	0.0010	1.95262E-05	
1A3. Transport	CH4	5.3955	5.7960	5	50	50.2494	0.0443	0.0001	0.0010	0.0044	0.0073	7.21039E-05	
1A4. Other sectors	CH4	2.5278	2.7525	5	20	20.6155	0.0086	0.0000	0.0005	0.0007	0.0035	1.23944E-05	
1A5. Other	CH4	0.0370	0.0500	20	40	44.7214	0.0003	0.0000	0.0000	0.0000	0.0003	6.52871E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	30	100	104.4031	0.0000	0.0000	0.0000	0.0000	0.0000	2.87137E-13	
3A. Enteric fermentation	CH4	199.6575	203.5275	5	30	30.4138	0.9416	0.0052	0.0361	0.1557	0.2553	0.08938685	
3B. Manure management	CH4	111.4133	134.1058	5	50	50.2494	1.0251	0.0007	0.0238	0.0373	0.1682	0.029677644	
3F. Field burning of agricultural residue	CH4	0.3450	0.3150	50	200	206.1553	0.0099	0.0000	0.0001	0.0031	0.0040	2.51879E-05	
5A. Solid waste disposal	CH4	251.1627	260.9192	5	20	20.6155	0.8183	0.0057	0.0463	0.1132	0.3272	0.119899163	
5D. Waste water treatment and dischar	CH4	91.1100	96.0450	20	40	44.7214	0.6534	0.0018	0.0170	0.0722	0.4818	0.237380066	
1A1. Energy industries	N2O	3.9813	4.8872	5	300	300.0417	0.0498	0.0000	0.0009	0.0130	0.0061	0.000207819	
1A2. Manufacturing industries and cons	N2O	1.7230	1.7692	5	300	300.0417	0.0065	0.0000	0.0003	0.0128	0.0022	0.000167671	
1A3. Transport	N2O	27.8034	30.6046	5	300	300.0417	1.9513	0.0003	0.0054	0.0965	0.0384	0.01077728	
1A4. Other sectors	N2O	0.9804	1.2427	5	100	100.1249	0.0004	0.0000	0.0002	0.0018	0.0016	5.54582E-06	
1A5. Other	N2O	0.0265	0.0358	20	20	28.2843	0.0000	0.0000	0.0000	0.0000	0.0002	3.24779E-08	
2G. Other product manufacture and use	N2O	41.3028	43.5676	50	200	206.1553	1.8668	0.0008	0.0077	0.1628	0.5464	0.325071641	
3B. Manure management	N2O	72.5332	77.0032	5	100	100.1249	1.3756	0.0013	0.0137	0.1342	0.0966	0.02733596	
3D. Agricultural soils	N2O	149.9732	170.8183	20	100	101.9804	7.0225	0.0007	0.0303	0.0717	0.8569	0.739497681	
3F. Field burning of agricultural residue	N2O	0.1073	0.0983	20	20	28.2843	0.0000	0.0000	0.0000	0.0001	0.0005	2.52388E-07	
5D. Waste water treatment and dischar	N2O	12.2776	13.4577	5	10	11.1803	0.0005	0.0002	0.0024	0.0015	0.0169	0.000287191	
2F Product uses as ODS substitutes	HFCs	0.1456	0.1642	50	200	206.1553	0.0000	0.0000	0.0000	0.0002	0.0021	4.2819E-06	
2F Product uses as ODS substitutes	SF6	0.0258	0.0342	50	200	206.1553	0.0000	0.0000	0.0000	0.0001	0.0004	2.06724E-07	
END													
Total		5638.0082	6573.6495				24.7046					13.2909	
Total Uncertainties						Uncertainty in total inventory %:	4.97037402				Trend uncertainty %:	3.645672104	

Reporting year:	1993												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2242.9861	5	5	7.0711	5.3200	0.0167	0.3978	0.0836	2.8131	7.920554864	
1A2. Manufacturing industries and cons	CO2	512.1969	768.4144	5	5	7.0711	0.7902	0.0255	0.1363	0.1273	0.9637	0.94498937	
1A3. Transport	CO2	1180.5150	1342.0860	5	5	7.0711	1.3801	0.0173	0.2380	0.0865	1.6832	2.840690585	
1A4. Other sectors	CO2	430.4000	558.1340	2	2	2.8284	0.2296	0.0059	0.0990	0.0118	0.2800	0.078538433	
1A5. Other	CO2	10.9950	15.3710	5	5	7.0711	0.0158	0.0003	0.0027	0.0017	0.0193	0.000374665	
2A. Mineral industry	CO2	759.1845	840.7310	5	5	7.0711	0.8645	0.0151	0.1491	0.0755	1.0544	1.117508594	
2D. Non-energy products from fuels an	CO2	6.2377	9.5362	20	400	400.4997	0.5554	0.0003	0.0017	0.1368	0.0478	0.021008453	
2G. Other product manufacture and use	CO2	0.0584	0.0175	50	200	206.1553	0.0005	0.0000	0.0000	0.0019	0.0002	3.67462E-06	
3H. Urea application	CO2	1.8150	1.6023	5	100	100.1249	0.0233	0.0001	0.0003	0.0108	0.0020	0.00012161	
1A1. Energy industries	CH4	1.7055	2.1805	5	100	100.1249	0.0317	0.0000	0.0004	0.0018	0.0027	1.0651E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8421	5	100	100.1249	0.0123	0.0000	0.0001	0.0042	0.0011	1.84807E-05	
1A3. Transport	CH4	5.3955	5.7503	5	50	50.2494	0.0420	0.0001	0.0010	0.0074	0.0072	0.000106226	
1A4. Other sectors	CH4	2.5278	2.7498	5	20	20.6155	0.0082	0.0001	0.0005	0.0012	0.0034	1.32902E-05	
1A5. Other	CH4	0.0370	0.0518	20	40	44.7214	0.0003	0.0000	0.0000	0.0000	0.0003	6.96082E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	30	100	104.4031	0.0000	0.0000	0.0000	0.0000	0.0000	3.30721E-13	
3A. Enteric fermentation	CH4	199.6575	212.4800	5	30	30.4138	0.9398	0.0055	0.0377	0.1650	0.2665	0.09825607	
3B. Manure management	CH4	111.4133	144.4028	5	50	50.2494	1.0552	0.0015	0.0256	0.0755	0.1811	0.038505911	
3F. Field burning of agricultural residue	CH4	0.3450	0.3050	50	200	206.1553	0.0091	0.0000	0.0001	0.0041	0.0038	3.14989E-05	
5A. Solid waste disposal	CH4	251.1627	266.5955	5	20	20.6155	0.7993	0.0070	0.0473	0.1409	0.3344	0.131641548	
5D. Waste water treatment and dischar	CH4	91.1100	97.7225	20	40	44.7214	0.6356	0.0024	0.0173	0.0950	0.4902	0.249373703	
1A1. Energy industries	N2O	3.9813	5.1792	5	300	300.0417	0.0511	0.0001	0.0009	0.0172	0.0065	0.000338572	
1A2. Manufacturing industries and cons	N2O	1.7230	1.8819	5	300	300.0417	0.0067	0.0000	0.0003	0.0117	0.0024	0.000142109	
1A3. Transport	N2O	27.8034	30.6791	5	300	300.0417	1.7920	0.0006	0.0054	0.1719	0.0385	0.031031713	
1A4. Other sectors	N2O	0.9804	1.2486	5	100	100.1249	0.0003	0.0000	0.0002	0.0009	0.0016	3.33162E-06	
1A5. Other	N2O	0.0265	0.0370	20	20	28.2843	0.0000	0.0000	0.0000	0.0000	0.0002	3.46317E-08	
2G. Other product manufacture and use	N2O	41.3028	44.5510	50	200	206.1553	1.7840	0.0010	0.0079	0.2066	0.5587	0.354865576	
3B. Manure management	N2O	72.5332	82.2182	5	100	100.1249	1.4332	0.0011	0.0146	0.1108	0.1031	0.022901441	
3D. Agricultural soils	N2O	149.9732	184.7915	20	100	101.9804	7.5108	0.0003	0.0328	0.0333	0.9270	0.860525086	
3F. Field burning of agricultural residue	N2O	0.1073	0.0954	20	20	28.2843	0.0000	0.0000	0.0000	0.0001	0.0005	2.44703E-07	
5D. Waste water treatment and dischar	N2O	12.2776	13.4011	5	10	11.1803	0.0005	0.0003	0.0024	0.0028	0.0168	0.000290271	
2F Product uses as ODS substitutes	HFCs	0.1456	0.2171	50	200	206.1553	0.0000	0.0000	0.0000	0.0014	0.0027	9.37909E-06	
2F Product uses as ODS substitutes	SF6	0.0258	0.0385	50	200	206.1553	0.0000	0.0000	0.0000	0.0003	0.0005	2.96144E-07	
END													
Total		5638.0082	6876.2972				25.2919					14.7119	
Total Uncertainties						Uncertainty in total inventory %:	5.029100599				Trend uncertainty %:	3.835603701	

Reporting year:	1994												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
						$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$		$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$				
		input data	input data	input data Note A	input data Note A			Note B		I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2370.8962	5	5	7.0711	5.5475	0.0260	0.4205	0.1300	2.9735	8.858764607	
1A2. Manufacturing industries and cons	CO2	512.1969	781.9994	5	5	7.0711	0.7769	0.0240	0.1387	0.1199	0.9808	0.9762882	
1A3. Transport	CO2	1180.5150	1395.2540	5	5	7.0711	1.3861	0.0168	0.2475	0.0842	1.7499	3.06922651	
1A4. Other sectors	CO2	430.4000	570.2910	2	2	2.8284	0.2266	0.0048	0.1012	0.0095	0.2861	0.081943504	
1A5. Other	CO2	10.9950	15.8190	5	5	7.0711	0.0157	0.0003	0.0028	0.0017	0.0198	0.000396574	
2A. Mineral industry	CO2	759.1845	873.3840	5	5	7.0711	0.8676	0.0151	0.1549	0.0753	1.0954	1.20553187	
2D. Non-energy products from fuels an	CO2	6.2377	13.1313	10	50	50.9902	0.0941	0.0009	0.0023	0.0466	0.0329	0.003257799	
2G. Other product manufacture and use	CO2	0.0584	0.0175	20	400	400.4997	0.0010	0.0000	0.0000	0.0040	0.0001	1.58962E-05	
3H. Urea application	CO2	1.8150	1.7035	50	200	206.1553	0.0493	0.0001	0.0003	0.0209	0.0214	0.000891371	
1A1. Energy industries	CH4	1.7055	2.2720	5	100	100.1249	0.0320	0.0000	0.0004	0.0021	0.0028	1.25632E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8393	5	100	100.1249	0.0118	0.0000	0.0001	0.0049	0.0011	2.49863E-05	
1A3. Transport	CH4	5.3955	6.0800	5	100	100.1249	0.0855	0.0001	0.0011	0.0130	0.0076	0.000226564	
1A4. Other sectors	CH4	2.5278	2.7035	5	50	50.2494	0.0191	0.0001	0.0005	0.0043	0.0034	3.02046E-05	
1A5. Other	CH4	0.0370	0.0533	5	20	20.6155	0.0002	0.0000	0.0000	0.0000	0.0001	4.9982E-09	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	2.02872E-13	
3A. Enteric fermentation	CH4	199.6575	215.9575	30	100	104.4031	3.1676	0.0064	0.0383	0.6402	1.6251	3.050739928	
3B. Manure management	CH4	111.4133	141.3570	5	30	30.4138	0.6040	0.0001	0.0251	0.0037	0.1773	0.031444532	
3F. Field burning of agricultural residue	CH4	0.3450	0.1925	5	50	50.2494	0.0014	0.0000	0.0000	0.0022	0.0002	4.70444E-06	
5A. Solid waste disposal	CH4	251.1627	272.4501	50	200	206.1553	7.8910	0.0079	0.0483	1.5827	3.4170	14.18092981	
5D. Waste water treatment and dischar	CH4	91.1100	99.7850	5	20	20.6155	0.2890	0.0027	0.0177	0.0540	0.1251	0.018583433	
1A1. Energy industries	N2O	3.9813	5.5011	20	40	44.7214	0.0346	0.0001	0.0010	0.0034	0.0276	0.000772961	
1A2. Manufacturing industries and cons	N2O	1.7230	1.8896	5	300	300.0417	0.0063	0.0001	0.0003	0.0152	0.0024	0.000236675	
1A3. Transport	N2O	27.8034	32.1453	5	300	300.0417	1.8361	0.0005	0.0057	0.1573	0.0403	0.02636014	
1A4. Other sectors	N2O	0.9804	1.2605	5	300	300.0417	0.0028	0.0000	0.0002	0.0012	0.0016	3.96921E-06	
1A5. Other	N2O	0.0265	0.0381	5	100	100.1249	0.0000	0.0000	0.0000	0.0001	0.0000	9.12206E-09	
2G. Other product manufacture and use	N2O	41.3028	45.4152	20	20	28.2843	0.0326	0.0012	0.0081	0.0239	0.2278	0.05247843	
3B. Manure management	N2O	72.5332	82.0394	50	200	206.1553	5.6460	0.0017	0.0146	0.3381	1.0289	1.172980627	
3D. Agricultural soils	N2O	149.9732	170.9751	5	100	100.1249	5.7843	0.0033	0.0303	0.3256	0.2144	0.151997515	
3F. Field burning of agricultural residue	N2O	0.1073	0.0596	20	100	101.9804	0.0000	0.0000	0.0000	0.0013	0.0003	1.89876E-06	
5D. Waste water treatment and dischar	N2O	12.2776	13.5799	20	20	28.2843	0.0029	0.0003	0.0024	0.0068	0.0681	0.004687589	
2F Product uses as ODS substitutes	HFCs	0.1456	0.7030	5	10	11.1803	0.0000	0.0001	0.0001	0.0009	0.0009	1.62552E-06	
2F Product uses as ODS substitutes	SF6	0.0258	0.0503	50	200	206.1553	0.0000	0.0000	0.0000	0.0006	0.0006	7.95966E-07	
END													
Total		5638.0082	7117.8433				34.4120					32.8878	
Total Uncertainties						Uncertainty in total inventory %:	5.866173002				Trend uncertainty %:	5.734791653	

Reporting year:	1995												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
						$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$		$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$				
		input data	input data	input data Note A	input data Note A			Note B		I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2166.1439	5	5	7.0711	4.6994	0.0073	0.3842	0.0366	2.7167	7.3819652	
1A2. Manufacturing industries and cons	CO2	512.1969	770.8955	5	5	7.0711	0.7715	0.0229	0.1367	0.1143	0.9668	0.947844603	
1A3. Transport	CO2	1180.5150	1482.0050	5	5	7.0711	1.4831	0.0005	0.2629	0.0023	1.8587	3.454765599	
1A4. Other sectors	CO2	430.4000	602.5390	2	2	2.8284	0.2412	0.0112	0.1069	0.0224	0.3023	0.091872218	
1A5. Other	CO2	10.9950	17.1660	5	5	7.0711	0.0172	0.0006	0.0030	0.0030	0.0215	0.000472529	
2A. Mineral industry	CO2	759.1845	838.7570	5	5	7.0711	0.8394	0.0200	0.1488	0.0998	1.0520	1.116557641	
2D. Non-energy products from fuels an	CO2	6.2377	13.0601	10	50	50.9902	0.0942	0.0009	0.0023	0.0465	0.0328	0.003234952	
2G. Other product manufacture and use	CO2	0.0584	0.0175	20	400	400.4997	0.0010	0.0000	0.0000	0.0039	0.0001	1.55921E-05	
3H. Urea application	CO2	1.8150	1.5407	50	200	206.1553	0.0450	0.0001	0.0003	0.0260	0.0193	0.001051142	
1A1. Energy industries	CH4	1.7055	2.0925	5	100	100.1249	0.0297	0.0000	0.0004	0.0008	0.0026	7.52063E-06	
1A2. Manufacturing industries and cons	CH4	0.8831	0.7966	5	100	100.1249	0.0113	0.0001	0.0001	0.0055	0.0010	3.12367E-05	
1A3. Transport	CH4	5.3955	6.2638	5	100	100.1249	0.0888	0.0001	0.0011	0.0088	0.0079	0.000139734	
1A4. Other sectors	CH4	2.5278	3.5940	5	50	50.2494	0.0256	0.0001	0.0006	0.0038	0.0045	3.46018E-05	
1A5. Other	CH4	0.0370	0.0580	5	20	20.6155	0.0002	0.0000	0.0000	0.0000	0.0001	6.99372E-09	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	1.65626E-13	
3A. Enteric fermentation	CH4	199.6575	225.3000	30	100	104.4031	3.3291	0.0044	0.0400	0.4418	1.6954	3.069522361	
3B. Manure management	CH4	111.4133	148.0505	5	30	30.4138	0.6373	0.0015	0.0263	0.0448	0.1857	0.036486647	
3F. Field burning of agricultural residue	CH4	0.3450	0.1975	5	50	50.2494	0.0014	0.0000	0.0000	0.0021	0.0002	4.39957E-06	
5A. Solid waste disposal	CH4	251.1627	278.6830	50	200	206.1553	8.1311	0.0064	0.0494	1.2793	3.4952	13.8528899	
5D. Waste water treatment and dischar	CH4	91.1100	99.9775	5	20	20.6155	0.2917	0.0025	0.0177	0.0504	0.1254	0.018260353	
1A1. Energy industries	N2O	3.9813	4.9110	20	40	44.7214	0.0311	0.0000	0.0009	0.0006	0.0246	0.000607305	
1A2. Manufacturing industries and cons	N2O	1.7230	1.8148	5	300	300.0417	0.0059	0.0001	0.0003	0.0183	0.0023	0.000341251	
1A3. Transport	N2O	27.8034	33.6740	5	300	300.0417	2.0448	0.0002	0.0060	0.0622	0.0422	0.005657779	
1A4. Other sectors	N2O	0.9804	1.3827	5	300	300.0417	0.0034	0.0000	0.0002	0.0082	0.0017	7.01874E-05	
1A5. Other	N2O	0.0265	0.0414	5	100	100.1249	0.0000	0.0000	0.0000	0.0001	0.0001	2.377E-08	
2G. Other product manufacture and use	N2O	41.3028	46.1900	20	20	28.2843	0.0342	0.0010	0.0082	0.0198	0.2317	0.054085649	
3B. Manure management	N2O	72.5332	85.0194	50	200	206.1553	6.1534	0.0010	0.0151	0.2086	1.0663	1.180491842	
3D. Agricultural soils	N2O	149.9732	212.1694	5	100	100.1249	9.0395	0.0043	0.0376	0.4295	0.2661	0.255250927	
3F. Field burning of agricultural residue	N2O	0.1073	0.0596	20	100	101.9804	0.0000	0.0000	0.0000	0.0013	0.0003	1.8517E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.2593	20	20	28.2843	0.0033	0.0002	0.0025	0.0040	0.0715	0.00513322	
2F Product uses as ODS substitutes	HFCs	0.1456	8.9521	5	10	11.1803	0.0002	0.0016	0.0016	0.0156	0.0112	0.000367997	
2F Product uses as ODS substitutes	SF6	0.0258	0.0581	50	200	206.1553	0.0000	0.0000	0.0000	0.0009	0.0007	1.3733E-06	
END													
Total		5638.0082	7065.6702				38.0538					31.4772	
Total Uncertainties						Uncertainty in total inventory %:	6.168774548				Trend uncertainty %:	5.610451465	

Reporting year:	1996												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2281.1158	5	5	7.0711	4.8067	0.0031	0.4046	0.0155	2.8609	8.185137117	
1A2. Manufacturing industries and cons	CO2	512.1969	829.3021	5	5	7.0711	0.7971	0.0285	0.1471	0.1426	1.0401	1.102123033	
1A3. Transport	CO2	1180.5150	1532.1250	5	5	7.0711	1.4725	0.0015	0.2717	0.0074	1.9216	3.692439911	
1A4. Other sectors	CO2	430.4000	628.3360	2	2	2.8284	0.2416	0.0118	0.1114	0.0236	0.3152	0.099921417	
1A5. Other	CO2	10.9950	18.0630	5	5	7.0711	0.0174	0.0007	0.0032	0.0033	0.0227	0.00052407	
2A. Mineral industry	CO2	759.1845	898.6285	5	5	7.0711	0.8637	0.0163	0.1594	0.0815	1.1270	1.276866157	
2D. Non-energy products from fuels an	CO2	6.2377	13.0723	10	50	50.9902	0.0906	0.0009	0.0023	0.0437	0.0328	0.002988679	
2G. Other product manufacture and use	CO2	0.0584	0.0545	20	400	400.4997	0.0030	0.0000	0.0000	0.0015	0.0003	2.44092E-06	
3H. Urea application	CO2	1.8150	1.3779	50	200	206.1553	0.0386	0.0002	0.0002	0.0351	0.0173	0.001533304	
1A1. Energy industries	CH4	1.7055	2.2133	5	100	100.1249	0.0301	0.0000	0.0004	0.0002	0.0028	7.7527E-06	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8821	5	100	100.1249	0.0120	0.0000	0.0002	0.0048	0.0011	2.42023E-05	
1A3. Transport	CH4	5.3955	6.4013	5	100	100.1249	0.0871	0.0001	0.0011	0.0113	0.0080	0.000193094	
1A4. Other sectors	CH4	2.5278	4.0200	5	50	50.2494	0.0275	0.0001	0.0007	0.0064	0.0050	6.63581E-05	
1A5. Other	CH4	0.0370	0.0610	5	20	20.6155	0.0002	0.0000	0.0000	0.0000	0.0001	7.88832E-09	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	1.41508E-13	
3A. Enteric fermentation	CH4	199.6575	231.7525	30	100	104.4031	3.2887	0.0051	0.0411	0.5104	1.7440	3.301861384	
3B. Manure management	CH4	111.4133	156.5620	5	30	30.4138	0.6472	0.0020	0.0278	0.0595	0.1964	0.04209107	
3F. Field burning of agricultural residue	CH4	0.3450	0.2000	5	50	50.2494	0.0014	0.0000	0.0000	0.0022	0.0003	4.98624E-06	
5A. Solid waste disposal	CH4	251.1627	285.6486	50	200	206.1553	8.0042	0.0075	0.0507	1.4928	3.5825	15.06294615	
5D. Waste water treatment and dischar	CH4	91.1100	98.0725	5	20	20.6155	0.2748	0.0037	0.0174	0.0738	0.1230	0.020581574	
1A1. Energy industries	N2O	3.9813	5.2001	20	40	44.7214	0.0316	0.0000	0.0009	0.0000	0.0261	0.000680554	
1A2. Manufacturing industries and cons	N2O	1.7230	2.0267	5	300	300.0417	0.0068	0.0000	0.0004	0.0118	0.0025	0.000145664	
1A3. Transport	N2O	27.8034	34.6783	5	300	300.0417	2.0001	0.0003	0.0062	0.0853	0.0435	0.009166929	
1A4. Other sectors	N2O	0.9804	1.5019	5	300	300.0417	0.0038	0.0000	0.0003	0.0118	0.0019	0.000143775	
1A5. Other	N2O	0.0265	0.0435	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	2.78897E-08	
2G. Other product manufacture and use	N2O	41.3028	46.9052	20	20	28.2843	0.0325	0.0012	0.0083	0.0248	0.2353	0.055985842	
3B. Manure management	N2O	72.5332	88.7444	50	200	206.1553	6.1837	0.0010	0.0157	0.2095	1.1130	1.28267863	
3D. Agricultural soils	N2O	149.9732	172.6445	5	100	100.1249	5.5204	0.0041	0.0306	0.4089	0.2165	0.214071493	
3F. Field burning of agricultural residue	N2O	0.1073	0.0626	20	100	101.9804	0.0000	0.0000	0.0000	0.0014	0.0003	1.98381E-06	
5D. Waste water treatment and dischar	N2O	12.2776	13.7974	20	20	28.2843	0.0028	0.0004	0.0024	0.0079	0.0692	0.004853311	
2F Product uses as ODS substitutes	HFCs	0.1456	3.6139	5	10	11.1803	0.0000	0.0006	0.0006	0.0061	0.0045	5.74223E-05	
2F Product uses as ODS substitutes	SF6	0.0258	0.0660	50	200	206.1553	0.0000	0.0000	0.0000	0.0011	0.0008	2.00015E-06	
END													
Total		5638.0082	7357.1728				34.4859					34.3571	
Total Uncertainties						Uncertainty in total inventory %:	5.872470817				Trend uncertainty %:	5.861493013	

Reporting year:	1997												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2410.9466	5	5	7.0711	5.1884	0.0128	0.4276	0.0642	3.0238	9.147224643	
1A2. Manufacturing industries and cons	CO2	512.1969	772.5180	5	5	7.0711	0.7299	0.0164	0.1370	0.0820	0.9689	0.945448233	
1A3. Transport	CO2	1180.5150	1598.2690	5	5	7.0711	1.5100	0.0055	0.2835	0.0276	2.0045	4.01883766	
1A4. Other sectors	CO2	430.4000	652.8240	2	2	2.8284	0.2467	0.0144	0.1158	0.0289	0.3275	0.108092261	
1A5. Other	CO2	10.9950	18.9610	5	5	7.0711	0.0179	0.0008	0.0034	0.0039	0.0238	0.000580497	
2A. Mineral industry	CO2	759.1845	863.4820	5	5	7.0711	0.8158	0.0256	0.1532	0.1278	1.0830	1.189142368	
2D. Non-energy products from fuels an	CO2	6.2377	12.8927	10	50	50.9902	0.0878	0.0008	0.0023	0.0409	0.0323	0.002718866	
2G. Other product manufacture and use	CO2	0.0584	0.0608	20	400	400.4997	0.0033	0.0000	0.0000	0.0012	0.0003	1.49005E-06	
3H. Urea application	CO2	1.8150	1.1015	50	200	206.1553	0.0303	0.0002	0.0002	0.0464	0.0138	0.002343397	
1A1. Energy industries	CH4	1.7055	2.3373	5	100	100.1249	0.0313	0.0000	0.0004	0.0013	0.0029	1.02789E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.7887	5	100	100.1249	0.0106	0.0001	0.0001	0.0068	0.0010	4.72621E-05	
1A3. Transport	CH4	5.3955	6.6065	5	100	100.1249	0.0884	0.0001	0.0012	0.0099	0.0083	0.000165897	
1A4. Other sectors	CH4	2.5278	3.6075	5	50	50.2494	0.0242	0.0000	0.0006	0.0022	0.0045	2.54624E-05	
1A5. Other	CH4	0.0370	0.0640	5	20	20.6155	0.0002	0.0000	0.0000	0.0001	0.0001	9.23012E-09	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	2.81099E-13	
3A. Enteric fermentation	CH4	199.6575	226.6125	30	100	104.4031	3.1611	0.0068	0.0402	0.6814	1.7053	3.37227238	
3B. Manure management	CH4	111.4133	161.4318	5	30	30.4138	0.6560	0.0024	0.0286	0.0720	0.2025	0.046173999	
3F. Field burning of agricultural residue	CH4	0.3450	0.2725	5	50	50.2494	0.0018	0.0000	0.0000	0.0016	0.0003	2.82265E-06	
5A. Solid waste disposal	CH4	251.1627	292.7766	50	200	206.1553	8.0644	0.0072	0.0519	1.4410	3.6719	15.55961707	
5D. Waste water treatment and dischar	CH4	91.1100	98.4500	5	20	20.6155	0.2712	0.0040	0.0175	0.0798	0.1235	0.021612967	
1A1. Energy industries	N2O	3.9813	5.4892	20	40	44.7214	0.0328	0.0000	0.0010	0.0014	0.0275	0.000760412	
1A2. Manufacturing industries and cons	N2O	1.7230	1.8008	5	300	300.0417	0.0052	0.0001	0.0003	0.0259	0.0023	0.000675228	
1A3. Transport	N2O	27.8034	35.9567	5	300	300.0417	2.0778	0.0002	0.0064	0.0507	0.0451	0.004599987	
1A4. Other sectors	N2O	0.9804	1.4781	5	300	300.0417	0.0035	0.0000	0.0003	0.0094	0.0019	9.17193E-05	
1A5. Other	N2O	0.0265	0.0459	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	3.92247E-08	
2G. Other product manufacture and use	N2O	41.3028	47.5310	20	20	28.2843	0.0323	0.0013	0.0084	0.0259	0.2384	0.057528261	
3B. Manure management	N2O	72.5332	91.7542	50	200	206.1553	6.3874	0.0008	0.0163	0.1608	1.1508	1.350102199	
3D. Agricultural soils	N2O	149.9732	156.1645	5	100	100.1249	4.3645	0.0076	0.0277	0.7611	0.1959	0.617670295	
3F. Field burning of agricultural residue	N2O	0.1073	0.0834	20	100	101.9804	0.0000	0.0000	0.0000	0.0010	0.0004	1.26933E-06	
5D. Waste water treatment and dischar	N2O	12.2776	13.9375	20	20	28.2843	0.0028	0.0004	0.0025	0.0084	0.0699	0.00495898	
2F Product uses as ODS substitutes	HFCs	0.1456	6.0945	5	10	11.1803	0.0001	0.0010	0.0011	0.0105	0.0076	0.000167976	
2F Product uses as ODS substitutes	SF6	0.0258	0.0695	50	200	206.1553	0.0000	0.0000	0.0000	0.0013	0.0009	2.3309E-06	
END													
Total		5638.0082	7484.4083				33.8456					36.4509	
Total Uncertainties						Uncertainty in total inventory %:	5.817696343				Trend uncertainty %:	6.037456108	

Reporting year:	1998												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2643.2136	5	5	7.0711	5.7283	0.0360	0.4688	0.1798	3.3151	11.02196219	
1A2. Manufacturing industries and cons	CO2	512.1969	776.4865	5	5	7.0711	0.7031	0.0119	0.1377	0.0594	0.9739	0.951917636	
1A3. Transport	CO2	1180.5150	1674.8810	5	5	7.0711	1.5166	0.0070	0.2971	0.0352	2.1006	4.413756108	
1A4. Other sectors	CO2	430.4000	678.9280	2	2	2.8284	0.2459	0.0147	0.1204	0.0293	0.3406	0.11686854	
1A5. Other	CO2	10.9950	20.1950	5	5	7.0711	0.0183	0.0009	0.0036	0.0044	0.0253	0.000660908	
2A. Mineral industry	CO2	759.1845	817.9293	5	5	7.0711	0.7406	0.0414	0.1451	0.2069	1.0258	1.095132651	
2D. Non-energy products from fuels an	CO2	6.2377	8.6151	10	50	50.9902	0.0563	0.0000	0.0015	0.0002	0.0216	0.000467031	
2G. Other product manufacture and use	CO2	0.0584	0.0619	20	400	400.4997	0.0032	0.0000	0.0000	0.0013	0.0003	1.90248E-06	
3H. Urea application	CO2	1.8150	0.8360	50	200	206.1553	0.0221	0.0003	0.0001	0.0595	0.0105	0.003652864	
1A1. Energy industries	CH4	1.7055	2.5653	5	100	100.1249	0.0329	0.0000	0.0005	0.0036	0.0032	2.33111E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8222	5	100	100.1249	0.0105	0.0001	0.0001	0.0071	0.0010	5.16331E-05	
1A3. Transport	CH4	5.3955	6.8013	5	100	100.1249	0.0872	0.0001	0.0012	0.0119	0.0085	0.000214836	
1A4. Other sectors	CH4	2.5278	3.8085	5	50	50.2494	0.0245	0.0001	0.0007	0.0027	0.0048	3.02435E-05	
1A5. Other	CH4	0.0370	0.0683	5	20	20.6155	0.0002	0.0000	0.0000	0.0001	0.0001	1.09643E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	3.01533E-13	
3A. Enteric fermentation	CH4	199.6575	219.5500	30	100	104.4031	2.9352	0.0101	0.0389	1.0105	1.6521	3.750725896	
3B. Manure management	CH4	111.4133	165.3260	5	30	30.4138	0.6439	0.0020	0.0293	0.0586	0.2073	0.046422893	
3F. Field burning of agricultural residue	CH4	0.3450	0.2875	5	50	50.2494	0.0018	0.0000	0.0001	0.0017	0.0004	2.97991E-06	
5A. Solid waste disposal	CH4	251.1627	300.1188	50	200	206.1553	7.9229	0.0085	0.0532	1.6937	3.7640	17.03635255	
5D. Waste water treatment and dischar	CH4	91.1100	98.6775	5	20	20.6155	0.2605	0.0049	0.0175	0.0976	0.1238	0.024842501	
1A1. Energy industries	N2O	3.9813	6.0911	20	40	44.7214	0.0349	0.0001	0.0011	0.0041	0.0306	0.000950493	
1A2. Manufacturing industries and cons	N2O	1.7230	1.8562	5	300	300.0417	0.0051	0.0001	0.0003	0.0282	0.0023	0.000801717	
1A3. Transport	N2O	27.8034	37.4407	5	300	300.0417	2.0694	0.0002	0.0066	0.0569	0.0470	0.005444038	
1A4. Other sectors	N2O	0.9804	1.5556	5	300	300.0417	0.0036	0.0000	0.0003	0.0105	0.0020	0.000114341	
1A5. Other	N2O	0.0265	0.0489	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	5.00949E-08	
2G. Other product manufacture and use	N2O	41.3028	48.0674	20	20	28.2843	0.0303	0.0016	0.0085	0.0324	0.2411	0.05919997	
3B. Manure management	N2O	72.5332	91.8436	50	200	206.1553	5.8786	0.0015	0.0163	0.3058	1.1519	1.420350392	
3D. Agricultural soils	N2O	149.9732	179.1254	5	100	100.1249	5.2746	0.0051	0.0318	0.5072	0.2247	0.307688542	
3F. Field burning of agricultural residue	N2O	0.1073	0.0894	20	100	101.9804	0.0000	0.0000	0.0000	0.0010	0.0004	1.30342E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.4351	20	20	28.2843	0.0027	0.0005	0.0026	0.0091	0.0724	0.005327346	
2F Product uses as ODS substitutes	HFCs	0.1456	9.3847	5	10	11.1803	0.0002	0.0016	0.0017	0.0163	0.0118	0.000403828	
2F Product uses as ODS substitutes	SF6	0.0258	0.0673	50	200	206.1553	0.0000	0.0000	0.0000	0.0011	0.0008	1.97387E-06	
END													
Total		5638.0082	7809.1773				34.2533					40.2634	
Total Uncertainties						Uncertainty in total inventory %:	5.852628867				Trend uncertainty %:	6.34534244	

Reporting year:	1999												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2826.9354	5	5	7.0711	6.1355	0.0540	0.5014	0.2702	3.5455	12.64343184	
1A2. Manufacturing industries and cons	CO2	512.1969	802.0577	5	5	7.0711	0.7028	0.0122	0.1423	0.0611	1.0059	1.015610541	
1A3. Transport	CO2	1180.5150	1718.8370	5	5	7.0711	1.5061	0.0051	0.3049	0.0257	2.1557	4.647826634	
1A4. Other sectors	CO2	430.4000	686.0850	2	2	2.8284	0.2405	0.0124	0.1217	0.0248	0.3442	0.119082302	
1A5. Other	CO2	10.9950	20.7560	5	5	7.0711	0.0182	0.0009	0.0037	0.0045	0.0260	0.000697455	
2A. Mineral industry	CO2	759.1845	823.8113	5	5	7.0711	0.7218	0.0466	0.1461	0.2328	1.0332	1.121711046	
2D. Non-energy products from fuels an	CO2	6.2377	9.5265	10	50	50.9902	0.0602	0.0001	0.0017	0.0053	0.0239	0.00059914	
2G. Other product manufacture and use	CO2	0.0584	0.0867	20	400	400.4997	0.0043	0.0000	0.0000	0.0002	0.0004	2.39071E-07	
3H. Urea application	CO2	1.8150	0.9167	50	200	206.1553	0.0234	0.0003	0.0002	0.0596	0.0115	0.003688978	
1A1. Energy industries	CH4	1.7055	2.7483	5	100	100.1249	0.0341	0.0001	0.0005	0.0054	0.0034	4.15412E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8763	5	100	100.1249	0.0109	0.0001	0.0002	0.0069	0.0011	4.84926E-05	
1A3. Transport	CH4	5.3955	7.0483	5	100	100.1249	0.0874	0.0001	0.0013	0.0120	0.0088	0.00022134	
1A4. Other sectors	CH4	2.5278	3.8698	5	50	50.2494	0.0241	0.0000	0.0007	0.0022	0.0049	2.85343E-05	
1A5. Other	CH4	0.0370	0.0700	5	20	20.6155	0.0002	0.0000	0.0000	0.0001	0.0001	1.13611E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	3.70486E-13	
3A. Enteric fermentation	CH4	199.6575	218.0300	30	100	104.4031	2.8207	0.0120	0.0387	1.2013	1.6407	4.134964343	
3B. Manure management	CH4	111.4133	160.0293	5	30	30.4138	0.6031	0.0001	0.0284	0.0030	0.2007	0.040291342	
3F. Field burning of agricultural residue	CH4	0.3450	0.3125	5	50	50.2494	0.0019	0.0000	0.0001	0.0016	0.0004	2.73935E-06	
5A. Solid waste disposal	CH4	251.1627	307.4425	50	200	206.1553	7.8538	0.0092	0.0545	1.8460	3.8559	18.27565173	
5D. Waste water treatment and dischar	CH4	91.1100	99.2100	5	20	20.6155	0.2534	0.0055	0.0176	0.1107	0.1244	0.027728936	
1A1. Energy industries	N2O	3.9813	6.4040	20	40	44.7214	0.0355	0.0001	0.0011	0.0050	0.0321	0.001057195	
1A2. Manufacturing industries and cons	N2O	1.7230	1.9370	5	300	300.0417	0.0052	0.0001	0.0003	0.0282	0.0024	0.000799101	
1A3. Transport	N2O	27.8034	38.5314	5	300	300.0417	2.0523	0.0002	0.0068	0.0673	0.0483	0.006868663	
1A4. Other sectors	N2O	0.9804	1.5973	5	300	300.0417	0.0035	0.0000	0.0003	0.0103	0.0020	0.000110508	
1A5. Other	N2O	0.0265	0.0501	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	5.00121E-08	
2G. Other product manufacture and use	N2O	41.3028	48.6038	20	20	28.2843	0.0290	0.0019	0.0086	0.0373	0.2438	0.060844994	
3B. Manure management	N2O	72.5332	92.0522	50	200	206.1553	5.5297	0.0021	0.0163	0.4174	1.1545	1.507127584	
3D. Agricultural soils	N2O	149.9732	163.1371	5	100	100.1249	4.0967	0.0091	0.0289	0.9137	0.2046	0.876746778	
3F. Field burning of agricultural residue	N2O	0.1073	0.0954	20	100	101.9804	0.0000	0.0000	0.0000	0.0010	0.0005	1.29435E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.6884	20	20	28.2843	0.0027	0.0005	0.0026	0.0102	0.0737	0.005534616	
2F Product uses as ODS substitutes	HFCs	0.1456	14.2378	5	10	11.1803	0.0004	0.0025	0.0025	0.0249	0.0179	0.000938057	
2F Product uses as ODS substitutes	SF6	0.0258	0.0651	50	200	206.1553	0.0000	0.0000	0.0000	0.0010	0.0008	1.67318E-06	
END													
Total		5638.0082	8070.0488				32.8575					44.4917	
Total Uncertainties						Uncertainty in total inventory %:	5.732143241				Trend uncertainty %:	6.670206721	

Reporting year:	2000												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2954.6042	5	5	7.0711	6.2772	0.0618	0.5241	0.3088	3.7056	13.82684486	
1A2. Manufacturing industries and cons	CO2	512.1969	818.7305	5	5	7.0711	0.6943	0.0108	0.1452	0.0542	1.0268	1.05732623	
1A3. Transport	CO2	1180.5150	1760.0960	5	5	7.0711	1.4925	0.0025	0.3122	0.0125	2.2075	4.873098094	
1A4. Other sectors	CO2	430.4000	725.3920	2	2	2.8284	0.2460	0.0157	0.1287	0.0315	0.3639	0.133420475	
1A5. Other	CO2	10.9950	21.4290	5	5	7.0711	0.0182	0.0009	0.0038	0.0046	0.0269	0.000743305	
2A. Mineral industry	CO2	759.1845	846.5433	5	5	7.0711	0.7178	0.0489	0.1501	0.2447	1.0617	1.187126912	
2D. Non-energy products from fuels an	CO2	6.2377	10.8971	10	50	50.9902	0.0666	0.0003	0.0019	0.0148	0.0273	0.00096682	
2G. Other product manufacture and use	CO2	0.0584	0.1630	20	400	400.4997	0.0078	0.0000	0.0000	0.0054	0.0008	3.02058E-05	
3H. Urea application	CO2	1.8150	1.6720	50	200	206.1553	0.0413	0.0002	0.0003	0.0359	0.0210	0.001729595	
1A1. Energy industries	CH4	1.7055	2.8720	5	100	100.1249	0.0345	0.0001	0.0005	0.0062	0.0036	5.14053E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.9906	5	100	100.1249	0.0119	0.0001	0.0002	0.0056	0.0012	3.28495E-05	
1A3. Transport	CH4	5.3955	7.1735	5	100	100.1249	0.0861	0.0001	0.0013	0.0143	0.0090	0.000285615	
1A4. Other sectors	CH4	2.5278	3.6198	5	50	50.2494	0.0218	0.0000	0.0006	0.0011	0.0045	2.17211E-05	
1A5. Other	CH4	0.0370	0.0723	5	20	20.6155	0.0002	0.0000	0.0000	0.0001	0.0001	1.20762E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	3.57491E-13	
3A. Enteric fermentation	CH4	199.6575	227.4975	30	100	104.4031	2.8483	0.0120	0.0404	1.2022	1.7119	4.375902941	
3B. Manure management	CH4	111.4133	158.2913	5	30	30.4138	0.5773	0.0012	0.0281	0.0345	0.1985	0.04060525	
3F. Field burning of agricultural residue	CH4	0.3450	0.2775	5	50	50.2494	0.0017	0.0000	0.0000	0.0021	0.0003	4.38225E-06	
5A. Solid waste disposal	CH4	251.1627	314.8307	50	200	206.1553	7.7834	0.0100	0.0558	2.0085	3.9485	19.62522353	
5D. Waste water treatment and dischar	CH4	91.1100	99.0625	5	20	20.6155	0.2449	0.0063	0.0176	0.1266	0.1242	0.03146138	
1A1. Energy industries	N2O	3.9813	6.6990	20	40	44.7214	0.0359	0.0001	0.0012	0.0058	0.0336	0.001162516	
1A2. Manufacturing industries and cons	N2O	1.7230	2.1435	5	300	300.0417	0.0059	0.0001	0.0004	0.0215	0.0027	0.000471419	
1A3. Transport	N2O	27.8034	39.3539	5	300	300.0417	2.0051	0.0003	0.0070	0.0941	0.0494	0.011287034	
1A4. Other sectors	N2O	0.9804	1.6450	5	300	300.0417	0.0035	0.0000	0.0003	0.0104	0.0021	0.000111796	
1A5. Other	N2O	0.0265	0.0519	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	5.43738E-08	
2G. Other product manufacture and use	N2O	41.3028	49.1104	20	20	28.2843	0.0277	0.0021	0.0087	0.0425	0.2464	0.062504601	
3B. Manure management	N2O	72.5332	94.1084	50	200	206.1553	5.4130	0.0023	0.0167	0.4671	1.1803	1.611294955	
3D. Agricultural soils	N2O	149.9732	156.2801	5	100	100.1249	3.5212	0.0116	0.0277	1.1621	0.1960	1.388805862	
3F. Field burning of agricultural residue	N2O	0.1073	0.0864	20	100	101.9804	0.0000	0.0000	0.0000	0.0013	0.0004	1.83016E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.5066	20	20	28.2843	0.0024	0.0006	0.0026	0.0130	0.0728	0.005464145	
2F Product uses as ODS substitutes	HFCs	0.1456	20.5024	5	10	11.1803	0.0008	0.0036	0.0036	0.0360	0.0257	0.001955941	
2F Product uses as ODS substitutes	SF6	0.0258	0.0755	50	200	206.1553	0.0000	0.0000	0.0000	0.0013	0.0009	2.65589E-06	
END													
Total		5638.0082	8338.7778				32.1875					48.2379	
Total Uncertainties						Uncertainty in total inventory %:	5.673405803				Trend uncertainty %:	6.945353727	

Reporting year:	2001												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2837.2828	5	5	7.0711	5.8693	0.0442	0.5032	0.2210	3.5585	12.71146835	
1A2. Manufacturing industries and cons	CO2	512.1969	764.8269	5	5	7.0711	0.6531	0.0022	0.1357	0.0111	0.9592	0.920243765	
1A3. Transport	CO2	1180.5150	1818.0790	5	5	7.0711	1.5524	0.0149	0.3225	0.0744	2.2802	5.20483238	
1A4. Other sectors	CO2	430.4000	728.5140	2	2	2.8284	0.2488	0.0171	0.1292	0.0341	0.3655	0.134737711	
1A5. Other	CO2	10.9950	21.6530	5	5	7.0711	0.0185	0.0010	0.0038	0.0049	0.0272	0.000761307	
2A. Mineral industry	CO2	759.1845	819.4360	5	5	7.0711	0.6997	0.0524	0.1453	0.2619	1.0277	1.124775329	
2D. Non-energy products from fuels an	CO2	6.2377	11.8986	10	50	50.9902	0.0733	0.0005	0.0021	0.0243	0.0298	0.001479711	
2G. Other product manufacture and use	CO2	0.0584	0.0502	20	400	400.4997	0.0024	0.0000	0.0000	0.0025	0.0003	6.44239E-06	
3H. Urea application	CO2	1.8150	0.1665	50	200	206.1553	0.0041	0.0004	0.0000	0.0887	0.0021	0.007865387	
1A1. Energy industries	CH4	1.7055	2.7485	5	100	100.1249	0.0332	0.0000	0.0005	0.0043	0.0034	3.05246E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.9899	5	100	100.1249	0.0120	0.0001	0.0002	0.0054	0.0012	3.12184E-05	
1A3. Transport	CH4	5.3955	7.5543	5	100	100.1249	0.0913	0.0001	0.0013	0.0066	0.0095	0.000133008	
1A4. Other sectors	CH4	2.5278	3.6460	5	50	50.2494	0.0221	0.0000	0.0006	0.0006	0.0046	2.12609E-05	
1A5. Other	CH4	0.0370	0.0730	5	20	20.6155	0.0002	0.0000	0.0000	0.0001	0.0001	1.2761E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	3.4566E-13	
3A. Enteric fermentation	CH4	199.6575	243.1975	30	100	104.4031	3.0660	0.0089	0.0431	0.8876	1.8301	4.137096992	
3B. Manure management	CH4	111.4133	173.5320	5	30	30.4138	0.6373	0.0018	0.0308	0.0526	0.2176	0.050133348	
3F. Field burning of agricultural residue	CH4	0.3450	0.2300	5	50	50.2494	0.0014	0.0000	0.0000	0.0025	0.0003	6.10658E-06	
5A. Solid waste disposal	CH4	251.1627	322.3987	50	200	206.1553	8.0259	0.0082	0.0572	1.6493	4.0435	19.06962564	
5D. Waste water treatment and dischar	CH4	91.1100	98.3325	5	20	20.6155	0.2448	0.0063	0.0174	0.1259	0.1233	0.031055371	
1A1. Energy industries	N2O	3.9813	6.5828	20	40	44.7214	0.0355	0.0001	0.0012	0.0052	0.0330	0.001117787	
1A2. Manufacturing industries and cons	N2O	1.7230	2.0952	5	300	300.0417	0.0058	0.0001	0.0004	0.0232	0.0026	0.000544113	
1A3. Transport	N2O	27.8034	40.9899	5	300	300.0417	2.2056	0.0000	0.0073	0.0081	0.0514	0.002708045	
1A4. Other sectors	N2O	0.9804	1.6569	5	300	300.0417	0.0036	0.0000	0.0003	0.0115	0.0021	0.000137423	
1A5. Other	N2O	0.0265	0.0522	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	5.90426E-08	
2G. Other product manufacture and use	N2O	41.3028	49.6766	20	20	28.2843	0.0288	0.0019	0.0088	0.0390	0.2492	0.063626812	
3B. Manure management	N2O	72.5332	100.8432	50	200	206.1553	6.3022	0.0010	0.0179	0.2020	1.2648	1.64040253	
3D. Agricultural soils	N2O	149.9732	178.8566	5	100	100.1249	4.6763	0.0073	0.0317	0.7346	0.2243	0.589929025	
3F. Field burning of agricultural residue	N2O	0.1073	0.0715	20	100	101.9804	0.0000	0.0000	0.0000	0.0015	0.0004	2.45843E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.6914	20	20	28.2843	0.0025	0.0006	0.0026	0.0119	0.0737	0.00557262	
2F Product uses as ODS substitutes	HFCs	0.1456	31.0082	5	10	11.1803	0.0018	0.0055	0.0055	0.0546	0.0389	0.004495657	
2F Product uses as ODS substitutes	SF6	0.0258	0.0766	50	200	206.1553	0.0000	0.0000	0.0000	0.0014	0.0010	2.80686E-06	
END													
Total		5638.0082	8281.2105				34.5181					45.7028	
Total Uncertainties						Uncertainty in total inventory %:	5.875209411				Trend uncertainty %:	6.760387799	

Reporting year:	2002												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2998.4718	5	5	7.0711	6.1963	0.0596	0.5318	0.2982	3.7606	14.23117616	
1A2. Manufacturing industries and cons	CO2	512.1969	775.2923	5	5	7.0711	0.6436	0.0003	0.1375	0.0013	0.9724	0.945475614	
1A3. Transport	CO2	1180.5150	1800.5420	5	5	7.0711	1.4948	0.0030	0.3194	0.0151	2.2582	5.099699365	
1A4. Other sectors	CO2	430.4000	732.5730	2	2	2.8284	0.2433	0.0146	0.1299	0.0292	0.3675	0.135916242	
1A5. Other	CO2	10.9950	20.7560	5	5	7.0711	0.0172	0.0007	0.0037	0.0037	0.0260	0.000691165	
2A. Mineral industry	CO2	759.1845	851.9245	5	5	7.0711	0.7072	0.0523	0.1511	0.2613	1.0685	1.209883598	
2D. Non-energy products from fuels an	CO2	6.2377	12.8831	10	50	50.9902	0.0771	0.0006	0.0023	0.0307	0.0323	0.001985489	
2G. Other product manufacture and use	CO2	0.0584	0.0470	20	400	400.4997	0.0022	0.0000	0.0000	0.0029	0.0002	8.61924E-06	
3H. Urea application	CO2	1.8150	0.4195	50	200	206.1553	0.0102	0.0004	0.0001	0.0824	0.0053	0.006815354	
1A1. Energy industries	CH4	1.7055	2.8993	5	100	100.1249	0.0341	0.0001	0.0005	0.0057	0.0036	4.59751E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	1.0021	5	100	100.1249	0.0118	0.0001	0.0002	0.0059	0.0013	3.62534E-05	
1A3. Transport	CH4	5.3955	7.7448	5	100	100.1249	0.0910	0.0001	0.0014	0.0072	0.0097	0.00014633	
1A4. Other sectors	CH4	2.5278	3.9063	5	50	50.2494	0.0230	0.0000	0.0007	0.0008	0.0049	2.4603E-05	
1A5. Other	CH4	0.0370	0.0700	5	20	20.6155	0.0002	0.0000	0.0000	0.0001	0.0001	1.02101E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	2.91678E-13	
3A. Enteric fermentation	CH4	199.6575	255.1450	30	100	104.4031	3.1274	0.0082	0.0453	0.8242	1.9200	4.365716901	
3B. Manure management	CH4	111.4133	187.7443	5	30	30.4138	0.6704	0.0034	0.0333	0.1033	0.2355	0.066124881	
3F. Field burning of agricultural residue	CH4	0.3450	0.2400	5	50	50.2494	0.0014	0.0000	0.0000	0.0025	0.0003	6.30995E-06	
5A. Solid waste disposal	CH4	251.1627	330.6611	50	200	206.1553	8.0031	0.0086	0.0586	1.7297	4.1471	20.19022891	
5D. Waste water treatment and dischar	CH4	91.1100	96.6875	5	20	20.6155	0.2340	0.0073	0.0171	0.1453	0.1213	0.035806702	
1A1. Energy industries	N2O	3.9813	7.0000	20	40	44.7214	0.0368	0.0002	0.0012	0.0070	0.0351	0.001282076	
1A2. Manufacturing industries and cons	N2O	1.7230	2.1244	5	300	300.0417	0.0056	0.0001	0.0004	0.0255	0.0027	0.000655725	
1A3. Transport	N2O	27.8034	41.2641	5	300	300.0417	2.1129	0.0001	0.0073	0.0394	0.0518	0.004228202	
1A4. Other sectors	N2O	0.9804	1.6658	5	300	300.0417	0.0034	0.0000	0.0003	0.0098	0.0021	0.000100902	
1A5. Other	N2O	0.0265	0.0501	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	3.5376E-08	
2G. Other product manufacture and use	N2O	41.3028	50.2130	20	20	28.2843	0.0278	0.0022	0.0089	0.0432	0.2519	0.065323877	
3B. Manure management	N2O	72.5332	105.9092	50	200	206.1553	6.5708	0.0007	0.0188	0.1302	1.3283	1.781302049	
3D. Agricultural soils	N2O	149.9732	174.1184	5	100	100.1249	4.1893	0.0093	0.0309	0.9301	0.2184	0.912787684	
3F. Field burning of agricultural residue	N2O	0.1073	0.0745	20	100	101.9804	0.0000	0.0000	0.0000	0.0016	0.0004	2.55231E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.7719	20	20	28.2843	0.0024	0.0007	0.0026	0.0134	0.0741	0.005671189	
2F Product uses as ODS substitutes	HFCs	0.1456	41.3333	5	10	11.1803	0.0029	0.0073	0.0073	0.0729	0.0518	0.008004905	
2F Product uses as ODS substitutes	SF6	0.0258	0.0821	50	200	206.1553	0.0000	0.0000	0.0000	0.0015	0.0010	3.40434E-06	
END													
Total		5638.0082	8517.6162				34.5403					49.0692	
Total Uncertainties						Uncertainty in total inventory %:	5.877096936				Trend uncertainty %:	7.004937621	

Reporting year:	2003												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3224.9118	5	5	7.0711	6.5455	0.0778	0.5720	0.3891	4.0446	16.51034124	
1A2. Manufacturing industries and cons	CO2	512.1969	802.6333	5	5	7.0711	0.6368	0.0013	0.1424	0.0063	1.0066	1.013374351	
1A3. Transport	CO2	1180.5150	1907.0620	5	5	7.0711	1.5129	0.0072	0.3383	0.0361	2.3918	5.721990261	
1A4. Other sectors	CO2	430.4000	757.3330	2	2	2.8284	0.2403	0.0136	0.1343	0.0273	0.3799	0.145091789	
1A5. Other	CO2	10.9950	21.3170	5	5	7.0711	0.0169	0.0007	0.0038	0.0035	0.0267	0.000726955	
2A. Mineral industry	CO2	759.1845	854.6973	5	5	7.0711	0.6781	0.0612	0.1516	0.3060	1.0719	1.242691057	
2D. Non-energy products from fuels an	CO2	6.2377	14.1845	10	50	50.9902	0.0811	0.0008	0.0025	0.0383	0.0356	0.002735902	
2G. Other product manufacture and use	CO2	0.0584	0.0338	20	400	400.4997	0.0015	0.0000	0.0000	0.0041	0.0002	1.72446E-05	
3H. Urea application	CO2	1.8150	0.7311	50	200	206.1553	0.0169	0.0004	0.0001	0.0759	0.0092	0.005837381	
1A1. Energy industries	CH4	1.7055	3.1243	5	100	100.1249	0.0351	0.0001	0.0006	0.0076	0.0039	7.29875E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	1.1280	5	100	100.1249	0.0127	0.0000	0.0002	0.0048	0.0014	2.45951E-05	
1A3. Transport	CH4	5.3955	8.4515	5	100	100.1249	0.0949	0.0000	0.0015	0.0014	0.0106	0.00011428	
1A4. Other sectors	CH4	2.5278	3.9235	5	50	50.2494	0.0221	0.0000	0.0007	0.0006	0.0049	2.46288E-05	
1A5. Other	CH4	0.0370	0.0720	5	20	20.6155	0.0002	0.0000	0.0000	0.0000	0.0001	1.04499E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0001	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	2.27719E-13	
3A. Enteric fermentation	CH4	199.6575	247.8650	30	100	104.4031	2.9033	0.0120	0.0440	1.2017	1.8652	4.922973001	
3B. Manure management	CH4	111.4133	186.1278	5	30	30.4138	0.6351	0.0018	0.0330	0.0532	0.2334	0.05732003	
3F. Field burning of agricultural residue	CH4	0.3450	0.2775	5	50	50.2494	0.0016	0.0000	0.0000	0.0024	0.0003	5.7662E-06	
5A. Solid waste disposal	CH4	251.1627	338.9954	50	200	206.1553	7.8408	0.0103	0.0601	2.0590	4.2516	22.31550769	
5D. Waste water treatment and dischar	CH4	91.1100	92.2825	5	20	20.6155	0.2134	0.0092	0.0164	0.1836	0.1157	0.047089026	
1A1. Energy industries	N2O	3.9813	7.2980	20	40	44.7214	0.0366	0.0002	0.0013	0.0071	0.0366	0.001391182	
1A2. Manufacturing industries and cons	N2O	1.7230	2.3447	5	300	300.0417	0.0062	0.0001	0.0004	0.0202	0.0029	0.000415956	
1A3. Transport	N2O	27.8034	44.2798	5	300	300.0417	2.2218	0.0001	0.0079	0.0173	0.0555	0.003383832	
1A4. Other sectors	N2O	0.9804	1.7016	5	300	300.0417	0.0033	0.0000	0.0003	0.0081	0.0021	6.96531E-05	
1A5. Other	N2O	0.0265	0.0516	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	3.33267E-08	
2G. Other product manufacture and use	N2O	41.3028	50.8686	20	20	28.2843	0.0261	0.0026	0.0090	0.0512	0.2552	0.067742358	
3B. Manure management	N2O	72.5332	100.5154	50	200	206.1553	5.4050	0.0025	0.0178	0.5020	1.2606	1.841196425	
3D. Agricultural soils	N2O	149.9732	173.8323	5	100	100.1249	3.8132	0.0112	0.0308	1.1217	0.2180	1.305830444	
3F. Field burning of agricultural residue	N2O	0.1073	0.0864	20	100	101.9804	0.0000	0.0000	0.0000	0.0015	0.0004	2.36455E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.1610	20	20	28.2843	0.0020	0.0009	0.0025	0.0186	0.0710	0.005393546	
2F Product uses as ODS substitutes	HFCs	0.1456	52.7576	5	10	11.1803	0.0044	0.0093	0.0094	0.0932	0.0662	0.013058158	
2F Product uses as ODS substitutes	SF6	0.0258	0.0890	50	200	206.1553	0.0000	0.0000	0.0000	0.0017	0.0011	4.17528E-06	
END													
Total		5638.0082	8913.1374				33.0078					55.2244	
Total Uncertainties						Uncertainty in total inventory %:	5.745245135				Trend uncertainty %:	7.431313903	

Reporting year:	2004												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3283.4408	5	5	7.0711	6.4485	0.0755	0.5824	0.3774	4.1180	17.10054243	
1A2. Manufacturing industries and cons	CO2	512.1969	880.4472	5	5	7.0711	0.6809	0.0088	0.1562	0.0442	1.1042	1.221291455	
1A3. Transport	CO2	1180.5150	2007.4170	5	5	7.0711	1.5525	0.0165	0.3561	0.0823	2.5177	6.34538485	
1A4. Other sectors	CO2	430.4000	681.1990	2	2	2.8284	0.2107	0.0030	0.1208	0.0059	0.3417	0.11682017	
1A5. Other	CO2	10.9950	20.3869	5	5	7.0711	0.0158	0.0005	0.0036	0.0023	0.0256	0.000658905	
2A. Mineral industry	CO2	759.1845	919.4030	5	5	7.0711	0.7111	0.0552	0.1631	0.2761	1.1531	1.405851139	
2D. Non-energy products from fuels an	CO2	6.2377	17.6709	10	50	50.9902	0.0986	0.0013	0.0031	0.0670	0.0443	0.00645422	
2G. Other product manufacture and use	CO2	0.0584	0.0503	20	400	400.4997	0.0022	0.0000	0.0000	0.0031	0.0003	9.96961E-06	
3H. Urea application	CO2	1.8150	0.9467	50	200	206.1553	0.0213	0.0004	0.0002	0.0708	0.0119	0.005157339	
1A1. Energy industries	CH4	1.7055	3.2113	5	100	100.1249	0.0352	0.0001	0.0006	0.0079	0.0040	7.86628E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	1.1906	5	100	100.1249	0.0130	0.0000	0.0002	0.0043	0.0015	2.05699E-05	
1A3. Transport	CH4	5.3955	9.2948	5	100	100.1249	0.1018	0.0001	0.0016	0.0097	0.0117	0.000229371	
1A4. Other sectors	CH4	2.5278	3.7698	5	50	50.2494	0.0207	0.0001	0.0007	0.0029	0.0047	3.08863E-05	
1A5. Other	CH4	0.0370	0.1540	5	20	20.6155	0.0003	0.0000	0.0000	0.0003	0.0002	1.48491E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001	0.0000	20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	2.91488E-13	
3A. Enteric fermentation	CH4	199.6575	246.1525	30	100	104.4031	2.8108	0.0138	0.0437	1.3763	1.8523	5.325249537	
3B. Manure management	CH4	111.4133	179.5968	5	30	30.4138	0.5974	0.0002	0.0319	0.0057	0.2252	0.050768751	
3F. Field burning of agricultural residue	CH4	0.3450	0.2675	5	50	50.2494	0.0015	0.0001	0.0000	0.0026	0.0003	6.81706E-06	
5A. Solid waste disposal	CH4	251.1627	347.5160	50	200	206.1553	7.8358	0.0106	0.0616	2.1198	4.3585	23.48970363	
5D. Waste water treatment and dischar	CH4	91.1100	88.2550	5	20	20.6155	0.1990	0.0106	0.0157	0.2110	0.1107	0.056777691	
1A1. Energy industries	N2O	3.9813	7.7599	20	40	44.7214	0.0380	0.0002	0.0014	0.0092	0.0389	0.001601034	
1A2. Manufacturing industries and cons	N2O	1.7230	2.4940	5	300	300.0417	0.0067	0.0001	0.0004	0.0160	0.0031	0.000264953	
1A3. Transport	N2O	27.8034	47.6174	5	300	300.0417	2.4419	0.0004	0.0084	0.1346	0.0597	0.021686707	
1A4. Other sectors	N2O	0.9804	1.5228	5	300	300.0417	0.0025	0.0000	0.0003	0.0036	0.0019	1.64037E-05	
1A5. Other	N2O	0.0265	0.0515	5	100	100.1249	0.0000	0.0000	0.0000	0.0002	0.0001	2.69016E-08	
2G. Other product manufacture and use	N2O	41.3028	51.6136	20	20	28.2843	0.0255	0.0027	0.0092	0.0545	0.2589	0.070015544	
3B. Manure management	N2O	72.5332	95.7176	50	200	206.1553	4.6581	0.0039	0.0170	0.7770	1.2005	2.044838748	
3D. Agricultural soils	N2O	149.9732	165.2082	5	100	100.1249	3.2733	0.0138	0.0293	1.3830	0.2072	1.955722684	
3F. Field burning of agricultural residue	N2O	0.1073	0.0834	20	100	101.9804	0.0000	0.0000	0.0000	0.0016	0.0004	2.75358E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.4292	20	20	28.2843	0.0020	0.0010	0.0026	0.0194	0.0724	0.005617868	
2F Product uses as ODS substitutes	HFCs	0.1456	65.9320	5	10	11.1803	0.0065	0.0117	0.0117	0.1165	0.0827	0.02041539	
2F Product uses as ODS substitutes	SF6	0.0258	0.1001	50	200	206.1553	0.0000	0.0000	0.0000	0.0021	0.0013	5.85994E-06	
END													
Total		5638.0082	9142.8997				31.8116					59.2452	
Total Uncertainties						Uncertainty in total inventory %:	5.640178418				Trend uncertainty %:	7.697091952	

Reporting year:	2005												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3471.8400	5	5	7.0711	7.0095	0.1016	0.6158	0.5082	4.3543	19.21822017	
1A2. Manufacturing industries and cons	CO2	512.1969	908.2836	5	5	7.0711	0.6926	0.0117	0.1611	0.0584	1.1391	1.301070968	
1A3. Transport	CO2	1180.5150	2045.1480	5	5	7.0711	1.5596	0.0183	0.3627	0.0917	2.5650	6.58753173	
1A4. Other sectors	CO2	430.4000	604.5970	2	2	2.8284	0.1844	0.0183	0.1072	0.0366	0.3033	0.093336107	
1A5. Other	CO2	10.9950	19.0299	5	5	7.0711	0.0145	0.0002	0.0034	0.0008	0.0239	0.000570334	
2A. Mineral industry	CO2	759.1845	894.2013	5	5	7.0711	0.6819	0.0628	0.1586	0.3139	1.1215	1.356248328	
2D. Non-energy products from fuels an	CO2	6.2377	17.5948	10	50	50.9902	0.0968	0.0013	0.0031	0.0651	0.0441	0.006180205	
2G. Other product manufacture and use	CO2	0.0584	0.0438	20	400	400.4997	0.0019	0.0000	0.0000	0.0037	0.0002	1.37506E-05	
3H. Urea application	CO2	1.8150	0.9665	50	200	206.1553	0.0215	0.0004	0.0002	0.0716	0.0121	0.005274175	
1A1. Energy industries	CH4	1.7055	3.4000	5	100	100.1249	0.0367	0.0001	0.0006	0.0106	0.0043	0.000129572	
1A2. Manufacturing industries and cons	CH4	0.8831	1.2150	5	100	100.1249	0.0131	0.0000	0.0002	0.0042	0.0015	2.00462E-05	
1A3. Transport	CH4	5.3955	9.8420	5	100	100.1249	0.1063	0.0002	0.0017	0.0172	0.0123	0.000447303	
1A4. Other sectors	CH4	2.5278	3.7875	5	50	50.2494	0.0205	0.0001	0.0007	0.0033	0.0048	3.33181E-05	
1A5. Other	CH4	0.0370	0.1495	5	20	20.6155	0.0003	0.0000	0.0000	0.0003	0.0002	1.34044E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	5.27166E-13	
3A. Enteric fermentation	CH4	199.6575	231.8575	30	100	104.4031	2.6106	0.0171	0.0411	1.7112	1.7447	5.972233834	
3B. Manure management	CH4	111.4133	165.1800	5	30	30.4138	0.5418	0.0032	0.0293	0.0961	0.2072	0.052144741	
3F. Field burning of agricultural residue	CH4	0.3450	0.1775	5	50	50.2494	0.0010	0.0001	0.0000	0.0035	0.0002	1.20061E-05	
5A. Solid waste disposal	CH4	251.1627	356.2353	50	200	206.1553	7.9201	0.0101	0.0632	2.0154	4.4678	24.02345798	
5D. Waste water treatment and dischar	CH4	91.1100	87.8875	5	20	20.6155	0.1954	0.0110	0.0156	0.2197	0.1102	0.060438916	
1A1. Energy industries	N2O	3.9813	8.0460	20	40	44.7214	0.0388	0.0003	0.0014	0.0106	0.0404	0.001742267	
1A2. Manufacturing industries and cons	N2O	1.7230	2.5407	5	300	300.0417	0.0068	0.0001	0.0005	0.0156	0.0032	0.000253304	
1A3. Transport	N2O	27.8034	49.3935	5	300	300.0417	2.5545	0.0007	0.0088	0.1951	0.0619	0.041896482	
1A4. Other sectors	N2O	0.9804	1.3648	5	300	300.0417	0.0020	0.0000	0.0002	0.0132	0.0017	0.000176523	
1A5. Other	N2O	0.0265	0.0482	5	100	100.1249	0.0000	0.0000	0.0000	0.0001	0.0001	1.035E-08	
2G. Other product manufacture and use	N2O	41.3028	52.3586	20	20	28.2843	0.0255	0.0028	0.0093	0.0552	0.2627	0.072044772	
3B. Manure management	N2O	72.5332	88.5358	50	200	206.1553	3.8746	0.0055	0.0157	1.0909	1.1104	2.423025868	
3D. Agricultural soils	N2O	149.9732	143.4661	5	100	100.1249	2.3998	0.0183	0.0254	1.8297	0.1799	3.380298596	
3F. Field burning of agricultural residue	N2O	0.1073	0.0536	20	100	101.9804	0.0000	0.0000	0.0000	0.0022	0.0003	4.8163E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.2802	20	20	28.2843	0.0019	0.0010	0.0025	0.0210	0.0716	0.005572054	
2F Product uses as ODS substitutes	HFCs	0.1456	90.9339	5	10	11.1803	0.0120	0.0161	0.0161	0.1609	0.1140	0.038883504	
2F Product uses as ODS substitutes	SF6	0.0258	0.1160	50	200	206.1553	0.0000	0.0000	0.0000	0.0026	0.0015	8.9412E-06	
END													
Total		5638.0082	9272.5743				30.6244					64.6413	
Total Uncertainties						Uncertainty in total inventory %:	5.533928167				Trend uncertainty %:	8.039979525	

Reporting year:	2006												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3653.3800	5	5	7.0711	7.3499	0.1196	0.6480	0.5979	4.5820	21.35210476	
1A2. Manufacturing industries and cons	CO2	512.1969	865.3334	5	5	7.0711	0.6421	0.0001	0.1535	0.0003	1.0853	1.177837989	
1A3. Transport	CO2	1180.5150	2031.3250	5	5	7.0711	1.5074	0.0064	0.3603	0.0320	2.5476	6.491511865	
1A4. Other sectors	CO2	430.4000	664.9020	2	2	2.8284	0.1974	0.0111	0.1179	0.0222	0.3336	0.11175487	
1A5. Other	CO2	10.9950	13.9469	5	5	7.0711	0.0103	0.0008	0.0025	0.0041	0.0175	0.000322868	
2A. Mineral industry	CO2	759.1845	902.1690	5	5	7.0711	0.6695	0.0675	0.1600	0.3374	1.1315	1.39406638	
2D. Non-energy products from fuels an	CO2	6.2377	19.7374	10	50	50.9902	0.1056	0.0016	0.0035	0.0815	0.0495	0.009100525	
2G. Other product manufacture and use	CO2	0.0584	0.0274	20	400	400.4997	0.0012	0.0000	0.0000	0.0051	0.0001	2.5599E-05	
3H. Urea application	CO2	1.8150	1.1660	50	200	206.1553	0.0252	0.0003	0.0002	0.0675	0.0146	0.004763877	
1A1. Energy industries	CH4	1.7055	3.4750	5	100	100.1249	0.0365	0.0001	0.0006	0.0105	0.0044	0.000129446	
1A2. Manufacturing industries and cons	CH4	0.8831	1.1326	5	100	100.1249	0.0119	0.0001	0.0002	0.0064	0.0014	4.27479E-05	
1A3. Transport	CH4	5.3955	10.2988	5	100	100.1249	0.1082	0.0002	0.0018	0.0209	0.0129	0.000604724	
1A4. Other sectors	CH4	2.5278	4.1435	5	50	50.2494	0.0219	0.0000	0.0007	0.0011	0.0052	2.83073E-05	
1A5. Other	CH4	0.0370	0.1698	5	20	20.6155	0.0004	0.0000	0.0000	0.0004	0.0002	1.89979E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	5.56703E-13	
3A. Enteric fermentation	CH4	199.6575	224.3775	30	100	104.4031	2.4584	0.0200	0.0398	2.0047	1.6885	6.869612959	
3B. Manure management	CH4	111.4133	172.5573	5	30	30.4138	0.5508	0.0028	0.0306	0.0837	0.2164	0.053850493	
3F. Field burning of agricultural residue	CH4	0.3450	0.1700	5	50	50.2494	0.0009	0.0001	0.0000	0.0037	0.0002	1.34659E-05	
5A. Solid waste disposal	CH4	251.1627	364.8780	50	200	206.1553	7.8941	0.0106	0.0647	2.1137	4.5762	25.40961211	
5D. Waste water treatment and dischar	CH4	91.1100	75.0725	5	20	20.6155	0.1624	0.0140	0.0133	0.2799	0.0942	0.087200965	
1A1. Energy industries	N2O	3.9813	8.3440	20	40	44.7214	0.0392	0.0003	0.0015	0.0115	0.0419	0.001883535	
1A2. Manufacturing industries and cons	N2O	1.7230	3.1543	5	300	300.0417	0.0099	0.0000	0.0006	0.0129	0.0040	0.000181772	
1A3. Transport	N2O	27.8034	50.3680	5	300	300.0417	2.5153	0.0006	0.0089	0.1797	0.0632	0.036283951	
1A4. Other sectors	N2O	0.9804	1.5287	5	300	300.0417	0.0023	0.0000	0.0003	0.0068	0.0019	5.02596E-05	
1A5. Other	N2O	0.0265	0.0420	5	100	100.1249	0.0000	0.0000	0.0000	0.0001	0.0001	5.32926E-09	
2G. Other product manufacture and use	N2O	41.3028	53.3420	20	20	28.2843	0.0251	0.0029	0.0095	0.0584	0.2676	0.07502102	
3B. Manure management	N2O	72.5332	86.5690	50	200	206.1553	3.5078	0.0064	0.0154	1.2776	1.0857	2.81099884	
3D. Agricultural soils	N2O	149.9732	159.7280	5	100	100.1249	2.8169	0.0166	0.0283	1.6622	0.2003	2.803156392	
3F. Field burning of agricultural residue	N2O	0.1073	0.0536	20	100	101.9804	0.0000	0.0000	0.0000	0.0023	0.0003	5.20048E-06	
5D. Waste water treatment and dischar	N2O	12.2776	14.1312	20	20	28.2843	0.0018	0.0012	0.0025	0.0235	0.0709	0.005576993	
2F Product uses as ODS substitutes	HFCs	0.1456	143.1581	5	10	11.1803	0.0282	0.0253	0.0254	0.2535	0.1795	0.096488575	
2F Product uses as ODS substitutes	SF6	0.0258	0.1226	50	200	206.1553	0.0000	0.0000	0.0000	0.0028	0.0015	1.02308E-05	
END													
Total		5638.0082	9528.8035				30.7005					68.7922	
Total Uncertainties						Uncertainty in total inventory %:	5.54080586				Trend uncertainty %:	8.294108808	

Reporting year:	2007												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3801.6700	5	5	7.0711	7.4158	0.1269	0.6743	0.6344	4.7680	23.13596191	
1A2. Manufacturing industries and cons	CO2	512.1969	923.0426	5	5	7.0711	0.6612	0.0047	0.1637	0.0233	1.1577	1.340717906	
1A3. Transport	CO2	1180.5150	2163.7750	5	5	7.0711	1.5499	0.0171	0.3838	0.0857	2.7138	7.371837771	
1A4. Other sectors	CO2	430.4000	636.0240	2	2	2.8284	0.1822	0.0208	0.1128	0.0417	0.3191	0.103545056	
1A5. Other	CO2	10.9950	20.3199	5	5	7.0711	0.0146	0.0002	0.0036	0.0009	0.0255	0.000650373	
2A. Mineral industry	CO2	759.1845	893.7265	5	5	7.0711	0.6402	0.0771	0.1585	0.3857	1.1209	1.405168476	
2D. Non-energy products from fuels an	CO2	6.2377	18.4459	10	50	50.9902	0.0953	0.0013	0.0033	0.0667	0.0463	0.006593614	
2G. Other product manufacture and use	CO2	0.0584	0.0285	20	400	400.4997	0.0012	0.0000	0.0000	0.0052	0.0001	2.73577E-05	
3H. Urea application	CO2	1.8150	1.1059	50	200	206.1553	0.0231	0.0004	0.0002	0.0735	0.0139	0.005594398	
1A1. Energy industries	CH4	1.7055	3.6250	5	100	100.1249	0.0368	0.0001	0.0006	0.0113	0.0045	0.000149079	
1A2. Manufacturing industries and cons	CH4	0.8831	1.3429	5	100	100.1249	0.0136	0.0000	0.0002	0.0036	0.0017	1.58271E-05	
1A3. Transport	CH4	5.3955	11.1643	5	100	100.1249	0.1132	0.0003	0.0020	0.0305	0.0140	0.001123944	
1A4. Other sectors	CH4	2.5278	4.7119	5	50	50.2494	0.0240	0.0001	0.0008	0.0025	0.0059	4.13606E-05	
1A5. Other	CH4	0.0370	0.1538	5	20	20.6155	0.0003	0.0000	0.0000	0.0003	0.0002	1.36787E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	5.97457E-13	
3A. Enteric fermentation	CH4	199.6575	234.4100	30	100	104.4031	2.4792	0.0204	0.0416	2.0419	1.7640	7.280973473	
3B. Manure management	CH4	111.4133	177.5448	5	30	30.4138	0.5470	0.0031	0.0315	0.0932	0.2227	0.058275962	
3F. Field burning of agricultural residue	CH4	0.3450	0.1550	5	50	50.2494	0.0008	0.0001	0.0000	0.0040	0.0002	1.58969E-05	
5A. Solid waste disposal	CH4	251.1627	374.5257	50	200	206.1553	7.8216	0.0116	0.0664	2.3128	4.6972	27.4130707	
5D. Waste water treatment and dischar	CH4	91.1100	66.9325	5	20	20.6155	0.1398	0.0164	0.0119	0.3284	0.0839	0.114889423	
1A1. Energy industries	N2O	3.9813	8.6420	20	40	44.7214	0.0392	0.0003	0.0015	0.0119	0.0434	0.002020201	
1A2. Manufacturing industries and cons	N2O	1.7230	2.7353	5	300	300.0417	0.0069	0.0000	0.0005	0.0150	0.0034	0.000236084	
1A3. Transport	N2O	27.8034	54.1585	5	300	300.0417	2.7098	0.0010	0.0096	0.2915	0.0679	0.08958033	
1A4. Other sectors	N2O	0.9804	1.5173	5	300	300.0417	0.0021	0.0000	0.0003	0.0106	0.0019	0.000116107	
1A5. Other	N2O	0.0265	0.0515	5	100	100.1249	0.0000	0.0000	0.0000	0.0001	0.0001	1.22686E-08	
2G. Other product manufacture and use	N2O	41.3028	54.6234	20	20	28.2843	0.0245	0.0031	0.0097	0.0628	0.2740	0.079030832	
3B. Manure management	N2O	72.5332	88.8934	50	200	206.1553	3.4464	0.0068	0.0158	1.3515	1.1149	3.069430858	
3D. Agricultural soils	N2O	149.9732	144.1784	5	100	100.1249	2.1386	0.0210	0.0256	2.0996	0.1808	4.440889692	
3F. Field burning of agricultural residue	N2O	0.1073	0.0477	20	100	101.9804	0.0000	0.0000	0.0000	0.0025	0.0002	6.23675E-06	
5D. Waste water treatment and dischar	N2O	12.2776	15.3261	20	20	28.2843	0.0019	0.0011	0.0027	0.0219	0.0769	0.00639067	
2F Product uses as ODS substitutes	HFCs	0.1456	168.4089	5	10	11.1803	0.0364	0.0298	0.0299	0.2983	0.2112	0.133565158	
2F Product uses as ODS substitutes	SF6	0.0258	0.1385	50	200	206.1553	0.0000	0.0000	0.0000	0.0033	0.0017	1.39858E-05	
END													
Total		5638.0082	9871.4251				30.1656					76.0599	
Total Uncertainties						Uncertainty in total inventory %:	5.492321529				Trend uncertainty %:	8.721234593	

Reporting year:	2008												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3967.2900	5	5	7.0711	7.7972	0.1465	0.7037	0.7324	4.9757	25.29396567	
1A2. Manufacturing industries and cons	CO2	512.1969	900.3345	5	5	7.0711	0.6337	0.0022	0.1597	0.0109	1.1292	1.275167322	
1A3. Transport	CO2	1180.5150	2205.4870	5	5	7.0711	1.5523	0.0180	0.3912	0.0902	2.7661	7.659302223	
1A4. Other sectors	CO2	430.4000	591.6920	2	2	2.8284	0.1666	0.0311	0.1049	0.0621	0.2968	0.091969344	
1A5. Other	CO2	10.9950	42.6239	5	5	7.0711	0.0300	0.0041	0.0076	0.0204	0.0535	0.003274942	
2A. Mineral industry	CO2	759.1845	895.4398	5	5	7.0711	0.6302	0.0810	0.1588	0.4051	1.1230	1.425288616	
2D. Non-energy products from fuels an	CO2	6.2377	16.3142	10	50	50.9902	0.0828	0.0009	0.0029	0.0461	0.0409	0.003800504	
2G. Other product manufacture and use	CO2	0.0584	0.0277	20	400	400.4997	0.0011	0.0000	0.0000	0.0054	0.0001	2.93131E-05	
3H. Urea application	CO2	1.8150	0.5368	50	200	206.1553	0.0110	0.0005	0.0001	0.0957	0.0067	0.009200799	
1A1. Energy industries	CH4	1.7055	3.8000	5	100	100.1249	0.0379	0.0001	0.0007	0.0135	0.0048	0.000204884	
1A2. Manufacturing industries and cons	CH4	0.8831	1.3487	5	100	100.1249	0.0134	0.0000	0.0002	0.0040	0.0017	1.87671E-05	
1A3. Transport	CH4	5.3955	11.7688	5	100	100.1249	0.1173	0.0004	0.0021	0.0382	0.0148	0.001678132	
1A4. Other sectors	CH4	2.5278	4.7908	5	50	50.2494	0.0240	0.0001	0.0008	0.0025	0.0060	4.25593E-05	
1A5. Other	CH4	0.0370	0.2290	5	20	20.6155	0.0005	0.0000	0.0000	0.0006	0.0003	4.1711E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	6.18822E-13	
3A. Enteric fermentation	CH4	199.6575	229.5275	30	100	104.4031	2.3853	0.0224	0.0407	2.2383	1.7272	7.993423541	
3B. Manure management	CH4	111.4133	175.4215	5	30	30.4138	0.5311	0.0041	0.0311	0.1229	0.2200	0.06351441	
3F. Field burning of agricultural residue	CH4	0.3450	0.1350	5	50	50.2494	0.0007	0.0001	0.0000	0.0043	0.0002	1.81308E-05	
5A. Solid waste disposal	CH4	251.1627	383.9537	50	200	206.1553	7.8789	0.0113	0.0681	2.2549	4.8155	28.2731947	
5D. Waste water treatment and dischar	CH4	91.1100	63.2250	5	20	20.6155	0.1297	0.0176	0.0112	0.3516	0.0793	0.129889987	
1A1. Energy industries	N2O	3.9813	8.9400	20	40	44.7214	0.0398	0.0003	0.0016	0.0131	0.0448	0.002182948	
1A2. Manufacturing industries and cons	N2O	1.7230	2.7282	5	300	300.0417	0.0066	0.0001	0.0005	0.0182	0.0034	0.000343045	
1A3. Transport	N2O	27.8034	57.0014	5	300	300.0417	2.8981	0.0013	0.0101	0.3969	0.0715	0.162601029	
1A4. Other sectors	N2O	0.9804	1.4536	5	300	300.0417	0.0019	0.0001	0.0003	0.0156	0.0018	0.0002471	
1A5. Other	N2O	0.0265	0.1051	5	100	100.1249	0.0000	0.0000	0.0000	0.0010	0.0001	1.07166E-06	
2G. Other product manufacture and use	N2O	41.3028	56.0836	20	20	28.2843	0.0249	0.0031	0.0099	0.0621	0.2814	0.083020161	
3B. Manure management	N2O	72.5332	82.9036	50	200	206.1553	2.8941	0.0082	0.0147	1.6438	1.0398	3.783021844	
3D. Agricultural soils	N2O	149.9732	134.2103	5	100	100.1249	1.7891	0.0236	0.0238	2.3588	0.1683	5.592480496	
3F. Field burning of agricultural residue	N2O	0.1073	0.0417	20	100	101.9804	0.0000	0.0000	0.0000	0.0027	0.0002	7.06961E-06	
5D. Waste water treatment and dischar	N2O	12.2776	15.8923	20	20	28.2843	0.0020	0.0011	0.0028	0.0212	0.0797	0.006807197	
2F Product uses as ODS substitutes	HFCs	0.1456	192.9170	5	10	11.1803	0.0461	0.0342	0.0342	0.3417	0.2420	0.175308073	
2F Product uses as ODS substitutes	SF6	0.0258	0.1525	50	200	206.1553	0.0000	0.0000	0.0000	0.0038	0.0019	1.79644E-05	
END													
Total		5638.0082	10046.3752				29.7263					82.0300	
Total Uncertainties						Uncertainty in total inventory %:	5.452186451				Trend uncertainty %:	9.057042688	

Reporting year:	2009												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3992.4700	5	5	7.0711	8.2570	0.1632	0.7081	0.8160	5.0073	25.73854418	
1A2. Manufacturing industries and cons	CO2	512.1969	795.9197	5	5	7.0711	0.5728	0.0171	0.1412	0.0856	0.9982	1.003782267	
1A3. Transport	CO2	1180.5150	2205.8050	5	5	7.0711	1.5876	0.0263	0.3912	0.1316	2.7665	7.670684747	
1A4. Other sectors	CO2	430.4000	616.7950	2	2	2.8284	0.1776	0.0236	0.1094	0.0472	0.3094	0.09797536	
1A5. Other	CO2	10.9950	20.2869	5	5	7.0711	0.0146	0.0002	0.0036	0.0010	0.0254	0.000648366	
2A. Mineral industry	CO2	759.1845	723.5988	5	5	7.0711	0.5208	0.1062	0.1283	0.5308	0.9075	1.105340147	
2D. Non-energy products from fuels an	CO2	6.2377	15.6961	10	50	50.9902	0.0815	0.0009	0.0028	0.0428	0.0394	0.003382117	
2G. Other product manufacture and use	CO2	0.0584	0.0309	20	400	400.4997	0.0013	0.0000	0.0000	0.0050	0.0002	2.53128E-05	
3H. Urea application	CO2	1.8150	1.1389	50	200	206.1553	0.0239	0.0004	0.0002	0.0718	0.0143	0.0053583	
1A1. Energy industries	CH4	1.7055	3.8500	5	100	100.1249	0.0392	0.0002	0.0007	0.0156	0.0048	0.000265856	
1A2. Manufacturing industries and cons	CH4	0.8831	1.1850	5	100	100.1249	0.0121	0.0001	0.0002	0.0063	0.0015	4.1593E-05	
1A3. Transport	CH4	5.3955	12.0110	5	100	100.1249	0.1224	0.0005	0.0021	0.0463	0.0151	0.002368232	
1A4. Other sectors	CH4	2.5278	5.3491	5	50	50.2494	0.0274	0.0002	0.0009	0.0084	0.0067	0.000115145	
1A5. Other	CH4	0.0370	0.1540	5	20	20.6155	0.0003	0.0000	0.0000	0.0003	0.0002	1.38159E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	5.91804E-13	
3A. Enteric fermentation	CH4	199.6575	228.9575	30	100	104.4031	2.4331	0.0211	0.0406	2.1092	1.7229	7.417207909	
3B. Manure management	CH4	111.4133	174.4005	5	30	30.4138	0.5399	0.0035	0.0309	0.1050	0.2187	0.058876198	
3F. Field burning of agricultural residue	CH4	0.3450	0.1550	5	50	50.2494	0.0008	0.0001	0.0000	0.0040	0.0002	1.56952E-05	
5A. Solid waste disposal	CH4	251.1627	394.0679	50	200	206.1553	8.2689	0.0077	0.0699	1.5460	4.9423	26.81648847	
5D. Waste water treatment and dischar	CH4	91.1100	53.7225	5	20	20.6155	0.1127	0.0186	0.0095	0.3726	0.0674	0.143343618	
1A1. Energy industries	N2O	3.9813	9.2380	20	40	44.7214	0.0421	0.0004	0.0016	0.0163	0.0463	0.002414151	
1A2. Manufacturing industries and cons	N2O	1.7230	2.3813	5	300	300.0417	0.0053	0.0001	0.0004	0.0331	0.0030	0.001101459	
1A3. Transport	N2O	27.8034	57.6213	5	300	300.0417	3.0967	0.0016	0.0102	0.4880	0.0723	0.243384508	
1A4. Other sectors	N2O	0.9804	1.6184	5	300	300.0417	0.0024	0.0000	0.0003	0.0048	0.0020	2.70744E-05	
1A5. Other	N2O	0.0265	0.0530	5	100	100.1249	0.0000	0.0000	0.0000	0.0001	0.0001	1.88921E-08	
2G. Other product manufacture and use	N2O	41.3028	57.6630	20	20	28.2843	0.0276	0.0025	0.0102	0.0508	0.2893	0.086258639	
3B. Manure management	N2O	72.5332	79.9534	50	200	206.1553	2.8147	0.0082	0.0142	1.6472	1.0028	3.718796974	
3D. Agricultural soils	N2O	149.9732	133.2269	5	100	100.1249	1.8435	0.0227	0.0236	2.2717	0.1671	5.188458856	
3F. Field burning of agricultural residue	N2O	0.1073	0.0477	20	100	101.9804	0.0000	0.0000	0.0000	0.0025	0.0002	6.15846E-06	
5D. Waste water treatment and dischar	N2O	12.2776	15.8149	20	20	28.2843	0.0021	0.0010	0.0028	0.0198	0.0793	0.006686368	
2F Product uses as ODS substitutes	HFCs	0.1456	221.2415	5	10	11.1803	0.0634	0.0392	0.0392	0.3920	0.2775	0.230626102	
2F Product uses as ODS substitutes	SF6	0.0258	0.1611	50	200	206.1553	0.0000	0.0000	0.0000	0.0041	0.0020	2.10813E-05	
END													
Total		5638.0082	9824.6141				30.6915					79.5422	
Total Uncertainties						Uncertainty in total inventory %:	5.53999172				Trend uncertainty %:	8.91864592	

Reporting year:	2010												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\left\|\frac{D}{\sum C}\right\|$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3868.0000	5	5	7.0711	8.2608	0.1582	0.6861	0.7911	4.8512	24.15965329	
1A2. Manufacturing industries and cons	CO2	512.1969	697.2583	5	5	7.0711	0.5181	0.0296	0.1237	0.1482	0.8745	0.78668785	
1A3. Transport	CO2	1180.5150	2253.2470	5	5	7.0711	1.6743	0.0461	0.3997	0.2307	2.8260	8.039360117	
1A4. Other sectors	CO2	430.4000	563.2160	2	2	2.8284	0.1674	0.0289	0.0999	0.0579	0.2825	0.083182098	
1A5. Other	CO2	10.9950	20.2869	5	5	7.0711	0.0151	0.0003	0.0036	0.0015	0.0254	0.000649717	
2A. Mineral industry	CO2	759.1845	584.6505	5	5	7.0711	0.4344	0.1234	0.1037	0.6171	0.7333	0.918436375	
2D. Non-energy products from fuels an	CO2	6.2377	17.1587	10	50	50.9902	0.0919	0.0012	0.0030	0.0588	0.0430	0.005309905	
2G. Other product manufacture and use	CO2	0.0584	0.0330	20	400	400.4997	0.0014	0.0000	0.0000	0.0047	0.0002	2.16796E-05	
3H. Urea application	CO2	1.8150	0.7377	50	200	206.1553	0.0160	0.0004	0.0001	0.0825	0.0093	0.006892268	
1A1. Energy industries	CH4	1.7055	3.7250	5	100	100.1249	0.0392	0.0002	0.0007	0.0150	0.0047	0.000247177	
1A2. Manufacturing industries and cons	CH4	0.8831	1.1690	5	100	100.1249	0.0123	0.0001	0.0002	0.0057	0.0015	3.46684E-05	
1A3. Transport	CH4	5.3955	12.2385	5	100	100.1249	0.1288	0.0006	0.0022	0.0555	0.0153	0.003320878	
1A4. Other sectors	CH4	2.5278	4.1480	5	50	50.2494	0.0219	0.0000	0.0007	0.0011	0.0052	2.81682E-05	
1A5. Other	CH4	0.0370	0.1540	5	20	20.6155	0.0003	0.0000	0.0000	0.0003	0.0002	1.42772E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	5.55224E-13	
3A. Enteric fermentation	CH4	199.6575	238.8100	30	100	104.4031	2.6200	0.0174	0.0424	1.7408	1.7971	6.259924057	
3B. Manure management	CH4	111.4133	174.8425	5	30	30.4138	0.5588	0.0023	0.0310	0.0703	0.2193	0.053021879	
3F. Field burning of agricultural residue	CH4	0.3450	0.2050	5	50	50.2494	0.0011	0.0001	0.0000	0.0033	0.0003	1.12627E-05	
5A. Solid waste disposal	CH4	251.1627	404.5393	50	200	206.1553	8.7638	0.0034	0.0718	0.6874	5.0736	26.21441123	
5D. Waste water treatment and dischar	CH4	91.1100	50.0750	5	20	20.6155	0.1085	0.0184	0.0089	0.3678	0.0628	0.139236083	
1A1. Energy industries	N2O	3.9813	8.9400	5	20	20.6155	0.0194	0.0004	0.0016	0.0079	0.0112	0.000187743	
1A2. Manufacturing industries and cons	N2O	1.7230	2.2851	20	40	44.7214	0.0107	0.0001	0.0004	0.0044	0.0115	0.000150959	
1A3. Transport	N2O	27.8034	58.8103	5	300	300.0417	3.4383	0.0021	0.0104	0.6322	0.0738	0.4051467	
1A4. Other sectors	N2O	0.9804	1.3343	5	300	300.0417	0.0018	0.0001	0.0002	0.0171	0.0017	0.00029371	
1A5. Other	N2O	0.0265	0.0530	5	300	300.0417	0.0000	0.0000	0.0000	0.0004	0.0001	1.96379E-07	
2G. Other product manufacture and use	N2O	41.3028	59.0934	5	100	100.1249	0.3866	0.0019	0.0105	0.1883	0.0741	0.040967078	
3B. Manure management	N2O	72.5332	81.8904	20	20	28.2843	0.0592	0.0072	0.0145	0.1438	0.4108	0.189444559	
3D. Agricultural soils	N2O	149.9732	147.1792	50	200	206.1553	10.1662	0.0188	0.0261	3.7576	1.8459	17.52653744	
3F. Field burning of agricultural residue	N2O	0.1073	0.0626	5	100	100.1249	0.0000	0.0000	0.0000	0.0021	0.0001	4.42323E-06	
5D. Waste water treatment and dischar	N2O	12.2776	16.4168	20	100	101.9804	0.0310	0.0008	0.0029	0.0764	0.0824	0.012615703	
2F Product uses as ODS substitutes	HFCs	0.1456	245.4311	20	20	28.2843	0.5321	0.0435	0.0435	0.8698	1.2313	2.272475603	
2F Product uses as ODS substitutes	SF6	0.0258	0.1507	5	20	20.6155	0.0000	0.0000	0.0000	0.0004	0.0002	1.80394E-07	
END													
Total		5638.0082	9516.1413				38.0795					87.1183	
Total Uncertainties						Uncertainty in total inventory %:	6.170858072				Trend uncertainty %:	9.333715934	

Reporting year:	2011												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3710.0400	5	5	7.0711	8.0758	0.1460	0.6580	0.7301	4.6531	22.18395148	
1A2. Manufacturing industries and cons	CO2	512.1969	579.9082	5	5	7.0711	0.4442	0.0459	0.1029	0.2293	0.7273	0.581535578	
1A3. Transport	CO2	1180.5150	2181.5880	5	5	7.0711	1.6710	0.0440	0.3869	0.2201	2.7361	7.534670949	
1A4. Other sectors	CO2	430.4000	613.1140	2	2	2.8284	0.1879	0.0162	0.1087	0.0325	0.3076	0.09566091	
1A5. Other	CO2	10.9950	26.6259	5	5	7.0711	0.0204	0.0015	0.0047	0.0076	0.0334	0.001173613	
2A. Mineral industry	CO2	759.1845	571.7278	5	5	7.0711	0.4379	0.1189	0.1014	0.5946	0.7170	0.867663581	
2D. Non-energy products from fuels an	CO2	6.2377	12.3875	10	50	50.9902	0.0684	0.0004	0.0022	0.0193	0.0311	0.001337218	
2G. Other product manufacture and use	CO2	0.0584	0.0269	20	400	400.4997	0.0012	0.0000	0.0000	0.0049	0.0001	2.37534E-05	
3H. Urea application	CO2	1.8150	0.9086	50	200	206.1553	0.0203	0.0004	0.0002	0.0732	0.0114	0.005486517	
1A1. Energy industries	CH4	1.7055	3.6000	5	100	100.1249	0.0390	0.0001	0.0006	0.0143	0.0045	0.000225505	
1A2. Manufacturing industries and cons	CH4	0.8831	0.8195	5	100	100.1249	0.0089	0.0001	0.0001	0.0111	0.0010	0.000124494	
1A3. Transport	CH4	5.3955	12.0357	5	100	100.1249	0.1305	0.0006	0.0021	0.0568	0.0151	0.003451772	
1A4. Other sectors	CH4	2.5278	4.7325	5	50	50.2494	0.0258	0.0001	0.0008	0.0053	0.0059	6.29465E-05	
1A5. Other	CH4	0.0370	0.1758	5	20	20.6155	0.0004	0.0000	0.0000	0.0004	0.0002	2.15491E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	5.22502E-13	
3A. Enteric fermentation	CH4	199.6575	244.6000	30	100	104.4031	2.7663	0.0146	0.0434	1.4594	1.8406	5.517854641	
3B. Manure management	CH4	111.4133	174.0905	5	30	30.4138	0.5736	0.0015	0.0309	0.0443	0.2183	0.049638055	
3F. Field burning of agricultural residue	CH4	0.3450	0.2850	5	50	50.2494	0.0016	0.0000	0.0001	0.0025	0.0004	6.28894E-06	
5A. Solid waste disposal	CH4	251.1627	418.1733	50	200	206.1553	9.3386	0.0012	0.0742	0.2457	5.2446	27.56658893	
5D. Waste water treatment and dischar	CH4	91.1100	42.9075	5	20	20.6155	0.0958	0.0188	0.0076	0.3769	0.0538	0.14496875	
1A1. Energy industries	N2O	3.9813	8.6420	5	20	20.6155	0.0193	0.0004	0.0015	0.0075	0.0108	0.000174202	
1A2. Manufacturing industries and cons	N2O	1.7230	1.6807	20	40	44.7214	0.0081	0.0002	0.0003	0.0081	0.0084	0.000136567	
1A3. Transport	N2O	27.8034	57.4530	5	300	300.0417	3.4870	0.0021	0.0102	0.6347	0.0721	0.408034992	
1A4. Other sectors	N2O	0.9804	1.4795	5	300	300.0417	0.0023	0.0000	0.0003	0.0067	0.0019	4.82456E-05	
1A5. Other	N2O	0.0265	0.0679	5	300	300.0417	0.0000	0.0000	0.0000	0.0013	0.0001	1.70304E-06	
2G. Other product manufacture and use	N2O	41.3028	60.6728	5	100	100.1249	0.4330	0.0012	0.0108	0.1233	0.0761	0.021005056	
3B. Manure management	N2O	72.5332	80.7580	20	20	28.2843	0.0612	0.0067	0.0143	0.1348	0.4051	0.182309348	
3D. Agricultural soils	N2O	149.9732	132.5802	50	200	206.1553	8.7661	0.0200	0.0235	4.0067	1.6628	18.81888454	
3F. Field burning of agricultural residue	N2O	0.1073	0.0894	5	100	100.1249	0.0000	0.0000	0.0000	0.0015	0.0001	2.35319E-06	
5D. Waste water treatment and dischar	N2O	12.2776	16.5777	20	100	101.9804	0.0335	0.0006	0.0029	0.0625	0.0832	0.010825709	
2F Product uses as ODS substitutes	HFCs	0.1456	273.5648	20	20	28.2843	0.7025	0.0485	0.0485	0.9696	1.3724	2.823566646	
2F Product uses as ODS substitutes	SF6	0.0258	0.1523	5	20	20.6155	0.0000	0.0000	0.0000	0.0004	0.0002	1.88909E-07	
END													
Total		5638.0082	9231.4649				37.4206					86.8194	
Total Uncertainties						Uncertainty in total inventory %:	6.117241892				Trend uncertainty %:	9.317693639	

Reporting year:	2012												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	3545.9300	5	5	7.0711	8.3002	0.1462	0.6289	0.7310	4.4472	20.31217325	
1A2. Manufacturing industries and cons	CO2	512.1969	456.8864	5	5	7.0711	0.3712	0.0591	0.0810	0.2957	0.5730	0.415800542	
1A3. Transport	CO2	1180.5150	2010.1930	5	5	7.0711	1.6332	0.0333	0.3565	0.1663	2.5211	6.383802869	
1A4. Other sectors	CO2	430.4000	587.7300	2	2	2.8284	0.1910	0.0136	0.1042	0.0272	0.2948	0.087673164	
1A5. Other	CO2	10.9950	20.2869	5	5	7.0711	0.0165	0.0006	0.0036	0.0029	0.0254	0.000656006	
2A. Mineral industry	CO2	759.1845	527.5157	5	5	7.0711	0.4286	0.1141	0.0936	0.5707	0.6616	0.763413613	
2D. Non-energy products from fuels an	CO2	6.2377	11.5782	10	50	50.9902	0.0678	0.0003	0.0021	0.0173	0.0290	0.001142341	
2G. Other product manufacture and use	CO2	0.0584	0.0293	20	400	400.4997	0.0013	0.0000	0.0000	0.0043	0.0001	1.86699E-05	
3H. Urea application	CO2	1.8150	0.5488	50	200	206.1553	0.0130	0.0004	0.0001	0.0799	0.0069	0.006434293	
1A1. Energy industries	CH4	1.7055	3.4250	5	100	100.1249	0.0394	0.0001	0.0006	0.0141	0.0043	0.000215945	
1A2. Manufacturing industries and cons	CH4	0.8831	0.4960	5	100	100.1249	0.0057	0.0002	0.0001	0.0154	0.0006	0.000236922	
1A3. Transport	CH4	5.3955	11.5035	5	100	100.1249	0.1323	0.0006	0.0020	0.0563	0.0144	0.003378996	
1A4. Other sectors	CH4	2.5278	4.8268	5	50	50.2494	0.0279	0.0002	0.0009	0.0082	0.0061	0.000103912	
1A5. Other	CH4	0.0370	0.1540	5	20	20.6155	0.0004	0.0000	0.0000	0.0003	0.0002	1.55425E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	4.64398E-13	
3A. Enteric fermentation	CH4	199.6575	238.6250	30	100	104.4031	2.8626	0.0123	0.0423	1.2336	1.7957	4.74615391	
3B. Manure management	CH4	111.4133	150.7225	5	30	30.4138	0.5267	0.0038	0.0267	0.1131	0.1890	0.048524834	
3F. Field burning of agricultural residue	CH4	0.3450	0.2300	5	50	50.2494	0.0013	0.0001	0.0000	0.0027	0.0003	7.28264E-06	
5A. Solid waste disposal	CH4	251.1627	431.0199	50	200	206.1553	10.2099	0.0077	0.0764	1.5359	5.4058	31.58109872	
5D. Waste water treatment and dischar	CH4	91.1100	34.6275	5	20	20.6155	0.0820	0.0188	0.0061	0.3760	0.0434	0.143266747	
1A1. Energy industries	N2O	3.9813	8.0460	5	20	20.6155	0.0191	0.0003	0.0014	0.0067	0.0101	0.000147274	
1A2. Manufacturing industries and cons	N2O	1.7230	1.0886	20	40	44.7214	0.0056	0.0003	0.0002	0.0111	0.0055	0.000154076	
1A3. Transport	N2O	27.8034	54.0249	5	300	300.0417	3.4690	0.0020	0.0096	0.5909	0.0678	0.353811382	
1A4. Other sectors	N2O	0.9804	1.4505	5	300	300.0417	0.0025	0.0000	0.0003	0.0033	0.0018	1.45007E-05	
1A5. Other	N2O	0.0265	0.0530	5	300	300.0417	0.0000	0.0000	0.0000	0.0006	0.0001	4.16143E-07	
2G. Other product manufacture and use	N2O	41.3028	60.9410	5	100	100.1249	0.4915	0.0005	0.0108	0.0499	0.0764	0.008335288	
3B. Manure management	N2O	72.5332	74.3808	20	20	28.2843	0.0584	0.0067	0.0132	0.1333	0.3731	0.15700968	
3D. Agricultural soils	N2O	149.9732	135.4768	50	200	206.1553	10.2985	0.0170	0.0240	3.4055	1.6991	14.48467693	
3F. Field burning of agricultural residue	N2O	0.1073	0.0715	5	100	100.1249	0.0000	0.0000	0.0000	0.0017	0.0001	2.79261E-06	
5D. Waste water treatment and dischar	N2O	12.2776	16.6493	20	100	101.9804	0.0381	0.0004	0.0030	0.0408	0.0835	0.008644704	
2F Product uses as ODS substitutes	HFCs	0.1456	314.3798	20	20	28.2843	1.0439	0.0557	0.0558	1.1144	1.5772	3.729341665	
2F Product uses as ODS substitutes	SF6	0.0258	0.1575	5	20	20.6155	0.0000	0.0000	0.0000	0.0004	0.0002	2.13469E-07	
END													
Total		5638.0082	8703.0481				40.3378					83.2362	
Total Uncertainties						Uncertainty in total inventory %:	6.351202894				Trend uncertainty %:	9.123389781	

Reporting year:	2013												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
		input data	input data	input data Note A	input data Note A	$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$	Note B	$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$	I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2829.7300	5	5	7.0711	6.3280	0.0609	0.5019	0.3046	3.5490	12.68810578	
1A2. Manufacturing industries and cons	CO2	512.1969	509.3222	5	5	7.0711	0.4528	0.0378	0.0903	0.1890	0.6388	0.443757522	
1A3. Transport	CO2	1180.5150	1808.4230	5	5	7.0711	1.6076	0.0253	0.3208	0.1265	2.2681	5.160208355	
1A4. Other sectors	CO2	430.4000	503.0950	2	2	2.8284	0.1789	0.0185	0.0892	0.0369	0.2524	0.065062079	
1A5. Other	CO2	10.9950	23.4399	5	5	7.0711	0.0208	0.0014	0.0042	0.0070	0.0294	0.000913661	
2A. Mineral industry	CO2	759.1845	765.1219	5	5	7.0711	0.6802	0.0542	0.1357	0.2710	0.9596	0.99425347	
2D. Non-energy products from fuels an	CO2	6.2377	9.4746	10	50	50.9902	0.0607	0.0001	0.0017	0.0060	0.0238	0.000600556	
2G. Other product manufacture and use	CO2	0.0584	0.0230	20	400	400.4997	0.0012	0.0000	0.0000	0.0042	0.0001	1.77695E-05	
3H. Urea application	CO2	1.8150	0.7905	50	200	206.1553	0.0205	0.0003	0.0001	0.0628	0.0099	0.004041259	
1A1. Energy industries	CH4	1.7055	2.7250	5	100	100.1249	0.0343	0.0001	0.0005	0.0057	0.0034	4.36614E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	0.6176	5	100	100.1249	0.0078	0.0001	0.0001	0.0111	0.0008	0.00012475	
1A3. Transport	CH4	5.3955	10.6914	5	100	100.1249	0.1346	0.0005	0.0019	0.0546	0.0134	0.003162794	
1A4. Other sectors	CH4	2.5278	4.3200	5	50	50.2494	0.0273	0.0001	0.0008	0.0067	0.0054	7.40429E-05	
1A5. Other	CH4	0.0370	0.1650	5	20	20.6155	0.0004	0.0000	0.0000	0.0004	0.0002	2.02936E-07	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	3.87921E-13	
3A. Enteric fermentation	CH4	199.6575	227.6850	30	100	104.4031	2.9885	0.0096	0.0404	0.9574	1.7133	3.852134724	
3B. Manure management	CH4	111.4133	138.0858	5	30	30.4138	0.5280	0.0034	0.0245	0.1016	0.1732	0.040316197	
3F. Field burning of agricultural residue	CH4	0.3450	0.1875	5	50	50.2494	0.0012	0.0001	0.0000	0.0027	0.0002	7.09753E-06	
5A. Solid waste disposal	CH4	251.1627	445.0365	50	200	206.1553	11.5343	0.0161	0.0789	3.2157	5.5816	41.49427109	
5D. Waste water treatment and dischar	CH4	91.1100	25.9500	5	20	20.6155	0.0673	0.0182	0.0046	0.3639	0.0325	0.133456542	
1A1. Energy industries	N2O	3.9813	6.5560	5	20	20.6155	0.0170	0.0002	0.0012	0.0033	0.0082	7.87057E-05	
1A2. Manufacturing industries and cons	N2O	1.7230	1.3318	20	40	44.7214	0.0075	0.0002	0.0002	0.0078	0.0067	0.000105446	
1A3. Transport	N2O	27.8034	49.4820	5	300	300.0417	3.4839	0.0018	0.0088	0.5457	0.0621	0.3016545	
1A4. Other sectors	N2O	0.9804	1.2387	5	300	300.0417	0.0022	0.0000	0.0002	0.0077	0.0016	6.15587E-05	
1A5. Other	N2O	0.0265	0.0590	5	300	300.0417	0.0000	0.0000	0.0000	0.0011	0.0001	1.3193E-06	
2G. Other product manufacture and use	N2O	41.3028	60.3748	5	100	100.1249	0.5776	0.0004	0.0107	0.0373	0.0757	0.007125879	
3B. Manure management	N2O	72.5332	68.9274	20	20	28.2843	0.0601	0.0059	0.0122	0.1185	0.3458	0.133607773	
3D. Agricultural soils	N2O	149.9732	120.6930	50	200	206.1553	9.7849	0.0161	0.0214	3.2234	1.5137	12.68178248	
3F. Field burning of agricultural residue	N2O	0.1073	0.0566	5	100	100.1249	0.0000	0.0000	0.0000	0.0017	0.0001	2.82831E-06	
5D. Waste water treatment and dischar	N2O	12.2776	16.5003	20	100	101.9804	0.0448	0.0001	0.0029	0.0146	0.0828	0.007064219	
2F Product uses as ODS substitutes	HFCs	0.1456	323.9791	20	20	28.2843	1.3272	0.0574	0.0575	1.1485	1.6253	3.960774196	
2F Product uses as ODS substitutes	SF6	0.0258	0.1503	5	20	20.6155	0.0000	0.0000	0.0000	0.0004	0.0002	1.98774E-07	
END													
Total		5638.0082	7954.2326				39.9792					81.9728	
Total Uncertainties						Uncertainty in total inventory %:	6.322912186				Trend uncertainty %:	9.053883733	

Reporting year:	2014												
IPCC category/Group	Gas	Base year emissions or removals	Year x emissions or removals	Activity data uncertainty (1)	Emission factor / estimation parameter uncertainty (1)	Combined uncertainty	Contribution to variance by category in year x	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty (2)	Uncertainty in trend in national emissions introduced by activity data uncertainty (3)	Uncertainty introduced into the trend in total national emissions	Comments (optional)
		Gg CO2 equivalent	Gg CO2 equivalent	%	%	%		%	%	%	%	%	
						$\sqrt{E^2+F^2}$	$\frac{(G \bullet D)^2}{(\sum D)^2}$		$\frac{\lvert D \rvert}{\lvert \sum C \rvert}$				
		input data	input data	input data Note A	input data Note A			Note B		I*F Note C	J*E*sqrt(2) Note D	K^2 + L^2	
1A1. Energy industries	CO2	1761.4882	2940.3200	5	5	7.0711	6.1509	0.0568	0.5215	0.2839	3.6877	13.67963715	
1A2. Manufacturing industries and cons	CO2	512.1969	699.6741	5	5	7.0711	0.5902	0.0110	0.1241	0.0549	0.8775	0.77304407	
1A3. Transport	CO2	1180.5150	1761.2000	5	5	7.0711	1.4855	0.0010	0.3124	0.0052	2.2089	4.879084851	
1A4. Other sectors	CO2	430.4000	446.7790	2	2	2.8284	0.1507	0.0342	0.0792	0.0685	0.2241	0.054926223	
1A5. Other	CO2	10.9950	34.9830	5	5	7.0711	0.0295	0.0033	0.0062	0.0165	0.0439	0.002198098	
2A. Mineral industry	CO2	759.1845	985.7014	5	5	7.0711	0.8314	0.0254	0.1748	0.1268	1.2362	1.544372566	
2D. Non-energy products from fuels an	CO2	6.2377	9.2573	10	50	50.9902	0.0563	0.0000	0.0016	0.0002	0.0232	0.000539222	
2G. Other product manufacture and use	CO2	0.0584	0.0091	20	400	400.4997	0.0004	0.0000	0.0000	0.0055	0.0000	3.03873E-05	
3H. Urea application	CO2	1.8150	0.4070	50	200	206.1553	0.0100	0.0004	0.0001	0.0813	0.0051	0.006635049	
1A1. Energy industries	CH4	1.7055	2.8250	5	100	100.1249	0.0337	0.0001	0.0005	0.0051	0.0035	3.88426E-05	
1A2. Manufacturing industries and cons	CH4	0.8831	1.1124	5	100	100.1249	0.0133	0.0000	0.0002	0.0036	0.0014	1.46044E-05	
1A3. Transport	CH4	5.3955	10.4196	5	100	100.1249	0.1244	0.0004	0.0018	0.0425	0.0131	0.00197826	
1A4. Other sectors	CH4	2.5278	3.9673	5	50	50.2494	0.0238	0.0000	0.0007	0.0019	0.0050	2.81832E-05	
1A5. Other	CH4	0.0370	0.1188	5	20	20.6155	0.0003	0.0000	0.0000	0.0002	0.0001	7.32972E-08	
1B2. Oil and natural gas and other emis	CH4	0.0001		20	40	44.7214	0.0000	0.0000	0.0000	0.0000	0.0000	4.3089E-13	
3A. Enteric fermentation	CH4	199.6575	233.0900	30	100	104.4031	2.9029	0.0113	0.0413	1.1309	1.7540	4.355491355	
3B. Manure management	CH4	111.4133	133.3240	5	30	30.4138	0.4837	0.0057	0.0236	0.1720	0.1672	0.057555242	
3F. Field burning of agricultural residue	CH4	0.3450	0.1650	5	50	50.2494	0.0010	0.0001	0.0000	0.0031	0.0002	9.56649E-06	
5A. Solid waste disposal	CH4	251.1627	455.5907	50	200	206.1553	11.2037	0.0146	0.0808	2.9123	5.7139	41.13050159	
5D. Waste water treatment and dischar	CH4	91.1100	17.3450	5	20	20.6155	0.0427	0.0209	0.0031	0.4190	0.0218	0.176009756	
1A1. Energy industries	N2O	3.9813	6.8540	5	20	20.6155	0.0169	0.0002	0.0012	0.0033	0.0086	8.48757E-05	
1A2. Manufacturing industries and cons	N2O	1.7230	2.1796	20	40	44.7214	0.0116	0.0001	0.0004	0.0027	0.0109	0.00012692	
1A3. Transport	N2O	27.8034	47.9055	5	300	300.0417	2.9398	0.0012	0.0085	0.3493	0.0601	0.125605588	
1A4. Other sectors	N2O	0.9804	1.0668	5	300	300.0417	0.0015	0.0001	0.0002	0.0208	0.0013	0.000434543	
1A5. Other	N2O	0.0265	0.0864	5	300	300.0417	0.0000	0.0000	0.0000	0.0025	0.0001	6.26197E-06	
2G. Other product manufacture and use	N2O	41.3028	59.6298	5	100	100.1249	0.5072	0.0003	0.0106	0.0316	0.0748	0.006593691	
3B. Manure management	N2O	72.5332	72.7716	20	20	28.2843	0.0603	0.0062	0.0129	0.1244	0.3651	0.14875954	
3D. Agricultural soils	N2O	149.9732	120.0940	50	200	206.1553	8.7219	0.0182	0.0213	3.6493	1.5062	15.5862614	
3F. Field burning of agricultural residue	N2O	0.1073	0.0507	5	100	100.1249	0.0000	0.0000	0.0000	0.0019	0.0001	3.7318E-06	
5D. Waste water treatment and dischar	N2O	12.2776	16.2946	20	100	101.9804	0.0393	0.0003	0.0029	0.0348	0.0817	0.00789207	
2F Product uses as ODS substitutes	HFCs	0.1456	319.8255	20	20	28.2843	1.1644	0.0567	0.0567	1.1338	1.6045	3.859756598	
2F Product uses as ODS substitutes	SF6	0.0258	0.1483	5	20	20.6155	0.0000	0.0000	0.0000	0.0004	0.0002	1.86918E-07	
END													
Total		5638.0082	8383.1956				37.5973					86.3976	
Total Uncertainties						Uncertainty in total inventory %:	6.131661856				Trend uncertainty %:	9.295032033	

Annex II. CRF summary tables for 1990-2014

This Annex contains CRF summary table 2 for 1990-2014. These tables have also been submitted in excel format.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1990
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	4049.35	664.28	310.74	0.15		0.03			5024.54
1. Energy	3895.60	10.55	34.51						3940.66
A. Fuel combustion (sectoral approach)	3895.60	10.55	34.51						3940.66
1. Energy industries	1761.49	1.71	3.98						1767.17
2. Manufacturing industries and construction	512.20	0.88	1.72						514.80
3. Transport	1180.52	5.40	27.80						1213.71
4. Other sectors	430.40	2.53	0.98						433.91
5. Other	11.00	0.04	0.03						11.06
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	765.48	NE,NO	41.30	0.15		0.03			806.95
A. Mineral industry	759.18								759.18
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	6.24	NE	NE,IE						6.24
E. Electronic Industry									
F. Product uses as ODS substitutes				0.15					0.15
G. Other product manufacture and use	0.06	NE	41.30			0.03			41.39
H. Other									
3. Agriculture	1.82	311.42	222.61						535.84
A. Enteric fermentation		199.66							199.66
B. Manure management		111.41	72.53						183.95
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	149.97						149.97
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.35	0.11						0.45
G. Liming	NO								NO
H. Urea application	1.82								1.82
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-613.54	0.04	0.03						-613.47
A. Forest land	-613.54	0.04	0.03						-613.47
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	342.27	12.28						354.55
A. Solid waste disposal	NE,NA	251.16							251.16
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		91.11	12.28						103.39
E. Other	NO	NO	NO						NO
6. Other *(as specified in summary 1.A)*									

Memo items:[(2)]									
International bunkers	915.95	0.47	8.38						924.79
Aviation	733.16	0.13	6.11						739.40
Navigation	182.79	0.34	2.26						185.39
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	17.95								17.95
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2[(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									5638.01
Total CO_2 equivalent emissions with land use, land-use change and forestry									5024.54
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									5638.01
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									5024.54

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1991
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	4527.01	677.59	310.86	0.16		0.03			5515.65
1. Energy	4423.58	11.12	36.24						4470.94
A. Fuel combustion (sectoral approach)	4423.58	11.12	36.24						4470.94
1. Energy industries	1824.04	1.76	4.29						1830.09
2. Manufacturing industries and construction	938.38	1.29	2.68						942.35
3. Transport	1178.56	5.56	28.19						1212.31
4. Other sectors	470.37	2.48	1.05						473.89
5. Other	12.23	0.04	0.03						12.30
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	721.78	NE,NO,IE	42.47	0.16		0.03			764.43
A. Mineral industry	716.21								716.21
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	5.51	NE,IE	NE,IE						5.51
E. Electronic Industry									
F. Product uses as ODS substitutes				0.16					0.16
G. Other product manufacture and use	0.06	NE	42.47			0.03			42.55
H. Other									
3. Agriculture	1.47	316.89	220.04						538.40
A. Enteric fermentation		198.51							198.51
B. Manure management		118.06	72.98						191.04
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	146.97						146.97
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.32	0.10						0.42
G. Liming	NO								NO
H. Urea application	1.47								1.47
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-619.81	0.13	0.08						-619.60
A. Forest land	-619.81	0.13	0.08						-619.60
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	349.46	12.03						361.49
A. Solid waste disposal	NE,NA	255.89							255.89
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		93.57	12.03						105.60
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1046.15	0.49	9.12						1055.75
Aviation	869.85	0.15	7.25						877.25
Navigation	176.30	0.34	1.87						178.50
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	15.45								15.45
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									6135.25
Total CO_2 equivalent emissions with land use, land-use change and forestry									5515.65
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									6135.25
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									5515.65

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1992
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	4893.05	706.40	343.51	0.16		0.03			5943.16
1. Energy	4748.14	11.45	38.54						4798.13
A. Fuel combustion (sectoral approach)	4748.14	11.45	38.54						4798.13
1. Energy industries	2120.79	2.06	4.89						2127.74
2. Manufacturing industries and construction	726.57	0.79	1.77						729.12
3. Transport	1324.53	5.80	30.60						1360.93
4. Other sectors	561.45	2.75	1.24						565.44
5. Other	14.81	0.05	0.04						14.90
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	773.55	NE,NO,IE	43.57	0.16		0.03			817.31
A. Mineral industry	767.55								767.55
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	5.93	NE,IE	NE,IE						5.93
E. Electronic Industry									
F. Product uses as ODS substitutes				0.16					0.16
G. Other product manufacture and use	0.06	NE	43.57			0.03			43.67
H. Other									
3. Agriculture	1.92	337.95	247.92						587.79
A. Enteric fermentation		203.53							203.53
B. Manure management		134.11	77.00						211.11
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	170.82						170.82
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.32	0.10						0.41
G. Liming	NO								NO
H. Urea application	1.92								1.92
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-630.56	0.04	0.03						-630.49
A. Forest land	-630.56	0.04	0.03						-630.49
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	356.96	13.46						370.42
A. Solid waste disposal	NE,NA	260.92							260.92
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		96.05	13.46						109.50
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1030.73	0.50	9.01						1040.25
Aviation	845.00	0.15	7.04						852.19
Navigation	185.74	0.36	1.96						188.06
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	15.25								15.25
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									6573.65
Total CO_2 equivalent emissions with land use, land-use change and forestry									5943.16
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									6573.65
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									5943.16

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1993
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	5161.47	733.40	364.30	0.22		0.04			6259.43
1. Energy	4926.99	11.57	39.03						4977.59
A. Fuel combustion (sectoral approach)	4926.99	11.57	39.03						4977.59
1. Energy industries	2242.99	2.18	5.18						2250.35
2. Manufacturing industries and construction	768.41	0.84	1.88						771.14
3. Transport	1342.09	5.75	30.68						1378.52
4. Other sectors	558.13	2.75	1.25						562.13
5. Other	15.37	0.05	0.04						15.46
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	850.28	NE,NO,IE	44.55	0.22		0.04			895.09
A. Mineral industry	840.73								840.73
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	9.54	NE,IE	NE,IE						9.54
E. Electronic Industry									
F. Product uses as ODS substitutes				0.22					0.22
G. Other product manufacture and use	0.02	NE	44.55			0.04			44.61
H. Other									
3. Agriculture	1.60	357.19	267.11						625.90
A. Enteric fermentation		212.48							212.48
B. Manure management		144.40	82.22						226.62
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	184.79						184.79
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.31	0.10						0.40
G. Liming	NO								NO
H. Urea application	1.60								1.60
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-617.41	0.32	0.21						-616.87
A. Forest land	-617.41	0.32	0.21						-616.87
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	364.32	13.40						377.72
A. Solid waste disposal	NE,NA	266.60							266.60
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		97.72	13.40						111.12
E. Other	NO	NO	NO						NO
6. Other *(as specified in summary 1.A)*									

Memo items:[(2)]									
International bunkers	874.81	0.44	7.55						882.79
Aviation	717.63	0.13	5.98						723.73
Navigation	157.18	0.31	1.57						159.06
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	15.15								15.15
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									6876.30
Total CO_2 equivalent emissions with land use, land-use change and forestry									6259.43
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									6876.30
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									6259.43

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1994
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	5408.11	742.53	353.45	0.70		0.05			6504.84
1. Energy	5134.26	11.95	40.83						5187.04
A. Fuel combustion (sectoral approach)	5134.26	11.95	40.83						5187.04
1. Energy industries	2370.90	2.27	5.50						2378.67
2. Manufacturing industries and construction	782.00	0.84	1.89						784.73
3. Transport	1395.25	6.08	32.15						1433.48
4. Other sectors	570.29	2.70	1.26						574.26
5. Other	15.82	0.05	0.04						15.91
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	886.53	NE,NO,IE	45.42	0.70		0.05			932.70
A. Mineral industry	873.38								873.38
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	13.13	NE,IE	NE,IE						13.13
E. Electronic Industry									
F. Product uses as ODS substitutes				0.70					0.70
G. Other product manufacture and use	0.02	NE	45.42			0.05			45.48
H. Other									
3. Agriculture	1.70	357.51	253.07						612.28
A. Enteric fermentation		215.96							215.96
B. Manure management		141.36	82.04						223.40
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	170.98						170.98
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.19	0.06						0.25
G. Liming	NO								NO
H. Urea application	1.70								1.70
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-614.39	0.84	0.55						-613.00
A. Forest land	-614.39	0.84	0.55						-613.00
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	372.24	13.58						385.81
A. Solid waste disposal	NE,NA	272.45							272.45
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		99.79	13.58						113.36
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	930.85	0.53	7.94						939.32
Aviation	736.27	0.13	6.14						742.53
Navigation	194.58	0.40	1.80						196.79
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	15.40								15.40
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									7117.84
Total CO_2 equivalent emissions with land use, land-use change and forestry									6504.84
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									7117.84
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									6504.84

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1995
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	5275.09	765.34	399.74	8.95		0.06			6449.18
1. Energy	5038.75	12.80	41.82						5093.38
A. Fuel combustion (sectoral approach)	5038.75	12.80	41.82						5093.38
1. Energy industries	2166.14	2.09	4.91						2173.15
2. Manufacturing industries and construction	770.90	0.80	1.81						773.51
3. Transport	1482.01	6.26	33.67						1521.94
4. Other sectors	602.54	3.59	1.38						607.52
5. Other	17.17	0.06	0.04						17.27
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	851.83	NE,NO,IE	46.19	8.95		0.06			907.03
A. Mineral industry	838.76								838.76
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	13.06	NE,IE	NE,IE						13.06
E. Electronic Industry									
F. Product uses as ODS substitutes				8.95					8.95
G. Other product manufacture and use	0.02	NE	46.19			0.06			46.27
H. Other									
3. Agriculture	1.54	373.55	297.25						672.34
A. Enteric fermentation		225.30							225.30
B. Manure management		148.05	85.02						233.07
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	212.17						212.17
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.20	0.06						0.26
G. Liming	NO								NO
H. Urea application	1.54								1.54
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-617.03	0.33	0.22						-616.49
A. Forest land	-617.03	0.33	0.22						-616.49
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	378.66	14.26						392.92
A. Solid waste disposal	NE,NA	278.68							278.68
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		99.98	14.26						114.24
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1024.37	0.59	8.78						1033.74
Aviation	807.72	0.14	6.73						814.59
Navigation	216.65	0.44	2.05						219.15
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	33.26								33.26
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									7065.67
Total CO_2 equivalent emissions with land use, land-use change and forestry									6449.18
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									7065.67
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									6449.18

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1996
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	5586.90	786.36	365.96	3.61		0.07			6742.90
1. Energy	5288.94	13.58	43.45						5345.97
A. Fuel combustion (sectoral approach)	5288.94	13.58	43.45						5345.97
1. Energy industries	2281.12	2.21	5.20						2288.53
2. Manufacturing industries and construction	829.30	0.88	2.03						832.21
3. Transport	1532.13	6.40	34.68						1573.20
4. Other sectors	628.34	4.02	1.50						633.86
5. Other	18.06	0.06	0.04						18.17
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	911.76	NE,NO,IE	46.91	3.61		0.07			962.34
A. Mineral industry	898.63								898.63
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	13.07	NE,IE	NE,IE						13.07
E. Electronic Industry									
F. Product uses as ODS substitutes				3.61					3.61
G. Other product manufacture and use	0.05	NE	46.91			0.07			47.03
H. Other									
3. Agriculture	1.38	388.51	261.45						651.34
A. Enteric fermentation		231.75							231.75
B. Manure management		156.56	88.74						245.31
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	172.64						172.64
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.20	0.06						0.26
G. Liming	NO								NO
H. Urea application	1.38								1.38
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-615.18	0.54	0.36						-614.27
A. Forest land	-615.18	0.54	0.36						-614.27
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	383.72	13.80						397.52
A. Solid waste disposal	NE,NA	285.65							285.65
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		98.07	13.80						111.87
E. Other	NO	NO	NO						NO
6. Other *(as specified in summary 1.A)*									

Memo items:[(2)]									
International bunkers	1056.46	0.70	9.26						1066.42
Aviation	773.55	0.14	6.45						780.13
Navigation	282.91	0.56	2.81						286.29
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	37.76								37.76
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									7357.17
Total CO_2 equivalent emissions with land use, land-use change and forestry									6742.90
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									7357.17
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									6742.90

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1997
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	5715.10	793.73	354.76	6.09		0.07			6869.75
1. Energy	5453.52	13.40	44.77						5511.69
A. Fuel combustion (sectoral approach)	5453.52	13.40	44.77						5511.69
1. Energy industries	2410.95	2.34	5.49						2418.77
2. Manufacturing industries and construction	772.52	0.79	1.80						775.11
3. Transport	1598.27	6.61	35.96						1640.83
4. Other sectors	652.82	3.61	1.48						657.91
5. Other	18.96	0.06	0.05						19.07
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	876.44	NE,NO,IE	47.53	6.09		0.07			930.13
A. Mineral industry	863.48								863.48
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	12.89	NE,IE	NE,IE						12.89
E. Electronic Industry									
F. Product uses as ODS substitutes				6.09					6.09
G. Other product manufacture and use	0.06	NE	47.53			0.07			47.66
H. Other									
3. Agriculture	1.10	388.32	248.00						637.42
A. Enteric fermentation		226.61							226.61
B. Manure management		161.43	91.75						253.19
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	156.16						156.16
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.27	0.08						0.36
G. Liming	NO								NO
H. Urea application	1.10								1.10
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-615.95	0.78	0.52						-614.66
A. Forest land	-615.95	0.78	0.52						-614.66
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	391.23	13.94						405.16
A. Solid waste disposal	NE,NA	292.78							292.78
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		98.45	13.94						112.39
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1069.16	0.75	9.40						1079.32
Aviation	761.12	0.13	6.34						767.60
Navigation	308.04	0.62	3.06						311.72
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	31.16								31.16
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									7484.41
Total CO_2 equivalent emissions with land use, land-use change and forestry									6869.75
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									7484.41
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									6869.75

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1998
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	6025.74	800.68	382.31	9.38		0.07			7218.18
1. Energy	5793.70	14.07	46.99						5854.76
A. Fuel combustion (sectoral approach)	5793.70	14.07	46.99						5854.76
1. Energy industries	2643.21	2.57	6.09						2651.87
2. Manufacturing industries and construction	776.49	0.82	1.86						779.16
3. Transport	1674.88	6.80	37.44						1719.12
4. Other sectors	678.93	3.81	1.56						684.29
5. Other	20.20	0.07	0.05						20.31
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	826.61	NE,NO,IE	48.07	9.38		0.07			884.13
A. Mineral industry	817.93								817.93
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	8.62	NE,IE	NE,IE						8.62
E. Electronic Industry									
F. Product uses as ODS substitutes				9.38					9.38
G. Other product manufacture and use	0.06	NE	48.07			0.07			48.20
H. Other									
3. Agriculture	0.84	385.16	271.06						657.06
A. Enteric fermentation		219.55							219.55
B. Manure management		165.33	91.84						257.17
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	179.13						179.13
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.29	0.09						0.38
G. Liming	NO								NO
H. Urea application	0.84								0.84
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-595.41	2.66	1.75						-591.00
A. Forest land	-595.41	2.66	1.75						-591.00
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	398.80	14.44						413.23
A. Solid waste disposal	NE,NA	300.12							300.12
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		98.68	14.44						113.11
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1110.02	0.73	10.40						1121.16
Aviation	801.51	0.14	6.68						808.33
Navigation	308.52	0.59	3.72						312.83
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	34.01								34.01
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									7809.18
Total CO_2 equivalent emissions with land use, land-use change and forestry									7218.18
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									7809.18
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7218.18

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1999
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	6262.04	799.65	367.11	14.24		0.07			7443.10
1. Energy	6054.67	14.61	48.52						6117.80
A. Fuel combustion (sectoral approach)	6054.67	14.61	48.52						6117.80
1. Energy industries	2826.94	2.75	6.40						2836.09
2. Manufacturing industries and construction	802.06	0.88	1.94						804.87
3. Transport	1718.84	7.05	38.53						1764.42
4. Other sectors	686.09	3.87	1.60						691.55
5. Other	20.76	0.07	0.05						20.88
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	833.42	NE,NO,IE	48.60	14.24		0.07			896.33
A. Mineral industry	823.81								823.81
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	9.53	NE,IE	NE,IE						9.53
E. Electronic Industry									
F. Product uses as ODS substitutes				14.24					14.24
G. Other product manufacture and use	0.09	NE	48.60			0.07			48.76
H. Other									
3. Agriculture	0.92	378.37	255.28						634.57
A. Enteric fermentation		218.03							218.03
B. Manure management		160.03	92.05						252.08
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	163.14						163.14
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.31	0.10						0.41
G. Liming	NO								NO
H. Urea application	0.92								0.92
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-626.97	0.02	0.01						-626.95
A. Forest land	-626.97	0.02	0.01						-626.95
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	406.65	14.69						421.34
A. Solid waste disposal	NE,NA	307.44							307.44
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		99.21	14.69						113.90
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1304.43	1.10	11.74						1317.26
Aviation	820.14	0.14	6.84						827.12
Navigation	484.28	0.96	4.90						490.14
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	32.96								32.96
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8070.05
Total CO_2 equivalent emissions with land use, land-use change and forestry									7443.10
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8070.05
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7443.10

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2000
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	6571.05	820.39	367.75	20.50		0.08			7779.77
1. Energy	6280.25	14.73	49.89						6344.87
A. Fuel combustion (sectoral approach)	6280.25	14.73	49.89						6344.87
1. Energy industries	2954.60	2.87	6.70						2964.18
2. Manufacturing industries and construction	818.73	0.99	2.14						821.86
3. Transport	1760.10	7.17	39.35						1806.62
4. Other sectors	725.39	3.62	1.64						730.66
5. Other	21.43	0.07	0.05						21.55
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	857.60	NE,NO,IE	49.11	20.50		0.08			927.29
A. Mineral industry	846.54								846.54
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	10.90	NE,IE	NE,NA,IE						10.90
E. Electronic Industry									
F. Product uses as ODS substitutes				20.50					20.50
G. Other product manufacture and use	0.16	NE	49.11			0.08			49.35
H. Other									
3. Agriculture	1.67	386.07	250.47						638.21
A. Enteric fermentation		227.50							227.50
B. Manure management		158.29	94.11						252.40
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	156.28						156.28
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.28	0.09						0.36
G. Liming	NO								NO
H. Urea application	1.67								1.67
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-568.48	5.71	3.76						-559.01
A. Forest land	-568.48	5.71	3.76						-559.01
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	413.89	14.51						428.40
A. Solid waste disposal	NE,NA	314.83							314.83
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		99.06	14.51						113.57
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1439.04	1.37	12.88						1453.29
Aviation	832.57	0.15	6.94						839.66
Navigation	606.47	1.22	5.94						613.63
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	29.16								29.16
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8338.78
Total CO_2 equivalent emissions with land use, land-use change and forestry									7779.77
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8338.78
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7779.77

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2001
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	6379.41	854.60	396.77	31.01		0.08			7661.87
1. Energy	6170.36	15.01	51.38						6236.74
A. Fuel combustion (sectoral approach)	6170.36	15.01	51.38						6236.74
1. Energy industries	2837.28	2.75	6.58						2846.61
2. Manufacturing industries and construction	764.83	0.99	2.10						767.91
3. Transport	1818.08	7.55	40.99						1866.62
4. Other sectors	728.51	3.65	1.66						733.82
5. Other	21.65	0.07	0.05						21.78
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	831.38	NE,NO,IE	49.68	31.01		0.08			912.15
A. Mineral industry	819.44								819.44
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	11.90	NE,IE	NE,IE						11.90
E. Electronic Industry									
F. Product uses as ODS substitutes				31.01					31.01
G. Other product manufacture and use	0.05	NE	49.68			0.08			49.80
H. Other									
3. Agriculture	0.17	416.96	279.77						696.90
A. Enteric fermentation		243.20							243.20
B. Manure management		173.53	100.84						274.38
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	178.86						178.86
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.23	0.07						0.30
G. Liming	NO								NO
H. Urea application	0.17								0.17
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-622.50	1.90	1.25						-619.34
A. Forest land	-622.50	1.90	1.25						-619.34
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	420.73	14.69						435.42
A. Solid waste disposal	NE,NA	322.40							322.40
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		98.33	14.69						113.02
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1578.64	1.39	13.97						1594.01
Aviation	975.48	0.17	8.13						983.78
Navigation	603.17	1.22	5.84						610.23
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	32.26								32.26
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8281.21
Total CO_2 equivalent emissions with land use, land-use change and forestry									7661.87
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8281.21
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7661.87

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2002
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	6545.22	886.16	397.23	41.33		0.08			7870.02
1. Energy	6327.64	15.62	52.10						6395.36
A. Fuel combustion (sectoral approach)	6327.64	15.62	52.10						6395.36
1. Energy industries	2998.47	2.90	7.00						3008.37
2. Manufacturing industries and construction	775.29	1.00	2.12						778.42
3. Transport	1800.54	7.74	41.26						1849.55
4. Other sectors	732.57	3.91	1.67						738.15
5. Other	20.76	0.07	0.05						20.88
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	864.85	NE,NO,IE	50.21	41.33		0.08			956.48
A. Mineral industry	851.92								851.92
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	12.88	NE,IE	NE,IE						12.88
E. Electronic Industry									
F. Product uses as ODS substitutes				41.33					41.33
G. Other product manufacture and use	0.05	NE	50.21			0.08			50.34
H. Other									
3. Agriculture	0.42	443.13	280.10						723.65
A. Enteric fermentation		255.15							255.15
B. Manure management		187.74	105.91						293.65
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	174.12						174.12
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.24	0.07						0.31
G. Liming	NO								NO
H. Urea application	0.42								0.42
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-647.69	0.05	0.04						-647.60
A. Forest land	-647.69	0.05	0.04						-647.60
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	427.35	14.77						442.12
A. Solid waste disposal	NE,NA	330.66							330.66
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		96.69	14.77						111.46
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1371.67	1.04	12.75						1385.47
Aviation	938.20	0.16	7.82						946.18
Navigation	433.48	0.88	4.93						439.29
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	40.56								40.56
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8517.62
Total CO_2 equivalent emissions with land use, land-use change and forestry									7870.02
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8517.62
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7870.02

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2003
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	6935.73	882.48	395.30	52.76		0.09			8266.36
1. Energy	6713.26	16.70	55.68						6785.63
A. Fuel combustion (sectoral approach)	6713.26	16.70	55.68						6785.63
1. Energy industries	3224.91	3.12	7.30						3235.33
2. Manufacturing industries and construction	802.63	1.13	2.34						806.11
3. Transport	1907.06	8.45	44.28						1959.79
4. Other sectors	757.33	3.92	1.70						762.96
5. Other	21.32	0.07	0.05						21.44
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	868.92	NE,NO,IE	50.87	52.76		0.09			972.63
A. Mineral industry	854.70								854.70
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	14.18	NE,IE	NE,IE						14.18
E. Electronic Industry									
F. Product uses as ODS substitutes				52.76					52.76
G. Other product manufacture and use	0.03	NE	50.87			0.09			50.99
H. Other									
3. Agriculture	0.73	434.27	274.43						709.44
A. Enteric fermentation		247.87							247.87
B. Manure management		186.13	100.52						286.64
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	173.83						173.83
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.28	0.09						0.36
G. Liming	NO								NO
H. Urea application	0.73								0.73
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-647.18	0.24	0.16						-646.78
A. Forest land	-647.18	0.24	0.16						-646.78
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	431.28	14.16						445.44
A. Solid waste disposal	NE,NA	339.00							339.00
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		92.28	14.16						106.44
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1393.31	0.95	12.28						1406.55
Aviation	1003.43	0.18	8.36						1011.97
Navigation	389.88	0.77	3.92						394.57
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	51.96								51.96
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8913.14
Total CO_2 equivalent emissions with land use, land-use change and forestry									8266.36
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8913.14
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8266.36

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2004
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	7167.04	879.87	386.80	65.93		0.10			8499.74
1. Energy	6872.89	17.62	59.45						6949.96
A. Fuel combustion (sectoral approach)	6872.89	17.62	59.45						6949.96
1. Energy industries	3283.44	3.21	7.76						3294.41
2. Manufacturing industries and construction	880.45	1.19	2.49						884.13
3. Transport	2007.42	9.29	47.62						2064.33
4. Other sectors	681.20	3.77	1.52						686.49
5. Other	20.39	0.15	0.05						20.59
B. Fugitive emissions from fuels	NO,NE	0.00	NE,NO						0.00
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	0.00	NE,NO						0.00
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	937.12	NE,NO,IE	51.61	65.93		0.10			1054.77
A. Mineral industry	919.40								919.40
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	17.67	NE,IE	NE,IE						17.67
E. Electronic Industry									
F. Product uses as ODS substitutes				65.93					65.93
G. Other product manufacture and use	0.05	NE	51.61			0.10			51.76
H. Other									
3. Agriculture	0.95	426.02	261.01						687.97
A. Enteric fermentation		246.15							246.15
B. Manure management		179.60	95.72						275.31
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	165.21						165.21
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.27	0.08						0.35
G. Liming	NO								NO
H. Urea application	0.95								0.95
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-643.92	0.46	0.30						-643.16
A. Forest land	-643.92	0.46	0.30						-643.16
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	435.77	14.43						450.20
A. Solid waste disposal	NE,NA	347.52							347.52
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		88.26	14.43						102.68
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1086.91	0.46	9.64						1097.01
Aviation	916.45	0.16	7.64						924.25
Navigation	170.46	0.30	2.00						172.76
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	46.41								46.41
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9142.90
Total CO_2 equivalent emissions with land use, land-use change and forestry									8499.74
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9142.90
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8499.74

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2005
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	7314.02	859.89	360.19	90.93		0.12			8625.14
1. Energy	7048.90	18.39	61.39						7128.69
A. Fuel combustion (sectoral approach)	7048.90	18.39	61.39						7128.69
1. Energy industries	3471.84	3.40	8.05						3483.29
2. Manufacturing industries and construction	908.28	1.21	2.54						912.04
3. Transport	2045.15	9.84	49.39						2104.38
4. Other sectors	604.60	3.79	1.36						609.75
5. Other	19.03	0.15	0.05						19.23
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	911.84	NE,NO,IE	52.36	90.93		0.12			1055.25
A. Mineral industry	894.20								894.20
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	17.59	NE,IE	NE,IE						17.59
E. Electronic Industry									
F. Product uses as ODS substitutes				90.93					90.93
G. Other product manufacture and use	0.04	NE	52.36			0.12			52.52
H. Other									
3. Agriculture	0.97	397.22	232.06						630.24
A. Enteric fermentation		231.86							231.86
B. Manure management		165.18	88.54						253.72
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	143.47						143.47
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.18	0.05						0.23
G. Liming	NO								NO
H. Urea application	0.97								0.97
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-647.69	0.15	0.10						-647.43
A. Forest land	-647.69	0.15	0.10						-647.43
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	444.12	14.28						458.40
A. Solid waste disposal	NE,NA	356.24							356.24
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		87.89	14.28						102.17
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1762.63	2.02	15.81						1780.46
Aviation	845.58	0.15	7.05						852.78
Navigation	917.05	1.87	8.77						927.69
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	44.12								44.12
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9272.57
Total CO_2 equivalent emissions with land use, land-use change and forestry									8625.14
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9272.57
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8625.14

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2006
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	7507.16	856.65	377.51	143.16		0.12			8884.60
1. Energy	7228.89	19.22	63.44						7311.54
A. Fuel combustion (sectoral approach)	7228.89	19.22	63.44						7311.54
1. Energy industries	3653.38	3.48	8.34						3665.20
2. Manufacturing industries and construction	865.33	1.13	3.15						869.62
3. Transport	2031.33	10.30	50.37						2091.99
4. Other sectors	664.90	4.14	1.53						670.57
5. Other	13.95	0.17	0.04						14.16
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	921.93	NE,NO,IE	53.34	143.16		0.12			1118.56
A. Mineral industry	902.17								902.17
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	19.74	NE,IE	NO,NE						19.74
E. Electronic Industry									
F. Product uses as ODS substitutes				143.16					143.16
G. Other product manufacture and use	0.03	NE	53.34			0.12			53.49
H. Other									
3. Agriculture	1.17	397.10	246.35						644.62
A. Enteric fermentation		224.38							224.38
B. Manure management		172.56	86.57						259.13
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	159.73						159.73
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.17	0.05						0.22
G. Liming	NO								NO
H. Urea application	1.17								1.17
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-644.82	0.37	0.25						-644.20
A. Forest land	-644.82	0.37	0.25						-644.20
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	439.95	14.13						454.08
A. Solid waste disposal	NE,NA	364.88							364.88
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		75.07	14.13						89.20
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1782.26	1.94	18.33						1802.53
Aviation	850.39	0.15	7.09						857.63
Navigation	931.87	1.79	11.24						944.90
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	49.02								49.02
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9528.80
Total CO_2 equivalent emissions with land use, land-use change and forestry									8884.60
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9528.80
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8884.60

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2007
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	7864.72	878.04	372.46	168.41		0.14			9283.76
1. Energy	7544.83	21.00	67.10						7632.93
A. Fuel combustion (sectoral approach)	7544.83	21.00	67.10						7632.93
1. Energy industries	3801.67	3.63	8.64						3813.94
2. Manufacturing industries and construction	923.04	1.34	2.74						927.12
3. Transport	2163.78	11.16	54.16						2229.10
4. Other sectors	636.02	4.71	1.52						642.25
5. Other	20.32	0.15	0.05						20.53
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	912.20	NE,NO,IE	54.62	168.41		0.14			1135.37
A. Mineral industry	893.73								893.73
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	18.45	NE,IE	NO,NE						18.45
E. Electronic Industry									
F. Product uses as ODS substitutes				168.41					168.41
G. Other product manufacture and use	0.03	NE	54.62			0.14			54.79
H. Other									
3. Agriculture	1.11	412.11	233.12						646.34
A. Enteric fermentation		234.41							234.41
B. Manure management		177.54	88.89						266.44
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	144.18						144.18
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.16	0.05						0.20
G. Liming	NO								NO
H. Urea application	1.11								1.11
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-593.42	3.47	2.29						-587.66
A. Forest land	-593.42	3.47	2.29						-587.66
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	441.46	15.33						456.78
A. Solid waste disposal	NE,NA	374.53							374.53
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		66.93	15.33						82.26
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1702.69	1.79	16.29						1720.77
Aviation	836.61	0.15	6.97						843.73
Navigation	866.09	1.65	9.32						877.05
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	72.36								72.36
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9871.43
Total CO_2 equivalent emissions with land use, land-use change and forestry									9283.76
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9871.43
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									9283.76

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2008
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	7982.68	874.32	359.44	192.92		0.15			9409.51
1. Energy	7707.43	21.94	70.23						7799.59
A. Fuel combustion (sectoral approach)	7707.43	21.94	70.23						7799.59
1. Energy industries	3967.29	3.80	8.94						3980.03
2. Manufacturing industries and construction	900.33	1.35	2.73						904.41
3. Transport	2205.49	11.77	57.00						2274.26
4. Other sectors	591.69	4.79	1.45						597.94
5. Other	42.62	0.23	0.11						42.96
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	911.78	NE,NO,IE	56.08	192.92		0.15			1160.93
A. Mineral industry	895.44								895.44
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	16.31	NE,IE	NE						16.31
E. Electronic Industry									
F. Product uses as ODS substitutes				192.92					192.92
G. Other product manufacture and use	0.03	NE	56.08			0.15			56.26
H. Other									
3. Agriculture	0.54	405.08	217.16						622.78
A. Enteric fermentation		229.53							229.53
B. Manure management		175.42	82.90						258.33
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	134.21						134.21
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.14	0.04						0.18
G. Liming	NO								NO
H. Urea application	0.54								0.54
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-637.07	0.12	0.08						-636.87
A. Forest land	-637.07	0.12	0.08						-636.87
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	447.18	15.89						463.07
A. Solid waste disposal	NE,NA	383.95							383.95
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		63.23	15.89						79.12
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1663.84	1.69	16.80						1682.33
Aviation	867.50	0.15	7.23						874.89
Navigation	796.34	1.54	9.56						807.44
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	132.79								132.79
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									10046.38
Total CO_2 equivalent emissions with land use, land-use change and forestry									9409.51
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									10046.38
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									9409.51

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2009
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	7724.95	874.05	357.75	221.24		0.16			9178.15
1. Energy	7631.28	22.55	70.91						7724.74
A. Fuel combustion (sectoral approach)	7631.28	22.55	70.91						7724.74
1. Energy industries	3992.47	3.85	9.24						4005.56
2. Manufacturing industries and construction	795.92	1.18	2.38						799.49
3. Transport	2205.81	12.01	57.62						2275.44
4. Other sectors	616.80	5.35	1.62						623.76
5. Other	20.29	0.15	0.05						20.49
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	739.33	NE,NO,IE	57.66	221.24		0.16			1018.39
A. Mineral industry	723.60								723.60
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	15.70	NE,IE	NE						15.70
E. Electronic Industry									
F. Product uses as ODS substitutes				221.24					221.24
G. Other product manufacture and use	0.03	NE	57.66			0.16			57.85
H. Other									
3. Agriculture	1.14	403.51	213.23						617.88
A. Enteric fermentation		228.96							228.96
B. Manure management		174.40	79.95						254.35
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	133.23						133.23
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.16	0.05						0.20
G. Liming	NO								NO
H. Urea application	1.14								1.14
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-646.79	0.20	0.13						-646.46
A. Forest land	-646.79	0.20	0.13						-646.46
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	447.79	15.81						463.61
A. Solid waste disposal	NE,NA	394.07							394.07
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		53.72	15.81						69.54
E. Other	NO	NO	NO						NO
6. Other *(as specified in summary 1.A)*									

Memo items:[(2)]									
International bunkers	1507.86	1.48	13.99						1523.33
Aviation	818.73	0.14	6.82						825.69
Navigation	689.14	1.34	7.16						697.64
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	148.46								148.46
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9824.61
Total CO_2 equivalent emissions with land use, land-use change and forestry									9178.15
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9824.61
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									9178.15

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2010
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	7363.28	893.28	378.43	245.43		0.15			8880.58
1. Energy	7402.01	21.43	71.42						7494.87
A. Fuel combustion (sectoral approach)	7402.01	21.43	71.42						7494.87
1. Energy industries	3868.00	3.73	8.94						3880.67
2. Manufacturing industries and construction	697.26	1.17	2.29						700.71
3. Transport	2253.25	12.24	58.81						2324.30
4. Other sectors	563.22	4.15	1.33						568.70
5. Other	20.29	0.15	0.05						20.49
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	601.84	NE,NO,IE	59.09	245.43		0.15			906.52
A. Mineral industry	584.65								584.65
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	17.16	NE,IE	NE						17.16
E. Electronic Industry									
F. Product uses as ODS substitutes				245.43					245.43
G. Other product manufacture and use	0.03	NE	59.09			0.15			59.28
H. Other									
3. Agriculture	0.74	413.86	229.13						643.73
A. Enteric fermentation		238.81							238.81
B. Manure management		174.84	81.89						256.73
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	147.18						147.18
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.21	0.06						0.27
G. Liming	NO								NO
H. Urea application	0.74								0.74
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-641.30	0.74	0.49						-640.07
A. Forest land	-641.30	0.74	0.49						-640.07
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	457.24	18.29						475.54
A. Solid waste disposal	NE,NA	404.54							404.54
B. Biological treatment of solid waste		2.63	1.88						4.51
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		50.08	16.42						66.49
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1423.68	1.32	13.81						1438.81
Aviation	835.79	0.15	6.97						842.90
Navigation	587.89	1.17	6.85						595.90
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	142.57								142.57
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9520.65
Total CO_2 equivalent emissions with land use, land-use change and forestry									8880.58
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9520.65
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8880.58

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	7052.00	906.82	363.83	273.56		0.15			8596.36
1. Energy	7111.28	21.36	69.32						7201.96
A. Fuel combustion (sectoral approach)	7111.28	21.36	69.32						7201.96
1. Energy industries	3710.04	3.60	8.64						3722.28
2. Manufacturing industries and construction	579.91	0.82	1.68						582.41
3. Transport	2181.59	12.04	57.45						2251.08
4. Other sectors	613.11	4.73	1.48						619.33
5. Other	26.63	0.18	0.07						26.87
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	584.14	NE,NO,IE	60.67	273.56		0.15			918.53
A. Mineral industry	571.73								571.73
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	12.39	NE,IE	NE						12.39
E. Electronic Industry									
F. Product uses as ODS substitutes				273.56					273.56
G. Other product manufacture and use	0.03	NE	60.67			0.15			60.85
H. Other									
3. Agriculture	0.91	418.98	213.43						633.31
A. Enteric fermentation		244.60							244.60
B. Manure management		174.09	80.76						254.85
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	132.58						132.58
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.29	0.09						0.37
G. Liming	NO								NO
H. Urea application	0.91								0.91
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-644.33	0.60	0.40						-643.33
A. Forest land	-644.33	0.60	0.40						-643.33
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	465.87	20.00						485.88
A. Solid waste disposal	NE,NA	418.17							418.17
B. Biological treatment of solid waste		4.79	3.43						8.22
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		42.91	16.58						59.49
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1487.14	1.39	13.48						1502.00
Aviation	861.43	0.15	7.18						868.76
Navigation	625.71	1.24	6.29						633.24
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	157.83								157.83
CO_2 captured	NO,IE								NO,IE
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									9239.68
Total CO_2 equivalent emissions with land use, land-use change and forestry									8596.36
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									9239.68
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8596.36

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2012
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	6515.75	882.06	356.76	314.38		0.16			8069.11
1. Energy	6621.03	20.41	64.66						6706.09
A. Fuel combustion (sectoral approach)	6621.03	20.41	64.66						6706.09
1. Energy industries	3545.93	3.43	8.05						3557.40
2. Manufacturing industries and construction	456.89	0.50	1.09						458.47
3. Transport	2010.19	11.50	54.02						2075.72
4. Other sectors	587.73	4.83	1.45						594.01
5. Other	20.29	0.15	0.05						20.49
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	539.12	NE,NO,IE	60.94	314.38		0.16			914.60
A. Mineral industry	527.52								527.52
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	11.58	NE,IE	NE						11.58
E. Electronic Industry									
F. Product uses as ODS substitutes				314.38					314.38
G. Other product manufacture and use	0.03	NE	60.94			0.16			61.13
H. Other									
3. Agriculture	0.55	389.58	209.93						600.06
A. Enteric fermentation		238.63							238.63
B. Manure management		150.72	74.38						225.10
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	135.48						135.48
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.23	0.07						0.30
G. Liming	NO								NO
H. Urea application	0.55								0.55
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-644.95	0.66	0.43						-643.86
A. Forest land	-644.95	0.66	0.43						-643.86
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	471.42	20.79						492.22
A. Solid waste disposal	NE,NA	431.02							431.02
B. Biological treatment of solid waste		5.78	4.14						9.92
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		34.63	16.65						51.28
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									
Memo items:[(2)]									
International bunkers	1452.28	1.34	14.39						1468.01
Aviation	832.18	0.15	6.94						839.26
Navigation	620.11	1.19	7.45						628.75
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	142.76								142.76
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8712.97
Total CO_2 equivalent emissions with land use, land-use change and forestry									8069.11
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8712.97
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8069.11

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[1]	5796.98	860.63	328.90	323.98		0.15			7310.64
1. Energy	5674.01	18.52	58.67						5751.20
A. Fuel combustion (sectoral approach)	5674.01	18.52	58.67						5751.20
1. Energy industries	2829.73	2.73	6.56						2839.01
2. Manufacturing industries and construction	509.32	0.62	1.33						511.27
3. Transport	1808.42	10.69	49.48						1868.60
4. Other sectors	503.10	4.32	1.24						508.65
5. Other	23.44	0.17	0.06						23.66
B. Fugitive emissions from fuels	NO,NE	NO,NE	NE,NO						NO,NE
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO,NE	NO,NE	NE,NO						NO,NE
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	774.62	NE,NO,IE	60.37	323.98		0.15			1159.12
A. Mineral industry	765.12								765.12
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	9.47	NE,IE	NE						9.47
E. Electronic Industry									
F. Product uses as ODS substitutes				323.98					323.98
G. Other product manufacture and use	0.02	NE	60.37			0.15			60.55
H. Other									
3. Agriculture	0.79	365.96	189.68						556.43
A. Enteric fermentation		227.69							227.69
B. Manure management		138.09	68.93						207.01
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	120.69						120.69
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.19	0.06						0.24
G. Liming	NO								NO
H. Urea application	0.79								0.79
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[1]	-652.44	0.22	0.15						-652.07
A. Forest land	-652.44	0.22	0.15						-652.07
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other	NO	NO	NO						NO
5. Waste	NE,NA,NO	475.93	20.03						495.96
A. Solid waste disposal	NE,NA	445.04							445.04
B. Biological treatment of solid waste		4.94	3.53						8.47
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		25.95	16.50						42.45
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[2]									
International bunkers	1531.23	1.59	14.40						1547.22
Aviation	775.83	0.14	6.47						782.44
Navigation	755.40	1.46	7.93						764.78
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	142.60								142.60
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [3]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									7962.71
Total CO_2 equivalent emissions with land use, land-use change and forestry									7310.64
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									7962.71
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7310.64

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2014
Submission 2016 v12
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	6226.45	864.69	331.73	319.83		0.15			7742.85
1. Energy	5882.96	18.44	58.09						5959.49
A. Fuel combustion (sectoral approach)	5882.96	18.44	58.09						5959.49
1. Energy industries	2940.32	2.83	6.85						2950.00
2. Manufacturing industries and construction	699.67	1.11	2.18						702.97
3. Transport	1761.20	10.42	47.91						1819.53
4. Other sectors	446.78	3.97	1.07						451.81
5. Other	34.98	0.12	0.09						35.19
B. Fugitive emissions from fuels	NE,NO	NE,NO	NE,NO						NE,NO
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NE,NO	NE,NO	NE,NO						NE,NO
C. CO_2 transport and storage	NO								NO
2. Industrial processes and product use	994.97	NE,NO,IE	59.63	319.83		0.15			1374.57
A. Mineral industry	985.70								985.70
B. Chemical industry	NO	NO	NO						NO
C. Metal industry	NO	NO							NO
D. Non-energy products from fuels and solvent use	9.26	NE,IE	NE						9.26
E. Electronic Industry									
F. Product uses as ODS substitutes				319.83					319.83
G. Other product manufacture and use	0.01	NE	59.63			0.15			59.79
H. Other									
3. Agriculture	0.41	366.58	192.92						559.90
A. Enteric fermentation		233.09							233.09
B. Manure management		133.32	72.77						206.10
C. Rice cultivation		NO							NO
D. Agricultural soils		NE	120.09						120.09
E. Prescribed burning of savannas									
F. Field burning of agricultural residues		0.17	0.05						0.22
G. Liming	NO								NO
H. Urea application	0.41								0.41
I. Other carbon-containing fertilizers	NO								NO
J. Other									
4. Land use, land-use change and forestry[(1)]	-651.88	0.24	0.16						-651.47
A. Forest land	-651.88	0.24	0.16						-651.47
B. Cropland	NE,NO	NE,NO	NE						NE,NO
C. Grassland	NE,NO	NE,NO	NE						NE,NO
D. Wetlands	NE,NO	NE,NO	NE,NO						NE,NO
E. Settlements	NE,NO	NE	NE,NO						NE,NO
F. Other land	NE,NO	NE	NE,NO						NE,NO
G. Harvested wood products	NE,NO								NE,NO
H. Other									
5. Waste	NE,NA,NO	479.42	20.93						500.36
A. Solid waste disposal	NE,NA	455.59							455.59
B. Biological treatment of solid waste		6.49	4.64						11.12
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		17.35	16.29						33.64
E. Other	NO	NO	NO						NO
6. Other ***(as specified in summary 1.A)***									

Memo items:[(2)]									
International bunkers	1509.74	1.55	10.16						1521.45
Aviation	776.41	0.14	6.47						783.02
Navigation	733.33	1.42	3.68						738.43
Multilateral operations	NO	NO	NO						NO
CO_2 emissions from biomass	144.83								144.83
CO_2 captured	NO								NO
Long-term storage of C in waste disposal sites	NE								NE
Indirect N_2O			NE,NO						
Indirect CO_2 [(3)]	NE,NO								
Total CO_2 equivalent emissions without land use, land-use change and forestry									8394.32
Total CO_2 equivalent emissions with land use, land-use change and forestry									7742.85
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8394.32
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									7742.85

Annex III. CO2 reference approach and comparison with sectoral approach, and relevant information on the national energy balance

IV1. Fuel consumption: Reference Vs. Sectoral approach

Due to the unavailability of consumption data for several years and sectors, using the data as is, would create issues of consistence and comparability. Therefore it was decided to complete the reporting period using certain assumptions. The assumptions made for each fuel are presented section 3.2.2.

The revised data used for the calculations of emissions is presented in the Tables that follow.

Crude oil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Imports (Balance)	624	763	749	789	916	797	804	1039	1075	1186	1155	1154	1078	969	243	NO
Stock changes	12	-7	-22	-8	-10	31	-44	4	7	-6	18	2	8	2	35	NO
Gross inland deliveries (Calculated)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NO
Statistical difference	0	-17	0	0	0	0	0	0	0	0	0	0	0	0	-1	NO
Gross inland deliveries (Observed)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NO
Refinery intake (Observed)	636	763	727	781	906	828	760	1043	1082	1180	1173	1156	1086	971	279	NO

LPG (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	25	29	28	27	32	27	26	32	30	34	30	31	33	28	9	
Imports (Balance)	25	16	28	25	13	21	24	17	20	10	14	19	19	28	45	49
Stock changes	1	-4	1	1	-2	0	1	0	0	0	0	-1	-1	1	1	-2
Gross inland deliveries (Calculated)	49	49	55	51	47	48	49	49	50	44	44	51	53	55	53	51
Statistical difference	0	0	0	0	-3	-3	-2	-3	0	-5	-9	-2	-1	-3	-3	-2
Gross inland deliveries (Observed)	49	49	55	51	50	51	51	52	50	49	53	53	54	58	56	53
Non-ferrous metals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-metallic minerals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Food, beverages and tobacco	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Commercial and public services	12	12	13	12	12	12	12	13	12	12	13	13	13	14	13	13
Residential	32	32	36	33	32	33	33	34	32	32	34	34	35	38	36	34
Agriculture/forestry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Refinery gross output																
Imports (Balance)	54	52	52	50	51	54	53	50	48							
Stock changes	1	1	0	-1	2	-1	1	-2	0							
Gross inland deliveries (Calculated)	53	51	52	51	49	55	52	52	48							
Statistical difference	-1	-4	-1	-4	-4	-4	-7	0	0							
Gross inland deliveries (Observed)	54	55	53	55	53	59	59	52	48							

Non-ferrous metals	1	1	0	1	1	1	1	0	1							
Non-metallic minerals	1	1	1	1	1	1	1	1	1							
Food, beverages and tobacco	3	3	3	3	3	4	5	4	4							
Commercial and public services	13	13	14	13	13	14	14	12	11							
Residential	35	36	34	36	34	38	37	33	31							
Agriculture/forestry	1	1	1	1	1	1	1	1	0							

Gasoline (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	122	121	102	94	122	102	95	141	142	148	153	150	153	146	40	
Imports (Balance)	32	40	70	75	58	72	99	50	51	57	62	84	78	110	239	331
Stock changes	-9	-9	0	0	-1	-5	5	-3	2	3	3	0	3	-5	-6	4
Gross inland deliveries (Calculated)	163	170	172	169	181	179	189	194	191	202	212	234	228	261	285	327
Statistical difference	0	0	0	0	1	-4	3	3	-4	-1	6	15	0	9	3	24
Gross inland deliveries (Observed)	163	170	172	169	180	183	186	191	195	203	206	219	228	252	282	303
Non-ferrous metals	163	170	172	169	180	183	186	191	195	203	206	219	228	252	282	303

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Refinery gross output																
Imports (Balance)	335	344	372	380	402	376	364	343	342							
Stock changes	29	-1	-9	2	9	0	0	-2	2							
Gross inland deliveries (Calculated)	306	345	381	378	393	376	364	345	340							
Statistical difference	-17	-7	8	-5	3	-9	-8	-4	-1							
Gross inland deliveries (Observed)	323	352	373	383	390	385	372	349	341							
Non-ferrous metals	323	352	373	383	390	385	372	349	341							

Jet kerosene (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	19	27	23	30	34	16	3	5	4	11	18	13	7			
Imports (Balance)	279	253	249	260	401	290	286	252	260	264	268	314	295	323	297	306
Stock changes				-18	8	-4	3	-5	4	-4	-4	10	-1	-3		-4
Gross inland deliveries (Calculated)	0	0	0	18	-8	4	-3	5	-4	4	4	-10	1	3	0	4

	298	280	272	272	443	302	292	252	268	271	282	337	301	320	297	302
Statistical difference	62	0	0	41	206	42	43	7	10	7	14	23	-1	-3	2	11
Gross inland deliveries (Observed)	236	280	272	231	237	260	249	245	258	264	268	314	302	323	295	291
International aviation	232.5	275.9	268.0	227.6	233.5	256.2	245.3	241.4	254.2	260.1	264.0	309.4	297.5	318.2	290.6	268.2
Domestic aviation	3.5	4.1	4.0	3.4	3.5	3.8	3.7	3.6	3.8	3.9	4.0	4.6	4.5	4.8	4.4	4.0
Not elsewhere specified (Other)																

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**							
Refinery gross output	321	269	286	285	277	284	265	238	221							
Imports (Balance)	-18	16	-3		-8	5	4	-8	4							
Stock changes	18	-16	3	0	8	-5	-4	8	-4							
	303	285	283	285	269	289	269	230	225							
Gross inland deliveries (Calculated)	3	-2	-3	19	-2	-7	4	-7	-8							
Statistical difference	300	287	286	266	271	296	265	237	233							
Gross inland deliveries (Observed)	321	269	286	285	277	284	265	238	221							
International aviation	269.7	265.3	275.1	259.7	265.1	273.2	263.9	246.1	246.2							
Domestic aviation	3.3	3.0	2.8	2.3	2.4	0.7	0.5	0.3	0.2							
Not elsewhere specified (Other)				1	1	2	1	2	2							

Other kerosene (kt)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Refinery gross output	12	12	14	14	15	14	18	20	23	20	19	24	29	38	11	
Imports (Balance)			3	2		3					5					15
Stock changes				-2	2				-2				2	-5	3	-1
	0	0	0	2	-2	0	0	0	2	0	0	0	-2	5	-3	1
Gross inland deliveries (Calculated)	12	12	17	14	17	17	18	20	21	20	24	24	31	33	14	14
Statistical difference	0	0	0	-2	0	0	0	0	0	0	0	0	0	2	-10	-2
Gross inland deliveries (Observed)	12	12	17	16	17	17	18	20	21	20	24	24	31	31	24	16
Residential	12	12	17	16	17	17	18	20	21	20	24	24	31	31	24	16
Not elsewhere specified (Industry)																

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Refinery gross output																
Imports (Balance)	10	13	18	19	8	16	13	12	13							
Stock changes		1	-2			-1	2	1	0							
	0	-1	2	0	0	1	-2	-1	0							
Gross inland deliveries (Calculated)	10	14	16	19	8	15	15	13	13							
Statistical difference	-6	-2	2	0	-6	-1	-2	1	2							
Gross inland deliveries (Observed)	16	16	14	19	14	16	17	12	11							
International aviation	16	16	14	19	14	16	17	12	9							
Domestic aviation									2							

Biodiesels (kt)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Refinery gross output										7	7	6	6	7	6	4
Imports (Balance)									1	9	10	11	12	12	11	7
Stock changes									-1					2		
	0	0	0	0	0	0	0	0	1	0	0	0	0	-2	0	
Gross inland deliveries (Calculated)	0	0	0	0	0	0	0	0	0	16	17	17	18	20	17	11
Statistical difference	0	0	0	0	0	0	0	0	-1	0	0	0	0	2	0	0
Gross inland deliveries (Observed)	0	0	0	0	0	0	0	0	1	16	17	17	18	18	17	11
Road									1	16	17	17	18	18	17	11

Diesel (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	230	278	252	253	324	300	258	365	382	411	406	390	362	327	88	
Imports (Balance)	118	32	182	168	85	152	225	146	175	165	194	198	194	252	480	603
International marine bunkers	24	20	21	14	12	15	25	27	35	46	50	47	33	36	27	67
Stock changes										-30	1	-2	3	-2	16	-17
	0	0	0	0	0	0	0	0	0	30	-1	2	-3	2	-16	17
Gross inland deliveries (Calculated)	324	290	413	407	397	437	458	484	522	500	551	539	526	541	557	519
Statistical difference	16	-21	24	12	-7	-9	-7	-5	-4	-46	-9	-13	-2	-5	24	0
Gross inland deliveries (Observed)	308	311	389	395	404	446	465	489	526	546	560	552	528	546	533	519

Main activity producer electricity plants			11	3	2	8	6	6	12	21	19	4	2	5	8	16
Road	209	201	245	254	260	284	297	313	333	339	349	355	340	351	353	345
Water-borne navigation	0.69	0.66	0.81	0.84	0.86	0.94	0.98	1.03	1.10	1.24	0.53	0.43	0.56	0.43	0.60	0.73
Chemical and petrochemical	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-ferrous metals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-metallic minerals	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	3
Mining and Quarrying	3	4	5	5	5	5	6	6	6	7	7	7	7	7	6	6
Food, beverages and tobacco	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	3
Construction	3	4	5	5	5	5	6	6	6	7	7	7	7	7	6	6
Not elsewhere specified (Industry)	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	3
Commercial and public services	11	12	15	15	16	17	18	19	20	21	22	22	21	21	19	18
Residential	52	58	71	73	75	82	86	90	96	99	102	103	99	102	92	83
Agriculture/forestry	14	16	20	20	21	23	24	25	27	27	28	29	27	28	25	24
Fishing	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	3
Not elsewhere specified (Other)	3	4	5	5	5	5	6	6	6	7	7	7	7	7	6	6

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**							
Refinery gross output																
Imports (Balance)	629	606	615	629	680	620	704	673	549							
International marine bunkers	106	104	88	73	53	58	69	83	80							
Stock changes	-46	20	-2	-19	-34	7	-2	-14	-6							
	46	-20	2	19	34	-7	2	14	6							
Gross inland deliveries (Calculated)	477	522	525	537	593	569	633	576	463							
Statistical difference	-26	7	17	-25	-29	-5	3	-12	1							
Gross inland deliveries (Observed)	503	515	508	562	622	574	630	588	462							
Main activity producer electricity plants	7	16	23	92	158	112	214	236	124							
Road	322	336	329	320	328	312	271	231	224							
Water-borne navigation	0.56	0.63	0.76	1.49	0.95	0.89	0.63	0.47	0.46							
Chemical and petrochemical	1	1	1	1	1	1	1	1	2							
Non-ferrous metals	1	1	1	1	1	1	1	0	0							
Non-metallic minerals	3	3	3	3	2	2	3	3	1							
Mining and Quarrying	6	5	4	4	3	4	5	4	3							
Food, beverages and tobacco	3	3	3	3	2	2	3	2	3							
Construction	6	5	4	4	3	4	5	3	3							

Not elsewhere specified (Industry)	3	4	3	3	2	4	5	3	2							
Commercial and public services	19	18	20	19	23	20	16	14	13							
Residential	98	89	78	83	70	80	76	63	57							
Agriculture/forestry	25	25	23	20	19	22	21	21	19							
Fishing	3	3	3	4	4	3	3	2	2							
Not elsewhere specified (Other)	4	6	13	5	5	6	5	5	9							

Total Fuel Oil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	162	235	264	313	316	317	316	421	442	495	491	482	423	362	112	
Refinery fuel	11	12	13	13	14	17	16	14	15	16	16					
Imports (Balance)	460	510	509	577	546	539	599	476	515	586	637	585	690	821	925	1298
Exports							22									
International marine bunkers	34	36	38	36	50	54	65	71	63	108	143	145	105	88	27	225
Stock changes	0	-12	41	-44	52	-63	52	-3	10	-59	11	22	-23	49	-20	-49
	0	12	-41	44	-52	63	-52	3	-10	59	-11	-22	23	-49	20	49
Gross inland deliveries (Calculated)	577	685	763	797	850	722	864	809	889	898	980	944	985	1144	990	1024
Refinery fuel	11	12	13	13	14	17	16	14	15	16	16					
Main activity producer electricity plants	540	561	645	697	727	662	703	743	811	856	902	897	932	1095	1046	1104
Non-metallic minerals	9	31	30	25	28	24	28	18	17	17	18	14	14	16	17	37
Food, beverages and tobacco	19	62	59	50	55	49	56	35	34	34	35	27	28	31	34	20
Paper, pulp and printing	2	5	5	4	5	4	5	3	3	3	3	2	2	3	3	2
Not elsewhere specified (Industry)	6	21	20	17	18	16	19	12	11	11	12	9	9	12	16	13
Commercial and public services	2	5	5	4	5	4	5	3	3	3	3	2	2	3	3	1

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Refinery gross output																
Refinery fuel																
Imports (Balance)	1404	1403	1479	1356	1317	1153	1072	830	942							
Exports																
International marine bunkers	190	171	165	146	134	141	128	157	153							
Stock changes	-11	10	4	37	-66	85	-24	4	39							
	11	-10	-4	-37	66	-85	24	-4	-39							

Gross inland deliveries (Calculated)	1203	1242	1318	1247	1117	1097	920	677	828							
Refinery fuel																
Main activity producer electricity plants	1137	1174	1219	1163	1053	1058	896	649	793							
Non-metallic minerals	35	38	38	30	25	15	13	8	6							
Food, beverages and tobacco	13	19	18	12	14	24	9	7	12							
Paper, pulp and printing	1	2	1	1	1	2	1	1	1							
Not elsewhere specified (Industry)	11	24	21	17	15	12	3	5	4							
Commercial and public services	2	2	2	2	2	2	3	3	1							

White spirit and SPB (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Imports (Balance)				1		1	1	1		1		1				1
Gross inland deliveries (Calculated)	0	0	0	1	0	1	1	1	0	1	0	1	0	0	0	1
Statistical difference	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross inland deliveries (Observed)	0	0	0	1	0	1	1	1	0	1	0	1	0	0	0	1
Not elsewhere specified (Industry)				1		1	1	1		1		1				1

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Imports (Balance)	1	1	0	0	0	0	0	0	0							
Gross inland deliveries (Calculated)	1	1	0	0	0	0	0	0	0							
Statistical difference	0	0	0	0	0	0	0	0	0							
Gross inland deliveries (Observed)	1	1	0	0	0	0	0	0	0							
Not elsewhere specified (Industry)	1	1	0	0	0	0	0	0	0							

Lubricants (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Imports (Balance)				8	11	11	13	12	6	6	7	9	10	9	11	12
International marine bunkers							1	1	1	1	1	1	1	1	1	1
Stock changes				-2					-1		1	1	-1		1	-1
	0	0	0	2	0	0	0	0	1	0	-1	-1	1	0	-1	1
Gross inland deliveries (Calculated)	0	0	0	6	11	11	12	11	4	5	7	9	8	8	11	10
Statistical difference	0	0	0	-2	0	0	0	0	-3	-2	0	2	0	0	1	4

Gross inland deliveries (Observed)	0	0	0	8	11	11	12	11	7	7	7	7	8	8	10	6
Non-energy use: Road				6	8	8	9	8	5	5	5	5	6	6	7	2
Non-energy use: Not elsewhere specified (Industry)				2	3	3	3	3	2	2	2	2	2	2	3	4

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Imports (Balance)	12	11	11	10	10	10	9	7	7							
International marine bunkers	1	1	1													
Stock changes					1											
	0	0	0	0	-1	0	0	0	0							
Gross inland deliveries (Calculated)	11	10	10	10	11	10	9	7	7							
Statistical difference	5	4	4	4	5	4	4	3	3							
Gross inland deliveries (Observed)	6	6	6	6	6	6	5	4	4							
Non-energy use: Road	2	2	2	2	2	2	1	1	1							
Non-energy use: Not elsewhere specified (Industry)	4	4	4	4	4	4	4	3	3							

Bitumen (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	33	23	24	34	35	37	30	37	37	37	36	42	38	30	9	
Imports (Balance)			28	21	23	17	25	21	38	48	50	41	46	40	53	70
Stock changes		-4	-2	4		-3		2		1	-1	-2		-1	4	1
	0	4	2	-4	0	3	0	-2	0	-1	1	2	0	1	-4	-1
Gross inland deliveries (Calculated)	33	19	50	59	58	51	55	60	75	86	85	81	84	69	66	71
Statistical difference	0	-4	0	0	1	-3	-2	-2	0	0	2	0	0	-1	1	2
Gross inland deliveries (Observed)	33	23	50	59	57	54	57	62	75	86	83	81	84	70	65	69
Construction	33	23	50	59	57	54	57	62	75	86	83	81	84	70	65	69

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Refinery gross output																
Imports (Balance)	70	62	69	61	68	60	36	29	21							
Stock changes	-5	-2		-4	6	4	-1	-3	1							
	5	2	0	4	-6	-4	1	3	-1							

Gross inland deliveries (Calculated)	65	60	69	57	74	64	35	26	22							
Statistical difference	-4	3	3	-17	-9	0	-1	2	1							
Gross inland deliveries (Observed)	69	57	66	74	83	64	36	24	21							
Construction	69	57	66	74	83	64	36	24	21							

Pet-coke (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Imports (Balance)	33	93	85	121	110	152	153	142	133	144	180	93	188	113	135	143
Stock changes	2		-22	-7	2	-27	-6	10	17	10	-39	40	-49	24	11	11
	-2	0	22	7	-2	27	6	-10	-17	-10	39	-40	49	-24	-11	-11
Gross inland deliveries (Calculated)	40	93	63	114	112	125	147	152	150	154	141	133	139	137	146	154
Statistical difference	0	0	-22	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross inland deliveries (Observed)	0	93	85	114	112	125	147	152	150	154	141	133	139	137	146	154
Non-metallic minerals	40	93	85	114	112	125	147	152	150	154	141	133	139	137	146	154

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Imports (Balance)	153	149	163	118	123	78	102	142	149							
Stock changes	-7	-6	-11	26	-7	23	-8	-7	13							
	7	6	11	-26	7	-23	8	7	-13							
Gross inland deliveries (Calculated)	146	143	152	144	116	101	94	135	162							
Statistical difference	0	0	0	0	0	1	0	0	0							
Gross inland deliveries (Observed)	146	143	152	144	116	100	94	135	162							
Non-metallic minerals	146	143	152	144	116	100	94	135	162							

Other Liquid fuels (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Refinery gross output	5	5						1					16	16	1	
Refinery fuel													16	16		
Imports (Balance)	33												5	5	6	
Stock changes	2															
	-2															
Gross inland deliveries (Calculated)	40	5						1					5	5	7	

Statistical difference													5	5	1	
Gross inland deliveries (Observed)	40	5						1							6	
Refinery fuel													16	16		
Not elsewhere specified (Industry)	0	5						1							6	

Other bituminous coal (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total imports (Balance)	97	97	26	33	27	20	18	19	21	26	50	59	66	51	39	63
Stock changes (National territory)	0	0	0	-2	0	0	0	0	5	4	-1	-6	-13	2	18	-11
	0	0	0	2	0	0	0	0	-5	-4	1	6	13	-2	-18	11
Non-metallic minerals	97	97	26	31	27	20	18	19	26	30	49	53	53	53	57	52

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Total imports (Balance)	63	33	41	26	17				5.452							
Stock changes (National territory)	-9	16	-1	-5	9	12	0	0	-1.3							
	9	-16	1	5	-9	-12	0	0	1.3							
Non-metallic minerals	54	49	40	21	26	12	20	20	4.152							

Lignite (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total imports (Balance)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Not elsewhere specified (Other)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Total imports (Balance)	1	1	1	1	1	1	1	1	0							
Not elsewhere specified (Other)	1	1	1	1	1	1	1	1	0							

Industrial waste (non-renewable) (TJ)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Indigenous production	0	0	0	0	0	0	0	0	0	0	0	18	0	15	71	138
Imports																
Inland consumption (calculated)	0	0	0	0	0	0	0	0	0	0	0	18	0	15	71	138
Non-metallic minerals	0	0	0	0	0	0	0	0	0	0	0	18	0	15	71	138

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Indigenous production	73	288	239	276	299	4	0	0	273							
Imports									6							
Inland consumption (calculated)	73	288	239	276	299	4	0	0	279							
Non-metallic minerals	73	288	239	276	299	4	0	0	279							

Solid biofuel (TJ)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Indigenous production	257	232	230	229	490	479	464	358	378	369	367	403	399	486	368	266
Total imports (balance)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	4
Inland consumption (calculated)	257	232	230	229	490	479	464	358	378	369	367	403	399	487	372	270
Statistical difference																
Chemical and petrochemical																
Non-metallic minerals											41	70	90	211	127	38
Food, beverages and tobacco																
Commercial and public services	19	15	15	15	11	12	17	9	8	11	10	10	10	9	8	7
Residential	126	105	103	102	74	79	119	61	56	77	68	70	64	58	53	51

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Indigenous production	269	512	452	295	225	211	236	209	355							
Total imports (balance)	6	4	178	293	269	276	122	168	152							
Inland consumption (calculated)	275	516	630	588	494	487	358	377	507							
Statistical difference									-1							
Chemical and petrochemical									42							
Non-metallic minerals	61	133	281	304	347	306	117	178	277							

Food, beverages and tobacco									44							
Commercial and public services	5	14	15	15	15	13	16	16	16							
Residential	74	95	123	222	84	123	143	112	71							

Charcoal (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Indigenous production	1	1	1	1	5	4	4	3	4	4	3	3	3	3	2	2
Total imports (balance)	0	0	0	0	3	3	3	4	4	3	2	2	4	4	6	8
Inland consumption (calculated)	1	1	1	1	8	7	7	7	8	7	5	5	7	7	8	10
Commercial and public services	0.5	0.5	0.5	0.5	1.0	4	4	4	4	4	3	3	4	4	4	5
Residential	0.5	0.5	0.5	0.5	1.0	4	4	4	4	4	3	3	4	4	4	5

	2006	2007	2008	2009	2010	2011	2012	2013	2014							
Indigenous production	2	4	3	1	1	1	1	1	1							
Imports	8	9	10	10	10	11	11	11	11							
Inland consumption (calculated)	10	13	13	11	11	12	12	12	12							
Commercial and public services	5	7	7	6	6	6	6	6	6							
Residential	5	6	6	5	5	6	6	6	6							

Biogases (kt)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Indigenous production	0	0	0	0	0	0	0	0	15	78	209	274	448	476	466	475
Imports	0	0	0	0	0	0	0	0	15	78	209	274	448	476	466	475
Inland consumption (calculated)																-1
Commercial and public services	0	0	0	0	0	0	0	0	0	0	11	12	11	11	11	11
Agriculture/Forestry	0	0	0	0	0	0	0	0	15	78	198	262	437	465	455	464

IV2. CO_2 emissions: Reference Vs. Sectoral approach

Crude oil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	1,972.87	2,314.09	2,255.15	2,422.66	2,810.41	2,568.46	2,357.52	3,235.39	3,356.36	3,660.36	3,638.65	3,585.91	3,368.77

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	3,012.04	862.356	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

Gasoline (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	125.87	150.43	214.90	230.25	181.13	236.39	288.58	162.71	150.43	165.78	181.13	257.88	230.25
Road Transport	500.41	521.90	528.04	518.83	552.60	561.81	571.02	586.37	598.65	623.21	632.42	672.33	699.96

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	353.05	752.15	1003.89	939.42	1059.15	1,169.67	1,160.46	1,206.51	1,154.32	1,117.48	1,059.15	1,043.80	
Road Transport	773.64	865.74	930.21	991.61	1080.64	1145.11	1175.81	1197.30	1181.95	1142.04	1071.43	1046.87	

Jet Kerosene (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	155.06	-68.62	-52.52	55.33	564.24	105.01	148.77	30.07	43.46	13.25	15.01	61.91	4.74
International Aviation	733.2	869.9	845.0	717.6	736.3	807.7	773.5	761.1	801.5	820.1	832.6	975.5	938.2
Domestic Aviation	11.0	13.0	12.7	10.8	11.0	12.1	11.6	11.4	12.0	12.3	12.5	14.6	14.1
Non specified/stationary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	20.90	37.68	66.58	41.37	25.98	25.64	99.12	32.82	19.95	46.77	14.07	12.12	
International Aviation	1003.4	916.4	845.6	850.4	836.6	867.5	818.7	835.8	861.4	832.2	775.8	776.4	
Domestic Aviation	15.0	13.7	12.5	10.5	9.4	8.9	7.2	7.7	2.3	1.5	1.0	0.6	
Non specified/stationary	0.00	0.00	0.00	0.00	0.00	0.00	3.15	3.15	6.31	3.15	6.31	6.31	

Other kerosene (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	0.00	0.00	9.44	0.00	0.00	15.74	0.00	0.00	-6.30	NO,NA	15.74	NO,NA	NO,NA
Non-specified Industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other sectors/residential	37.79	37.79	53.54	50.39	53.54	53.54	56.69	62.98	66.13	62.98	75.58	75.58	97.63

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	NO,NA	9.44	44.07	31.48	44.07	50.36	59.81	25.18	47.22	47.22	40.92	40.92	
Non-specified Industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.30	
Other sectors/residential	97.63	75.58	50.39	50.39	50.39	44.09	59.84	44.09	50.39	53.54	37.79	28.34	

Gas/ Diesel oil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	299.38	38.22	512.76	490.47	232.50	436.33	636.97	379.00	445.88	283.45	461.81	474.55	522.32
electricity	0.00	0.00	32.62	10.79	6.09	25.45	18.39	17.83	35.91	64.97	57.89	11.48	4.91
Non-ferrous metals	2.20	2.45	2.96	3.07	3.16	3.43	3.61	3.79	4.04	4.15	4.29	4.33	4.15
Chemicals	2.20	2.45	2.96	3.07	3.16	3.43	3.61	3.79	4.04	4.15	4.29	4.33	4.15
Food Processing, Beverages and Tobacco	6.60	7.34	8.89	9.22	9.49	10.30	10.84	11.38	12.12	12.45	12.86	12.99	12.45
Non-Metallic Minerals	6.60	7.34	8.89	9.22	9.49	10.30	10.84	11.38	12.12	12.45	12.86	12.99	12.45
Mining (excluding fuels) and Quarrying	10.99	12.23	14.81	15.37	15.82	17.17	18.06	18.96	20.19	20.76	21.43	21.65	20.76
Construction	10.99	12.23	14.81	15.37	15.82	17.17	18.06	18.96	20.19	20.76	21.43	21.65	20.76
Non-specified Industry	6.60	7.34	8.89	9.22	9.49	10.30	10.84	11.38	12.12	12.45	12.86	12.99	12.45
Road Transport	666.93	641.52	781.26	809.84	828.89	905.11	946.40	997.21	1060.73	1079.40	1113.51	1129.77	1084.74
Urea-based catalysts	1.00	0.96	1.17	1.21	1.24	1.35	1.42	1.49	1.59	1.61	1.67	1.69	1.62
International water-borne navigation	76.47	63.73	66.91	44.61	38.24	47.79	79.66	86.03	111.52	146.57	159.32	149.76	105.15
Domestic water-borne navigation	2.20	2.11	2.57	2.67	2.73	2.98	3.12	3.29	3.50	3.94	1.69	1.37	1.79
Other sectors/commercial	35.18	39.13	47.39	49.19	50.62	54.93	57.80	60.67	64.62	66.42	68.57	69.29	66.42
Other sectors/residential	167.12	185.88	225.11	233.63	240.45	260.92	274.56	288.20	306.96	315.49	325.72	329.13	315.49

Other sectors/agriculture/stationary	46.18	51.36	62.20	64.56	66.44	72.10	75.87	79.64	84.82	87.17	90.00	90.94	87.17
Other sectors/agriculture/fishing	6.60	7.34	8.89	9.22	9.49	10.30	10.84	11.38	12.12	12.45	12.86	12.99	12.45
Non specified/stationary	10.99	12.23	14.81	15.37	15.82	17.17	18.06	18.96	20.19	20.76	21.43	21.65	20.76

	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	
Reference	681.56	1493.70	1652.95	1519.18	1662.50	1,672.06	1,710.27	1,888.63	1,812.19	2,016.02	1,834.48	1,474.59	
electricity	15.73	26.14	50.60	21.28	49.72	70.98	284.84	490.53	336.65	676.13	743.85	387.23	
Non-ferrous metals	4.26	3.84	3.57	3.64	3.03	2.73	2.73	2.12	2.43	3.19	0.00	0.07	
Chemicals	4.26	3.84	3.57	3.64	3.03	2.73	2.73	2.12	2.43	3.19	3.19	6.37	
Food Processing, Beverages and Tobacco	12.79	11.51	10.70	10.92	9.10	8.19	8.19	6.37	7.28	9.56	6.37	9.56	
Non-Metallic Minerals	12.79	11.51	10.70	10.92	9.10	8.19	8.19	6.37	7.28	9.56	9.56	3.19	
Mining (excluding fuels) and Quarrying	21.32	19.19	17.83	18.21	15.17	13.66	13.66	10.62	12.14	15.93	12.75	9.56	
Construction	21.32	19.19	17.83	18.21	15.17	13.66	13.66	10.62	12.14	15.93	9.56	9.56	
Non-specified Industry	12.79	11.51	10.70	10.92	12.29	8.19	8.19	6.37	13.66	15.93	9.56	6.37	
Road Transport	1117.02	1126.05	1100.13	1027.39	1071.79	1049.06	1018.05	1045.28	994.49	864.68	734.53	712.27	
Urea-based catalysts	1.67	1.68	1.65	1.54	1.60	1.57	1.52	1.56	1.49	1.29	1.10	1.07	
International water-borne navigation	114.71	86.03	213.48	337.75	331.38	280.39	232.60	168.87	184.81	219.85	264.46	254.90	
Domestic water-borne navigation	1.37	1.90	2.33	1.78	2.00	2.42	4.75	3.02	2.83	1.99	1.51	1.46	
Other sectors/commercial	68.21	61.39	57.05	60.54	57.35	63.73	60.54	73.28	63.73	50.98	44.61	41.42	
Other sectors/residential	324.02	291.61	264.46	312.26	283.58	248.53	264.46	223.04	254.90	242.16	200.74	181.62	
Other sectors/agriculture/stationary	89.53	80.58	76.26	79.75	79.53	73.28	63.73	60.54	70.10	66.91	66.91	60.54	
Other sectors/agriculture/fishing	12.79	11.51	9.77	9.46	9.69	9.56	12.75	12.75	9.56	9.56	6.37	6.37	
Non specified/stationary	21.32	19.19	17.83	12.75	19.12	41.42	15.93	15.93	19.12	15.93	15.93	28.68	

Residual Fuel Oil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	1331.51	1444.03	1600.31	1553.43	1712.84	1319.01	1762.85	1256.50	1419.03	1309.63	1578.43	1444.03	1756.59
electricity	1675.77	1738.05	1999.05	2154.48	2252.60	2050.47	2178.47	2303.72	2514.78	2654.91	2792.51	2771.63	2886.54
Petroleum refining	34.40	37.52	40.65	40.65	43.78	53.16	50.03	43.78	46.90	50.03	50.03	0.00	0.00
Pulp, Paper and Print	4.82	16.16	15.37	13.03	14.33	12.64	14.46	9.12	8.86	8.86	9.12	7.04	7.17
Food Processing, Beverages and Tobacco	57.85	193.87	184.49	156.35	171.98	151.66	173.55	109.44	106.32	106.32	109.44	84.43	85.99
Non-Metallic Minerals	28.92	96.94	92.25	78.17	85.99	75.83	86.77	54.72	53.16	53.16	54.72	42.21	43.00
Non-specified Industry	19.28	64.62	61.50	52.12	57.33	50.55	57.85	36.48	35.44	35.44	36.48	28.14	28.66
International water-borne navigation	106.32	112.57	118.82	112.57	156.35	168.86	203.25	222.01	197.00	337.71	447.16	453.41	328.33
Other sectors/commercial	4.82	16.16	15.37	13.03	14.33	12.64	14.46	9.12	8.86	8.86	9.12	7.04	7.17

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	2444.23	2744.29	3200.63	3760.11	3882.01	4,119.56	3,897.64	3,491.31	3,428.80	2,875.56	2,116.04	2,588.01	
electricity	3102.16	3231.64	3421.25	3632.10	3751.94	3896.32	3707.63	3377.47	3373.38	2869.80	2085.88	2553.09	
Petroleum refining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pulp, Paper and Print	8.08	8.86	5.15	3.49	4.97	4.60	3.13	3.68	6.25	3.50	3.00	3.13	
Food Processing, Beverages and Tobacco	96.94	106.32	61.80	41.94	59.60	55.18	37.52	44.15	75.05	28.14	21.89	37.52	
Non-Metallic Minerals	48.47	53.16	115.70	109.44	118.82	118.82	93.81	78.17	46.90	40.65	25.02	18.76	
Non-specified Industry	38.57	51.07	39.36	35.87	76.15	65.30	53.16	45.98	37.52	9.38	15.63	12.51	
International water-borne navigation	275.17	84.43	703.57	594.12	534.71	515.95	456.54	419.01	440.90	400.25	490.93	478.42	
Other sectors/commercial	8.08	8.86	3.13	6.25	6.25	6.25	6.25	6.25	6.25	9.38	9.38	3.13	

Liquefied Petroleum Gases (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	71.59	59.66	80.54	71.59	44.75	62.64	68.61	50.71	59.66	29.83	41.76	59.66	59.66
Non-ferrous metals	2.71	2.71	3.04	2.82	2.76	2.82	2.82	2.87	2.76	2.71	2.93	2.93	2.98
Food Processing, Beverages and Tobacco	8.12	8.12	9.12	8.46	8.29	8.46	8.46	8.62	8.29	8.12	8.79	8.79	8.95
Non-Metallic Minerals	2.71	2.71	3.04	2.82	2.76	2.82	2.82	2.87	2.76	2.71	2.93	2.93	2.98
Other sectors/commercial	35.21	35.21	39.52	36.64	35.93	36.64	36.64	37.36	35.93	35.21	38.08	38.08	38.80
Other sectors/residential	94.79	94.79	106.40	98.66	96.72	98.66	98.66	100.59	96.72	94.79	102.53	102.53	104.46
Other sectors/agriculture/stationary	2.71	2.71	3.04	2.82	2.76	2.82	2.82	2.87	2.76	2.71	2.93	2.93	2.98

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	80.54	131.25	152.14	158.10	152.14	155.12	152.14	146.17	164.07	155.12	155.12	143.19	
Non-ferrous metals	3.21	3.10	2.93	2.98	2.98	0.00	2.98	2.98	2.98	2.98	0.00	2.98	
Food Processing, Beverages and Tobacco	9.62	9.29	8.79	8.95	8.95	8.95	8.95	8.95	11.94	14.92	11.94	11.94	
Non-Metallic Minerals	3.21	3.10	2.93	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	
Other sectors/commercial	41.67	40.24	38.08	38.80	38.80	41.78	38.80	38.80	41.78	41.78	35.82	32.83	
Other sectors/residential	112.20	108.33	102.53	104.46	107.45	101.48	107.45	101.48	113.42	110.43	98.49	92.52	
Other sectors/agriculture/stationary	3.21	3.10	2.93	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	0.00	

Bitumen (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	-3.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	155.23	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	

Lubricants (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.95	-2.95	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Petroleum coke (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	96.13	255.42	173.03	313.09	307.60	343.30	403.73	417.46	411.97	422.95	387.25	365.28	381.75
Non-Metallic Minerals	109.86	255.42	233.45	313.09	307.60	343.30	403.72	417.46	411.96	422.95	387.25	365.27	381.75

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	376.26	400.98	422.95	420.34	420.21	443.52	438.92	352.70	304.52	277.75	406.02	493.88	
Non-Metallic Minerals	376.26	400.98	422.95	420.34	420.21	443.53	438.92	352.70	301.51	277.74	406.01	493.87	

Other Oil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	14.74
Petroleum Refining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.15
Non-specified Industry	0.00	14.73	0.00	0.00	0.00	0.00	0.00	2.95	0.00	0.00	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	14.74	17.69	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Petroleum Refining	47.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Non-specified Industry	0.00	17.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Other Liquid Fossil (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	NO	NO	NO	2.95	NO	2.95	2.95	2.95	NO	NA,NO	NO	2.95	NO
Non-specified Industry	0.00	0.00	0.00	2.95	0.00	2.95	2.95	2.95	0.00	2.95	0.00	2.95	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	NO	NO	2.95	2.95	2.95	NO	NO	NO	NO	NO	NO	NO	
Non-specified Industry	0.00	0.00	2.95	2.95	2.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Other bituminous coal (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	248.35	248.35	66.57	79.37	69.13	51.21	46.09	48.65	66.57	76.81	125.46	131.72	129.56
Non-Metallic Minerals	231.74	231.74	62.12	74.06	64.51	47.78	43.00	45.39	62.12	71.67	117.06	126.62	126.62

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	133.98	151.06	137.81	149.40	116.25	110.63	56.87	151.06	65.95	28.77	NO	NO	
Non-Metallic Minerals	126.62	136.18	151.12	149.47	117.33	109.44	57.64	136.18	69.61	29.37	0.00	0.00	

Lignite (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Non specified/stationary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	NO	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	NO	
Non specified/stationary	0.00	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	0.00	

Waste (non-biomass fraction) (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	2.57	NO
Non-Metallic Minerals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.57	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	2.15	10.15	19.73	10.44	41.18	34.18	39.47	42.76	8.04	3.30	6.45	55.85	
Non-Metallic Minerals	2.15	10.15	19.73	10.44	41.18	34.18	39.47	42.76	8.04	3.30	6.45	55.85	

Solid biomass (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	29.02	26.52	26.32	26.22	75.44	71.04	69.54	58.93	64.23	50.80	53.23	56.84	63.03
Chemicals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food Processing, Beverages and Tobacco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Metallic Minerals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.10	7.00	9.00
Other sectors/commercial	3.51	3.19	3.17	3.15	4.40	12.73	13.31	12.46	14.04	12.69	9.26	9.29	12.51
Other sectors/residential	14.44	12.26	12.08	12.00	11.01	20.53	24.45	18.70	19.97	20.27	15.80	15.97	19.05
Non specified/stationary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	71.84	63.63	60.02	60.52	94.54	105.95	95.15	85.74	88.34	75.42	77.33	90.34	
Chemicals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	
Food Processing, Beverages and Tobacco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	
Non-Metallic Minerals	21.10	12.70	3.80	6.10	13.30	28.10	30.40	34.70	30.60	11.70	17.80	27.70	
Other sectors/commercial	12.42	14.00	17.26	17.02	24.53	24.63	21.32	21.32	21.12	21.42	21.42	21.42	
Other sectors/residential	18.44	19.71	23.05	25.40	31.09	33.894	40.195	26.395	33.89	35.89	32.79	32.35	
Non specified/stationary	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Liquid biomass (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Road Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Road Transport	0.00	0.00	0.00	0.00	1.91	30.59	32.50	32.50	34.41	34.41	32.50	21.03	

Gas biomass (kt)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Other sectors/commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other sectors/agriculture/stationary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Reference	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other sectors/commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.66	0.60	0.60	0.60	0.60	
Other sectors/agriculture/stationary	0.00	0.00	0.00	0.00	0.82	4.26	11.41	14.96	24.46	25.99	25.44	25.33	